

Video Adresse: <https://youtu.be/5uWEjtQLXCI>

1

00:00:00,410 --> 00:00:09,179

Hello Tyler, so good that you could be in Munich this day! And we have so many

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00:00:09,179 --> 00:00:14,340

questions to you!

We already already had some correspondence...

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00:00:14,340 --> 00:00:23,160

It's from the last year and it's almost a book! And now we will take the rest and I am so glad

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00:00:23,160 --> 00:00:29,760

that you are here and will answer our questions! (Cut in) And you people

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00:00:29,760 --> 00:00:39,469

welcome with Mr. Tyler LeBaron: He is the King!

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00:00:41,300 --> 00:00:47,280

Once again welcome to Munich. Tyler LeBaron!

You are the founder, the head and

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00:00:47,280 --> 00:00:53,090

the heart of the molecular hydrogen foundation MHF in the US.

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00:00:53,090 --> 00:01:00,270

A worldwide active foundation that has taken up the cause to spread the quite

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00:01:00,270 --> 00:01:07,460

young knowledge of medicinal uses of hydrogen gas to the world. You are a

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00:01:07,460 --> 00:01:14,400

biochemist and yourself still quite young. Today in May 2017 on the 29th

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00:01:14,400 --> 00:01:22,950

you are 29 years old and are most probably the most booked conference talker on

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00:01:22,950 --> 00:01:31,619

this subject. On the Advisory Council of the MHF are eminent authorities and

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00:01:31,619 --> 00:01:37,310

you are practically the head coordinator of this worldwide research of this

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00:01:37,310 --> 00:01:45,990

exploding subject. What do you see as the duty of your foundation?

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00:01:45,990 --> 00:01:49,820

- So, yeah, I am the founder of the Molecular Hydrogen Foundation which is a science-based

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00:01:49,820 --> 00:01:55,950

nonprofit organisation. And we're really focused on advancing the research, the awareness and

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00:01:55,950 --> 00:02:01,860

the education of hydrogen as a therapeutic medical gas. So we don't sell

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00:02:01,860 --> 00:02:06,000

any products or make recommendations or endorsements. We just really want to

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00:02:06,000 --> 00:02:10,640

focus on advancing this research and bring in the

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00:02:10,640 --> 00:02:14,330

awareness of what hydrogen is. Because it's still very much in its infancy.

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00:02:14,330 --> 00:02:20,000

The hydrogen research really started in about 2007 when an article was

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00:02:20,000 --> 00:02:24,620

published in Nature Medicine that showed hydrogen could have therapeutic benefits.

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00:02:24,620 --> 00:02:29,209

But the research has grown since then exponentially. I mean there's but

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00:02:29,209 --> 00:02:33,230

there's still only around a thousand publications or so on molecular hydrogen

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00:02:33,230 --> 00:02:38,090

which although one could consider is quite a bit and it is.

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00:02:38,090 --> 00:02:42,260

It is growing exponentially, but in the field of academia it's still a very

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00:02:42,260 --> 00:02:46,700

small amount of research and so we really need to understand this molecular

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00:02:46,700 --> 00:02:51,709

hydrogen more. It's a very fascinating area so with MHF where we're hoping to

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00:02:51,709 --> 00:02:56,300

bring forth that awareness and get the education out there to people.

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00:02:56,300 --> 00:03:01,970

Because one thing we see, and this is long before it was even known that Hydrogen

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00:03:01,970 --> 00:03:06,050

was very therapeutic:
hydrogen is safe.

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00:03:06,050 --> 00:03:10,580

We produce it by our intestinal flora and we're exposed to it all the time.

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00:03:10,580 --> 00:03:16,400

It is something very natural. They used it in

deep-sea diving back to the 1940s to prevent

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00:03:16,400 --> 00:03:20,959
decompression sickness or the bends,
because hydrogen has such a fast rate of

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00:03:20,959 --> 00:03:24,709
diffusivity. It goes out of the body very
quickly. So it's not going to have that

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00:03:24,709 --> 00:03:29,660
toxic build-up, for example, the humans
that have done it at literally millions of

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00:03:29,660 --> 00:03:34,400
times higher concentrations than what we
need for therapeutic use. They have really

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00:03:34,400 --> 00:03:40,100
shown the high safety profile of hydrogen. So
because we see this is safe - and we see that

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00:03:40,100 --> 00:03:44,450
in the various studies out there: clinical
studies and animal studies and cell

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00:03:44,450 --> 00:03:48,590
studies, tissue studies. Different
animals have been used, not just your

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00:03:48,590 --> 00:03:56,840
rats and mice but pigs and dogs and
monkeys and some different animal models.

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00:03:56,840 --> 00:04:03,820
We're starting to see that hydrogen
actually may really have some

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00:04:03,820 --> 00:04:09,079
remarkable benefits. But we need
to understand exactly how that works.

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00:04:09,079 --> 00:04:14,720

And why? And for the dosing. There's so much to understand! But because it's safe

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00:04:14,720 --> 00:04:19,820

it's certainly something we need to do more research on.

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00:04:19,820 --> 00:04:26,240

And perhaps this could benefit a lot of people. - With regard to the pedagogic duties of your

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00:04:26,240 --> 00:04:30,950

foundation
maybe we should first put in order for

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00:04:30,950 --> 00:04:38,390

some of our audience all the basic principles of hydrogen so that we not

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00:04:38,390 --> 00:04:46,250

only know what we are talking about but in front of everyone about what we are

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00:04:46,250 --> 00:04:51,410

not talking about! A bit of chaos surrounds the different forms of

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00:04:51,410 --> 00:04:59,330

hydrogen. Most know it as a component of water H₂O. But then quite a few

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00:04:59,330 --> 00:05:09,290

definitions are floating around like H. H+. H-. Hydroxide, Protons, hydrogen ions,

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00:05:09,290 --> 00:05:18,370

active hydrogen, hydrogen radical, hydrogen superoxide, oxy-hydrogen gas and

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00:05:18,370 --> 00:05:26,440

much more... What is the issue for your foundation with such interesting

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00:05:26,440 --> 00:05:33,110
molecular hydrogen? – one of the main
questions I often get is for what what

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00:05:33,110 --> 00:05:38,990
is hydrogen in general: like Water is H₂O so isn't that already
Hydrogen,
or if you've got

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00:05:38,990 --> 00:05:44,720
Hydrogen to the water, well isn't that like
you can have H₃O or H₂O Plus

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00:05:44,720 --> 00:05:49,190
which is the hydronium-ion which is acid.
Is it acid water or is it alkaline

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00:05:49,190 --> 00:05:52,490
water? Because pH stands for potential of Hydrogen. So more Hydrogen
the higher the pH, or you know, all these things.

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00:05:52,490 --> 00:05:56,840
or you know all these things. Let me go
through some of these things.

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00:05:56,840 --> 00:06:01,070
But first let me explain what we're
talking about with molecular hydrogen.

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00:06:01,070 --> 00:06:05,900
It is simply hydrogen gas. That's what people want
to use it for the alternative energy source.

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00:06:05,900 --> 00:06:12,050
It's simply two hydrogen atoms
that are combined together to form a

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00:06:12,050 --> 00:06:17,990
hydrogen molecule. So it's just 2 (mean Di-) and so
it's di-atomic hydrogen.

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00:06:17,990 --> 00:06:22,340
Hydrogen gas is not bound to anything
else. It's free, it's available, it's not

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00:06:22,340 --> 00:06:28,700

about anything else...

So is medicinally used Hydrogen in Hydrogen water,

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00:06:28,700 --> 00:06:33,040

by inhalation, injection or infusion quite
the same thing as

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00:06:33,040 --> 00:06:38,940

what I use to tank up a hydrogen car
with fuel cells if I want to drive it?

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00:06:38,940 --> 00:06:45,790

Yes, so the exact same hydrogen gas
that you are putting into your water,

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00:06:45,790 --> 00:06:50,950

whether bubbling in or whatever, that's
the same hydrogen gas that people use

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00:06:50,950 --> 00:06:56,440

to put into their car or other things
for a fuel source. An it's a great fuel

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00:06:56,440 --> 00:07:01,930

source is three times more energy dense
than gasoline by mass. So what we're also

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00:07:01,930 --> 00:07:06,010

seeing: it's great for the human body.
So it's a very exciting area.

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00:07:06,010 --> 00:07:11,320

It's the molecule of the century if you
will for both of these aspects. But when

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00:07:11,320 --> 00:07:15,970

you add a hydrogen gas to the water
you're not hydrogenating the water. Or in

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00:07:15,970 --> 00:07:21,130

other words you're not making the

hydrogen bond to water molecules, it

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00:07:21,130 --> 00:07:25,210

doesn't do that. It just dissolves into the water like you add salt to the water you

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00:07:25,210 --> 00:07:29,800

get water with salt in it, water with sodium chloride. The sodium ions don't

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00:07:29,800 --> 00:07:35,680

actually covalently bond or something to the water molecule. It's just a salt

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00:07:35,680 --> 00:07:41,140

just dissolves the same with the hydrogen gas. So you don't form like H₄O or H₃O

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00:07:41,140 --> 00:07:46,000

or these different things, structures of the water. Something that is simply water that has hydrogen gas in it.

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00:07:46,000 --> 00:07:52,360

And once you have a saturated solution of the

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00:07:52,360 --> 00:07:56,740

hydrogen gas in the water, you should drink it quite soon or the gas will simply

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00:07:56,740 --> 00:08:02,080

escape out of the water. So there are different forms of hydrogen and maybe we

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00:08:02,080 --> 00:08:07,000

could talk about those briefly. When you look at the water molecule, many people

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00:08:07,000 --> 00:08:11,740

know it looks kind of like Mickey Mouse. and and the hydrogens that are attached to it.

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00:08:11,740 --> 00:08:16,570

But notice: the hydrogens are attached to the oxygen.

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00:08:16,570 --> 00:08:22,870

So those hydrogens are not available. I mean most compounds have hydrogen in them.

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00:08:22,870 --> 00:08:29,350

It's like a sugar, for example glucose, which has the the chemical formula c 6.

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00:08:29,350 --> 00:08:38,080

6 carbons so c 6 6 carbons and six oxygens and 12 hydrogens. So glucose has

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00:08:38,080 --> 00:08:44,620

12 hydrogens in it. Water has 2 hydrogens in it. But yet those are

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00:08:44,620 --> 00:08:50,020

completely different. Because the those hydrogens are bound to

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00:08:50,020 --> 00:08:53,730

the glucose molecule or bound to the water molecule: So you have a totally different

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00:08:53,730 --> 00:08:59,380

structure. And remember: the structure of the molecule always dictates its

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00:08:59,380 --> 00:09:04,870

function so we have hydrogen gas as two hydrogen atoms that are all by

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00:09:04,870 --> 00:09:09,700

themselves and the smallest gas. It can diffuse through cell membranes very

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00:09:09,700 --> 00:09:13,600

quickly and it can go everywhere very quickly. It's the smallest molecule there is.

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00:09:13,600 --> 00:09:18,130

That's the molecular hydrogen,
it's not bound to anything else.

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00:09:18,130 --> 00:09:25,510

And the other hydrogens some people say hydrogen,
they also refer to the hydrogen ion.

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00:09:25,510 --> 00:09:31,660

Meaning like H^+ , which is a positively charged
hydrogen atom, has no electron,

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00:09:31,660 --> 00:09:38,440

It just has simply one proton and this hydrogen ion is actually
what makes the water acidic.

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00:09:38,440 --> 00:09:43,510

So if you have an acid. And acid by definition is
something that can donate an H^+ ion.

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00:09:43,510 --> 00:09:50,920

So if you have a molecule that is an acid.
Then you have the molecule

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00:09:50,920 --> 00:09:55,630

and this is the hydrogen ion. It can donate the hydrogen ion into
the water
and that will make it acidic

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00:09:55,630 --> 00:10:01,630

And because acid and base, that's about the pH scale.

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00:10:01,630 --> 00:10:09,430

And pH we can briefly talk about
The p in pH means potential or power but

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00:10:09,430 --> 00:10:16,030

this is a mathematical expression. The power of ten,
in this case it's an exponent,

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00:10:16,030 --> 00:10:22,660

which is specifically it's a negative logarithm,
which is an inverse exponent,

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00:10:22,660 --> 00:10:28,090

So the p in pH really means a negative logarithm and

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00:10:28,090 --> 00:10:34,990

the H is the H⁺ and so really it's a negative logarithm of the

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00:10:34,990 --> 00:10:42,490

H⁺ concentration. And and that's what pH really means. And so when we hear pH, we're

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00:10:42,490 --> 00:10:50,860

talking about the H⁺ ions. So by having H⁺ ions in the water, then, the more H⁺ ions

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00:10:50,860 --> 00:10:57,220

we have, there we have the more acidic pH. A lower pH, because the negative log of

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00:10:57,220 --> 00:11:03,010

a bigger number is going to be smaller. so that's why H⁺

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00:11:03,010 --> 00:11:08,470

is specific to the pH in making something acidic.

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00:11:08,470 --> 00:11:14,230

Tyler, the whole universe is made of mainly hydrogen. One can speak more of an

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00:11:14,230 --> 00:11:23,950

abundance than a scarcity! There is an enormous amount of it. Why is it still

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00:11:23,950 --> 00:11:31,000

good for us and why is it useful for our health if we supply ourselves with hydrogen?

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00:11:31,000 --> 00:11:37,990

So although the universe is full of hydrogen and hydrogen is the most

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00:11:37,990 --> 00:11:44,620

abundant of all the elements that there are, the atmosphere is still very low

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00:11:44,620 --> 00:11:52,390
about 0.0005 five percent hydrogen. So, when we inhale additional hydrogen gas

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00:11:52,390 --> 00:11:56,680
or maybe take the hydrogen gas and dissolve it into water and then drink it.

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00:11:56,680 --> 00:12:02,140
what we see is: there are still therapeutic effects from that. And this is a very new

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00:12:02,140 --> 00:12:08,050
area in the biomedical research. It's that this small amount of additional hydrogen

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00:12:08,050 --> 00:12:12,790
gas has some benefits. Some of those benefits are, for example, reducing

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00:12:12,790 --> 00:12:20,230
oxidative stress or reducing inflammation or helping with the

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00:12:20,230 --> 00:12:25,120
constant decline. They have studies on proximal disease arthritis. All all of these

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00:12:25,120 --> 00:12:32,200
will have a basis in oxidative stress and with inflammation. So this is why

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00:12:32,200 --> 00:12:37,450
we're now seeing that yes, maybe having some more hydrogen, I guess molecular

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00:12:37,450 --> 00:12:41,830
hydrogen in our body, can be beneficial. But the research still is very much in

131

00:12:41,830 --> 00:12:47,380
it in its infancy. We need to understand
better which disease models or which

132
00:12:47,380 --> 00:12:51,610
people hydrogen is gonna be the most
effective for. But the preliminary data

133
00:12:51,610 --> 00:12:56,830
and some of the clinical studies that
have been done so far is very impressive,

134
00:12:56,830 --> 00:13:00,970
very remarkable. And we hope that more
research would be done, so we can understand

135
00:13:00,970 --> 00:13:09,250
the true significance of hydrogen therapy...
Oh well, there is so much Hydrogen

136
00:13:09,250 --> 00:13:15,930
in the universe
yet in our atmosphere on the earth there

137
00:13:15,930 --> 00:13:25,170
is less than 1% of it. But where does
this tiny amount of this earthly scarce

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00:13:25,170 --> 00:13:33,150
good come from? Hydrogen gas escapes at
high speed into the universe. Where is it

139
00:13:33,150 --> 00:13:44,030
reproduced? And what meaning does it
actually have naturally in our habitat?

140
00:13:44,030 --> 00:13:49,620
It's a very interesting question.
If we look back at the

141
00:13:49,620 --> 00:13:57,120
beginning of time, there is the earth has more
of a reducing atmosphere.

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00:13:57,120 --> 00:14:02,340

The concentration of hydrogen time was a lot higher and a lot of the hydrogen is

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00:14:02,340 --> 00:14:08,160

produced originally, actually some of it was even trapped

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00:14:08,160 --> 00:14:12,300

into various rocks and things at the very beginning. And there's actually some research

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00:14:12,300 --> 00:14:16,230

suggesting that for a lot of the waters came from

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00:14:16,230 --> 00:14:23,280

as hydrogen gas reacts with oxygen to form water. But also we have like in the deep sea

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00:14:23,280 --> 00:14:27,690

hydrothermal vents in places where there's reactions taking place with

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00:14:27,690 --> 00:14:34,500

basalt catalyzed reactions or just you know metals, iron, or different metals

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00:14:34,500 --> 00:14:38,430

that can donate its electrons that react with the water and that produces

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00:14:38,430 --> 00:14:43,830

hydrogen gas and that hydrogen gas interns what acted as an energy source for

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00:14:43,830 --> 00:14:51,630

the first organisms the archaea, the bacteria and it could basically use the

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00:14:51,630 --> 00:14:56,430

hydrogen gas and energy stores to extract the electrons and thus was the

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00:14:56,430 --> 00:15:02,760

genesis of life. And as time continued
of course the atmosphere changed and

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00:15:02,760 --> 00:15:07,500

hydrogen gas is the lightest molecule of
all the gases and has a highest rate of

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00:15:07,500 --> 00:15:12,360

diffusivity so it escapes the atmosphere
very easily, very quickly.

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00:15:12,360 --> 00:15:18,990

But it's still being constantly generated by
water or by bacteria. And even in our

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00:15:18,990 --> 00:15:24,180

Even in our bodies, for example, we have developed
a simbiotic relationship with bacteria

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00:15:24,180 --> 00:15:30,090

on our skin and our intestines and all
over our body. But we see the intestinal

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00:15:30,090 --> 00:15:36,060

microflora can metabolize the
non-digestible carbohydrates and some of

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00:15:36,060 --> 00:15:40,830

that bacteria will actually produce
hydrogen gas. So we end up always having

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00:15:40,830 --> 00:15:45,450

basal levels of hydrogen gas. In our
blood and in our breath pretty much all

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00:15:45,450 --> 00:15:49,500

the time.
So it is interesting that we've had this

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00:15:49,500 --> 00:15:54,210

relationship with hydrogen really from
the very beginning of time.

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00:15:54,210 --> 00:15:59,430

Hydrogen is really what was involved in even the evolution of your prokaryotes

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00:15:59,430 --> 00:16:05,700

and to your eukaryotes with the hydrogenesis, hydrogeous zones and different

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00:16:05,700 --> 00:16:09,770

things in the early days we have that evolution taking place.

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00:16:09,770 --> 00:16:17,840

Well, we allow our intestinal bacteria to produce hydrogen and we constantly

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00:16:17,840 --> 00:16:26,280

breath it out. Why is it healthy to inhale it or to incorporate it into us by drinking it?

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00:16:26,280 --> 00:16:35,400

It is so often people do wonder why we had to ingest more hydrogen if

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00:16:35,400 --> 00:16:41,940

we're already getting hydrogen from our bacteria in our intestines and it is one

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00:16:41,940 --> 00:16:47,700

of the enigmas if you will of the hydrogen therapy: The bacteria in our

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00:16:47,700 --> 00:16:53,460

intestines can produce a substantial amount of molecular hydrogen, but what we

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00:16:53,460 --> 00:16:58,740

see though, in animals studies and human studies is by taking small amounts more

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00:16:58,740 --> 00:17:03,360

of molecular hydrogen either where it's

dissolved in water or simply through

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00:17:03,360 --> 00:17:08,840

inhalation with a cannula or a gas mask,
for example, still observe therapeutic

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00:17:08,840 --> 00:17:14,580

protective health benefits. There's a
couple of reasons why that probably is.

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00:17:14,580 --> 00:17:21,630

One of them is a concentration issue even
though we get some hydrogen gas from the

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00:17:21,630 --> 00:17:26,550

bacteria and quite a bit of a amount of
it, we can still get fairly high

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00:17:26,550 --> 00:17:31,290

concentrations by inhaling hydrogen gas
when it goes into the bloodstream.

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00:17:31,290 --> 00:17:35,280

It's circulated through
and we get to that concentration to

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00:17:35,280 --> 00:17:39,809

reach the the minimal effective dose.
(Which we're still not quite sure what it is.)

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00:17:39,809 --> 00:17:43,920

it could be 20 micro micro molar,

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00:17:43,920 --> 00:17:48,090

for example, in at the sole cellular level.

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00:17:48,090 --> 00:17:53,940

The other thing, though is it's about
maybe a intermit

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00:17:53,940 --> 00:18:00,690

type exposure, what we see a lot in
pharmacology in general, is sometimes you

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00:18:00,690 --> 00:18:05,100

can have a signal that is constantly present and you have an attenuation or

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00:18:05,100 --> 00:18:10,220

habituation of that signal, if you will as a desensitization that occurs and

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00:18:10,220 --> 00:18:15,090

perhaps that same thing is happening with molecular hydrogen that, when you

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00:18:15,090 --> 00:18:19,830

have a constant exposure, although you have some benefits that are occurring,

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00:18:19,830 --> 00:18:25,620

maybe a continuous scavenging of the hydroxyl radical because it's present.

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00:18:25,620 --> 00:18:30,750

Some of the more important effects, such as a cell modulating activity of

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00:18:30,750 --> 00:18:34,770

hydrogen that gives it more of this anti-inflammatory effects or altering

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00:18:34,770 --> 00:18:41,040

protein phosphorylations or gene expressions, this seems to require

194

00:18:41,040 --> 00:18:45,470

more of an intermittent or post type effect. A tangent if you will. And so

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00:18:45,470 --> 00:18:52,140

by taking an inhalation of hydrogen or a higher concentration or drinking

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00:18:52,140 --> 00:18:58,830

hydrogen rich water can give you that

intermittent concentration to cause those

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00:18:58,830 --> 00:19:05,280

transient changes. For example, there was an article in 2012 was published

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00:19:05,280 --> 00:19:09,990

with using a Parkinson's disease model and they showed that a continuous

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00:19:09,990 --> 00:19:17,370

hydrogen exposure by inhaling hydrogen about 2% 24/7 it had no effect on

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00:19:17,370 --> 00:19:21,450

Parkinson's disease. Similarly when they gave the non-digestible carbohydrate Lactulose

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00:19:21,450 --> 00:19:25,860

which is metabolized by the intestinal flora to

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00:19:25,860 --> 00:19:31,110

produce high amounts of hydrogen gas that also didn't have any effect.

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00:19:31,110 --> 00:19:36,570

But when they gave inhalation of hydrogen gas intermittently - I think about 15

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00:19:36,570 --> 00:19:41,550

minutes every hour - that did have statistically significant benefits.

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00:19:41,550 --> 00:19:44,650

But interestingly though in this model that

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00:19:44,650 --> 00:19:49,660

was used it was still not near as effective as simply drinking hydrogen

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00:19:49,660 --> 00:19:56,050

rich water. So what we learn from this is the intermittent type of exposure is very

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00:19:56,050 --> 00:20:00,250

important. That goes back to what I was talking about the desensitization or the

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00:20:00,250 --> 00:20:06,070

habituation of this signal that is important for the cell modulated

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00:20:06,070 --> 00:20:12,790

activity of hydrogen gas which is similar with all gaseous or signaling

211

00:20:12,790 --> 00:20:18,880

molecules in general. The secondly is: the around administration may be

212

00:20:18,880 --> 00:20:23,440

different because when you alter pharmacokinetics you alter pharmacodynamics.

213

00:20:23,440 --> 00:20:28,060

dynamics. In other words when we're taking something inhalation versus

214

00:20:28,060 --> 00:20:34,330

taking them in orally you are getting the hydrogen differently. When you

215

00:20:34,330 --> 00:20:39,730

drink it you're going to go through the stomach and into the intestines and

216

00:20:39,730 --> 00:20:44,050

onto the blood. Whereas when you inhale it, it goes directly to the to the lungs and then

217

00:20:44,050 --> 00:20:51,490

to the bloodstream. Well, there was an article published in Nature World

218

00:20:51,490 --> 00:20:56,380

publishing journal. At Kyushu University Dr. Noda

219

00:20:56,380 --> 00:21:01,690

found that the drinking of hydrogen could actually enact a neuro protective

220

00:21:01,690 --> 00:21:07,900

gastric ghrelin secretion. And ghrelin is very protective, has anti-inflammatory

221

00:21:07,900 --> 00:21:14,520

benefits and many others but the drinking of hydrogen rich water could induce that

222

00:21:14,520 --> 00:21:20,890

secretion of Ghrelin. And maybe You don't get as much of that ghrelin levels when

223

00:21:20,890 --> 00:21:24,790

you are inhaling the gas, and so if I did this different route of administration

224

00:21:24,790 --> 00:21:31,240

and by this intermittent exposure we're starting to understand better why the

225

00:21:31,240 --> 00:21:35,000

different effects of hydrogen in different diseases. -

226

00:21:35,000 --> 00:21:42,710

I would like to understand more about the solubility of hydrogen in water. About that which we

227

00:21:43,510 --> 00:21:51,190

can then drink as hydrogen water. with a salt crystal one can see how water

228

00:21:51,190 --> 00:21:56,679

slowly dissolves it. It is divided into its two ions: Sodium

229

00:21:56,679 --> 00:22:06,029

and chloride. Yet hydrogen gas is not a

salt. It is a non polar element, so not

230

00:22:06,029 --> 00:22:14,429

soluble as a hydrogen bond like a grain of salt: Is this is not a different type of

231

00:22:14,429 --> 00:22:20,619

solubility? Somehow it seems to me that hydrogen doesn't feel so good in water

232

00:22:20,619 --> 00:22:29,390

instead wants to rid itself from it because basically it is hydrophobic

233

00:22:29,690 --> 00:22:34,480

it's a great a great question that's number one question that I get is what

234

00:22:34,480 --> 00:22:38,350

about the solubility of hydrogen? It's not even soluble in water. So how can you have

235

00:22:38,350 --> 00:22:41,919

even hydrogen rich water in the first place? And even if you get any in

236

00:22:41,919 --> 00:22:46,090

there it's just going to be out immediately, because it's just not

237

00:22:46,090 --> 00:22:52,389

soluble. And solubility is a subjective term. I mean everything is slightly

238

00:22:52,389 --> 00:22:57,879

soluble in water! Even if you just get one atom that gets solvated by water or

239

00:22:57,879 --> 00:23:05,409

something, right? But the saturation of hydrogen at SATP or standard ambient

240

00:23:05,409 --> 00:23:09,970

temperature and pressure is considered to be about 0.8 millimol or about 1.6 ppm

241

00:23:09,970 --> 00:23:15,190

which is equivalent to one point six milligrams per liter. So you have one

242

00:23:15,190 --> 00:23:20,889

liter of water and yet you're at 100% atmospheric conditions of hydrogen gas

243

00:23:20,889 --> 00:23:26,499

at sea level, then you could get about one point six milligrams of hydrogen in

244

00:23:26,499 --> 00:23:33,460

a liter of water. Now, first off, when you so now here it's , okay, only

245

00:23:33,460 --> 00:23:40,210

1.6 milligrams of hydrogen in that liter of water: that's not very much! Can I

246

00:23:40,210 --> 00:23:46,470

take a hundred milligrams of vitamin C? Well, what we're forgetting here is that

247

00:23:46,470 --> 00:23:53,799

vitamin C weighs a lot more than hydrogen gas. Vitamin C is about

248

00:23:53,799 --> 00:23:59,169

176 grams per mole. So we have 1 mol. Think of a mole like it doesn't: Mol is a set

249

00:23:59,169 --> 00:24:08,840

number. So do if you have one mole of vitamin C molecules: that weighs 176 grams.

250

00:24:08,840 --> 00:24:14,299

If you have a one mole of hydrogen gas molecules, it only weighs two

251

00:24:14,299 --> 00:24:20,690
grams: So the masses are very different!
So actually if you look, if you compare the

252
00:24:20,690 --> 00:24:26,750
mols to mols or molecules to molecules of
hydrogen gas and vitamin C, you would

253
00:24:26,750 --> 00:24:32,929
actually see that there are actually
more molecules of hydrogen in a liter of

254
00:24:32,929 --> 00:24:39,520
water - saturated water with 1.6 ppm
then there are molecules of vitamin C

255
00:24:39,520 --> 00:24:45,289
in by taking 100 milligrams of vitamin C.
There are more molecules of hydrogen. So in

256
00:24:45,289 --> 00:24:49,850
this case it actually is the sufficient
dose. But more important than that is

257
00:24:49,850 --> 00:24:55,789
the fact that when we do the actual
scientific studies in animals and in

258
00:24:55,789 --> 00:25:02,870
humans, we see that that concentration is
affected. Even more so we see that if we

259
00:25:02,870 --> 00:25:09,919
take one point six milligrams of water
orally of hydrogen then that's going to

260
00:25:09,919 --> 00:25:13,669
be diluted by another forty liters of
water in our human body and then you're

261
00:25:13,669 --> 00:25:17,600
going to be down to a very low
concentration. Say, you know, ten, twenty

262

00:25:17,600 --> 00:25:23,539
micro molar concentration, so we can do a
self-study that uses that same

263

00:25:23,539 --> 00:25:29,899
concentration and we still see an effect!
So the concentration of hydrogen that

264

00:25:29,899 --> 00:25:37,570
gets into water can be enough but we do
have to drink the hydrogen rich water as

265

00:25:37,570 --> 00:25:43,399
soon as prepared. Because it is a gas. It
doesn't combine with the water. It's not

266

00:25:43,399 --> 00:25:48,679
highly soluble. It is very light. It
wants to go right up to the atmosphere

267

00:25:48,679 --> 00:25:54,620
very quickly. And so if you can consider
it really like carbonated beverages: If

268

00:25:54,620 --> 00:26:00,020
you have carbonated water, for example,
that's CO₂ gas that dissolves into the water.

269

00:26:00,020 --> 00:26:04,220
Well, if you leave it out forever, it
eventually it's going to go flat: The CO₂

270

00:26:04,220 --> 00:26:07,100
is gonna go out.
well with the hydrogen gas

271

00:26:07,100 --> 00:26:10,549
if you put the hydrogen gas in there,
it will eventually go out. It is not to go out

272

00:26:10,549 --> 00:26:15,830
immediately it's gonna it's going to
take some time. So maybe, if you drink it

273

00:26:15,830 --> 00:26:20,700

within a half an hour, you're going to get most of the hydrogen gas,

274

00:26:20,700 --> 00:26:25,050

depending on the surface area and how much disturbance there is and the

275

00:26:25,050 --> 00:26:28,710

temperature and all these things in the water so if you have like a bottle of soda

276

00:26:28,710 --> 00:26:32,430

just shaking it around it's going to go flat a lot quicker. But the

277

00:26:32,430 --> 00:26:38,420

half-life of hydrogen is about two hours. So if you start with say one point six ppm

278

00:26:38,420 --> 00:26:44,460

and two hours you come back and test it, you'll be closer to about 0 point eight ppm.

279

00:26:44,460 --> 00:26:50,580

So if you drink it within a half an hour or so. - So if that is only

280

00:26:50,580 --> 00:26:57,750

one point six milligrams per liter or rather one point six ppm how can some

281

00:26:57,750 --> 00:27:03,480

people claim that they can produce water with a much higher hydrogen content?

282

00:27:03,480 --> 00:27:08,880

Yeah, another question I often get is because we say that one point

283

00:27:08,880 --> 00:27:14,160

six PPM is the saturation of hydrogen

so we can't get any more than that, how

284

00:27:14,160 --> 00:27:18,720

can you possibly have products that have a higher concentration; two point six ppm,

285

00:27:18,720 --> 00:27:23,910

3 ppm, 5 ppm. How is this even possible? Is it possible? Is this just

286

00:27:23,910 --> 00:27:28,290

marketing hype? Well, sometimes it is just marketing hype and they have no

287

00:27:28,290 --> 00:27:32,880

idea what the concentration really is. Their just putting a number out there. But you

288

00:27:32,880 --> 00:27:40,710

can get higher than 1.6 ppm. The 1.6 ppm is simply the concentration at

289

00:27:40,710 --> 00:27:46,470

equilibrium at SATP standard ambient temperature and pressure. So if you

290

00:27:46,470 --> 00:27:54,720

simply increase the pressure then you can go to a higher concentration and so

291

00:27:54,720 --> 00:27:59,880

if you, and remember when we talk about the pressure we're talking about partial

292

00:27:59,880 --> 00:28:04,680

pressure of just hydrogen gas not total pressure. So for example if you're at sea

293

00:28:04,680 --> 00:28:13,470

level and the pressure is 1 atm, well that's 1 atm of total pressure so you

294

00:28:13,470 --> 00:28:17,520

have a 21% oxygen, 78%
nitrogen and then the rest of these

295

00:28:17,520 --> 00:28:23,460
other gases. So that's a partial
pressure so not a total atmosphere but

296

00:28:23,460 --> 00:28:29,880
just partial pressure so when we have a
hundred percent of just hydrogen gas at 1 atm

297

00:28:29,880 --> 00:28:34,770
then the concentration, if you wait long
enough, will reach an equilibrium of 1

298

00:28:34,770 --> 00:28:42,900
point six ppm. But like I said, if you
pressurize a bottle or do something

299

00:28:42,900 --> 00:28:48,330
to increase that pressure higher,
then the equilibrium now changes and the

300

00:28:48,330 --> 00:28:53,010
new saturation point is maybe 3 ppm or
5 ppm and you can just keep on going up

301

00:28:53,010 --> 00:28:58,350
with more and more pressure and get
higher, higher concentrations and of course

302

00:28:58,350 --> 00:29:03,030
it gets more difficult to go up
higher and higher in pressure and the

303

00:29:03,030 --> 00:29:07,110
higher the concentration you have the
gas will start to dissipate out a lot

304

00:29:07,110 --> 00:29:13,160
quicker and, so you can have you know 3 or
4 or 5 ppm and some of the research

305

00:29:13,160 --> 00:29:18,960
publications actually use that
concentration. - Very well if people, for

306

00:29:18,960 --> 00:29:26,780
example, buy hydrogen water in a special
drinking bag or get themselves an

307

00:29:26,780 --> 00:29:34,260
electrolysis device which can work with
higher pressure: how are they able to

308

00:29:34,260 --> 00:29:42,540
control, if then two or three or even
more ppm are contained in the water? In

309

00:29:42,540 --> 00:29:49,170
videos from suppliers you often see a
measuring device of the Japanese firm

310

00:29:49,170 --> 00:29:59,250
Trustlex. It is able to show a maximum
of 2 ppm and with that one knows that

311

00:29:59,250 --> 00:30:08,340
this which such a measuring method is not
possible with all types of water. How

312

00:30:08,340 --> 00:30:14,640
do you measure independently of the
water type and how do you measure the

313

00:30:14,640 --> 00:30:25,710
values over 2 ppm or even 5 or 10 ppm?
All that is offered. - For that is it not

314

00:30:25,710 --> 00:30:32,940
best, to use the H₂ blue test drops which
can determine the hydrogen content with

315

00:30:32,940 --> 00:30:39,300
titration? What are the differences
between the electrical and the chemical

316

00:30:39,300 --> 00:30:44,490

measuring methods? --- So measuring the concentration of molecular hydrogen is

317

00:30:44,490 --> 00:30:48,450

very important. We have to do that in the research so we know what

318

00:30:48,450 --> 00:30:52,680

the dose of hydrogen that the animals or the humans are getting or what the

319

00:30:52,680 --> 00:30:57,810

concentration is in the in the cell, culture media or in the blood. So it's

320

00:30:57,810 --> 00:31:02,970

critical to measure hydrogen. It's also important for people to know how much

321

00:31:02,970 --> 00:31:07,910

hydrogen they're actually getting when they buy products from various companies.

322

00:31:07,910 --> 00:31:14,610

But the measurement of hydrogen is quite difficult because the meters are

323

00:31:14,610 --> 00:31:19,980

different things out there. They work based upon typically on ions

324

00:31:19,980 --> 00:31:24,660

type things and hydrogen is a gas, it's small, it's a neutral molecule of

325

00:31:24,660 --> 00:31:29,820

non an ion, so most things that are like an ion selective electrode. So for example a

326

00:31:29,820 --> 00:31:36,090

pH meter that measures the H⁺ ion so it's an ion selective electrode, or there's

327

00:31:36,090 --> 00:31:40,110
nitrate meters or different meters or
full right meters or things that measure

328

00:31:40,110 --> 00:31:46,710
just that ion. But because hydrogen gas
is a neutral molecule, it's not an ion and it's

329

00:31:46,710 --> 00:31:51,540
non-polar it makes it very difficult. Then
you have other things like oxygen.

330

00:31:51,540 --> 00:31:57,110
Well, oxygen is also a neutral molecule, it's
a gas but yet we have meters for that

331

00:31:57,110 --> 00:32:01,760
but that's because oxygen has a
different property with this electron,

332

00:32:01,760 --> 00:32:06,630
the way the electrons are in the
outer shell that makes it paramagnetic

333

00:32:06,630 --> 00:32:11,640
and so we can use that property of
hydrogen, its been being paramagnetic to

334

00:32:11,640 --> 00:32:16,530
also measure (hydrogen but, sorry,) also measure
oxygen. But hydrogen is

335

00:32:16,530 --> 00:32:20,100
diamagnetic and it also makes it more
difficult to measure.

336

00:32:20,100 --> 00:32:24,480
So typically to measure hydrogen you
have to use a specific gas

337

00:32:24,480 --> 00:32:28,200
chromatography. Then it gets more

complicated because you have to have a

338

00:32:28,200 --> 00:32:34,140

specific column to measure that molecule
because it's so small and most columns

339

00:32:34,140 --> 00:32:38,370

of the universities of things that have
a gas chromatography, they can't

340

00:32:38,370 --> 00:32:44,180

actually measure for hydrogen either,
so it becomes rather difficult. There are

341

00:32:44,180 --> 00:32:48,840

meters or some meters that claim
you can measure the hydrogen, most of

342

00:32:48,840 --> 00:32:58,110

those meters use a basically of volt
type meter in order to measure or it's not

343

00:32:58,110 --> 00:33:01,680

really measuring, it's really
correlating the potential that

344

00:33:01,680 --> 00:33:06,720

they're given to what the
likelihood of the concentration of

345

00:33:06,720 --> 00:33:12,060

hydrogen is. But it's not selective to
hydrogen and it's also pH sensitive

346

00:33:12,060 --> 00:33:17,610

and it often can be wrong. Because of
the way they're calibrated, there's no

347

00:33:17,610 --> 00:33:22,200

actual standard.
So the real types of meters that we use

348

00:33:22,200 --> 00:33:29,220

in research for example, you actually have to prepare a sample with a known

349

00:33:29,220 --> 00:33:33,720

amount of concentration so you can make a standard calibration curve. So you have

350

00:33:33,720 --> 00:33:37,140

you know this amount, you know this amount, you have that calibration curve

351

00:33:37,140 --> 00:33:42,270

and then you can use that and measure your unknown and you can compare that to

352

00:33:42,270 --> 00:33:45,860

your calibration curve and then you can calculate what the concentration is.

353

00:33:45,860 --> 00:33:51,120

That's the standard way, it's a little more difficult and very expensive for

354

00:33:51,120 --> 00:33:56,990

most people to do. Then another method that's very easy to use: it's not as

355

00:33:56,990 --> 00:34:03,300

accurate and it's not as precise in terms of being able to measure to a very

356

00:34:03,300 --> 00:34:08,070

small concentrations like 0.001 ppm or something like if you measure in

357

00:34:08,070 --> 00:34:14,100

the blood. But there is the simple redox titration reagents that use a methylene

358

00:34:14,100 --> 00:34:19,410

blue with the quanta platinum as the catalyst that's able to make that

359

00:34:19,410 --> 00:34:24,210
reaction happen. But it's very
simple, you just pour the water into 6

360
00:34:24,210 --> 00:34:29,700
ml of, pour the Hydrogen water, into the
six ml of the beaker

361
00:34:29,700 --> 00:34:35,490
and then you add the reagents in there
and the hydrogen reacts with the reagent

362
00:34:35,490 --> 00:34:41,640
and it converts to methylene blue from
blue to clear. And you can add another

363
00:34:41,640 --> 00:34:44,910
drop. And the more you add the more
hydrogen molecules are used until all

364
00:34:44,910 --> 00:34:50,340
the hydrogen molecules are used up and
the reagent turns blue and it stays blue

365
00:34:50,340 --> 00:34:55,890
in this case, and that is the, sort
of the titration endpoint. And now you

366
00:34:55,890 --> 00:34:59,400
can simply calculate how, what the
concentration is because you know how

367
00:34:59,400 --> 00:35:04,830
many drops you've added to the water. So
that's probably the simplest or easiest

368
00:35:04,830 --> 00:35:08,460
method at this point for people to
measure the concentration of hydrogen

369
00:35:08,460 --> 00:35:13,579
in the various products or to make sure
that what they have is going to be therapeutic.

370

00:35:13,579 --> 00:35:20,849

Good, now we know the most important things for measuring – the control of

371

00:35:20,849 --> 00:35:28,770

dissolved hydrogen. Next, we should find out how much of the good stuff we should

372

00:35:28,770 --> 00:35:38,130

drink and also at which concentration? So, for example, is it better to drink more

373

00:35:38,130 --> 00:35:46,430

frequently during the day a lower concentration around 0.5 to 1 ppm?

374

00:35:46,430 --> 00:35:53,640

And like that to gradually drink two to three liters a day? Or would it be better

375

00:35:53,640 --> 00:36:00,390

to just drink one liter a day with a higher concentration like three ppm?

376

00:36:00,390 --> 00:36:06,660

Another main question, I'm often asked is: Okay how much hydrogen do I need to get this

377

00:36:06,660 --> 00:36:10,740

therapeutic effect? What is the concentration or the dose that I require?

378

00:36:10,740 --> 00:36:17,790

Well, we really don't know for sure what the minimal concentration is or what's

379

00:36:17,790 --> 00:36:23,520

going to be the most effective. We can really say what a suitable concentration

380

00:36:23,520 --> 00:36:27,780

is and that simply based upon the animal and specifically the human studies

381

00:36:27,780 --> 00:36:33,150

where we've used a certain concentration and it has shown therapeutic benefits. And

382

00:36:33,150 --> 00:36:40,230

typically that concentration is around 1 to 1.6 ppm. Even higher even

383

00:36:40,230 --> 00:36:44,880

up to close to 5 ppm but then you have to consider not just the concentration

384

00:36:44,880 --> 00:36:49,589

but the dose of hydrogen that you're getting because you could drink 3 liters

385

00:36:49,589 --> 00:36:55,980

of 1 ppm and that would give you 3 milligrams or you could drink one liter

386

00:36:55,980 --> 00:37:01,559

of 3 ppm now it also gives you three mg but the volume of water is

387

00:37:01,559 --> 00:37:07,020

different. So if you go through the human studies and you calculate; ok they drink this

388

00:37:07,020 --> 00:37:11,940

much water the concentration was this, typically the amount of hydrogen they are

389

00:37:11,940 --> 00:37:19,500

getting in milligrams per day is about 0.5 milligrams to 3 milligrams and

390

00:37:19,500 --> 00:37:26,730

even higher. That's the common range. So getting it around the 1, 1.6 milligrams a

391

00:37:26,730 --> 00:37:32,370

day 3 mg a day is

probably where you want to be. We are

392

00:37:32,370 --> 00:37:37,110

seeing that in some cases it's likely that a higher concentration can be more

393

00:37:37,110 --> 00:37:44,370

effective. In other cases it seems to not have any additional benefit. But what we

394

00:37:44,370 --> 00:37:50,100

do see it appears so far, at least from both self studies and animal studies that

395

00:37:50,100 --> 00:37:57,110

a higher concentration is not less effective than a lower concentration and

396

00:37:57,110 --> 00:38:00,840

that's an important thing because we already know the hydrogen is

397

00:38:00,840 --> 00:38:08,840

rather safe we can take the higher concentration and feel good that

398

00:38:08,840 --> 00:38:13,890

at least we're getting enough that if something were to happen we should be

399

00:38:13,890 --> 00:38:18,630

getting enough that it can't happen. So that's kind of where things are figured out but

400

00:38:18,630 --> 00:38:24,410

because the research is still very much in its infancy. There are about 40 or so

401

00:38:24,410 --> 00:38:29,010

clinical studies that are currently registered. 40 are already been done. Just

402

00:38:29,010 --> 00:38:32,580

human studies and things in general
sense this inception of hydrogen. But there's

403

00:38:32,580 --> 00:38:36,390
another 40 or so that are done, some of
those are just with inhalation like in

404

00:38:36,390 --> 00:38:40,050
the hospitals and things, but many of
that are with the drinking of hydrogen rich

405

00:38:40,050 --> 00:38:45,900
water. But we really needed more human
studies to understand the dosing

406

00:38:45,900 --> 00:38:49,470
protocols and, you know if you're going to
going to get a total of 3 milligrams a

407

00:38:49,470 --> 00:38:54,090
day, should you take that 3 milligrams in
the morning or at night? Should you take

408

00:38:54,090 --> 00:38:58,380
1 milligram in the morning, one in the
evening or one night? Or you know, what about

409

00:38:58,380 --> 00:39:01,170
if you had this disease then maybe we should do
it this way, maybe we should do it this way.

410

00:39:01,170 --> 00:39:07,140
These are viable questions and there is
some suggestive reasonings about that

411

00:39:07,140 --> 00:39:11,430
doing one way or the other may have a
different effect because again you're

412

00:39:11,430 --> 00:39:16,380
changing the pharmacokinetics and you do
that you change the pharmacodynamics if

413

00:39:16,380 --> 00:39:21,060
you will. And the concentration that
actually gets to the cellular level is

414

00:39:21,060 --> 00:39:26,730
going to be higher. -
Well that is the field of therapy. There I can look up the

415

00:39:26,730 --> 00:39:31,670
disease and the individual studies and
see which

416

00:39:31,670 --> 00:39:40,640
dose was successful and it is important
to note the following statement: more

417

00:39:40,640 --> 00:39:48,829
hydrogen is not harmful. There are,
according to therapeutic goals, only low

418

00:39:48,829 --> 00:39:56,299
limits but no maximum limit. I don't need
to be ill in order to be enthusiastic

419

00:39:56,299 --> 00:40:03,079
about drinking hydrogen water it also
tastes good! And maybe I just want to

420

00:40:03,079 --> 00:40:08,980
stay healthier for longer... Or drinking
this water should support me in

421

00:40:08,980 --> 00:40:17,869
completing a fitness program. In short,
wellness and fitness people, even

422

00:40:17,869 --> 00:40:25,339
competitive athletes always ask me how
much they should drink and what

423

00:40:25,339 --> 00:40:34,119
concentration they need. Does it help
with muscle development? And the most

424

00:40:34,119 --> 00:40:42,260

pressing question seems to be: can one lose weight by drinking this hydrogen

425

00:40:42,260 --> 00:40:52,309

water, or actually not? After all, plants grow faster if you water them with this

426

00:40:52,309 --> 00:40:59,240

water. Even animal breeders discussed the use of it and apply it because there is

427

00:40:59,240 --> 00:41:05,770

proof that pigs or chicken gained weight faster from it.

428

00:41:05,770 --> 00:41:12,829

Producers advertise the most varied arguments and advertising statements of

429

00:41:12,829 --> 00:41:19,450

all that. What is correct and what is marketing drivel?

430

00:41:19,450 --> 00:41:25,220

Another question I'm often, I often get is about the effects of hydrogen water

431

00:41:25,220 --> 00:41:30,500

on weight. We have some people who they drink hydrogen water and they're saying:

432

00:41:30,500 --> 00:41:34,400

hey I'm able to gain weight finally. I have other people that drink hydrogen

433

00:41:34,400 --> 00:41:38,119

water and they say: hey I'm able to lose weight finally. You have other people who

434

00:41:38,119 --> 00:41:43,369

drink hydrogen water and say: my weight stays the same. So, which is it? Is hydrogen

435

00:41:43,369 --> 00:41:45,590

water going to help you

lose weight, is it going to help you gain weight,

436

00:41:45,590 --> 00:41:49,490

is it going to do nothing for you, or

is it's going to do whatever you want it to do?

437

00:41:49,490 --> 00:41:56,390

I don't know. We need to have more

human studies to understand this area

438

00:41:56,390 --> 00:42:02,780

better. Now we can talk about some data

we have to suggest that it can maybe do

439

00:42:02,780 --> 00:42:06,920

one thing or a different thing, for

example there was a study in an ancient

440

00:42:06,920 --> 00:42:11,480

publishing group, the Journal of

Obesity, that showed that hydrogen rich

441

00:42:11,480 --> 00:42:19,490

water can, basically induces fgf21

which is fibroblast growth factor 21

442

00:42:19,490 --> 00:42:25,340

which helps to stimulate energy

metabolism as specifically the

443

00:42:25,340 --> 00:42:30,560

expenditure of fatty acids and different

things. And if you have an increased

444

00:42:30,560 --> 00:42:34,610

metabolism, an increased metabolic rate,

then you're going to burn more calories.

445

00:42:34,610 --> 00:42:41,090

And in fact in the study they also had

one group of the rats, or maybe it was mice,

446

00:42:41,090 --> 00:42:46,040

I think it was mice. And they were on caloric restriction and the other group was not

447

00:42:46,040 --> 00:42:51,050

but they drank hydrogen rich water and, but they found that drinking hydrogen water

448

00:42:51,050 --> 00:42:56,030

had a similar effect as at about a 20% caloric restriction that was in a

449

00:42:56,030 --> 00:43:01,070

high-fat diet. Then they also did it combined where they showed that hydrogen

450

00:43:01,070 --> 00:43:07,490

water and caloric restriction had an even greater effect. So, this study suggests that

451

00:43:07,490 --> 00:43:11,900

actually yes, hydrogen may be able to help with the weight loss because it was

452

00:43:11,900 --> 00:43:17,450

able to activate this fgf21, induce this energy expenditure, improve the

453

00:43:17,450 --> 00:43:22,960

metabolism. And in other studies on the hydrogen's effect on the mitochondria and

454

00:43:22,960 --> 00:43:26,930

many different aspects were yes, it starts to make sense. Okay, maybe hydrogen

455

00:43:26,930 --> 00:43:32,510

can't help with this weight loss, this fat loss. Now on the other side, what

456

00:43:32,510 --> 00:43:37,790

about these people who say they could finally gain weight? Well, there are some

457

00:43:37,790 --> 00:43:42,140
things to consider in that realm as well.
We talked about earlier how hydrogen

458

00:43:42,140 --> 00:43:46,310
rich water can actually induce
neuroprotective gastric ghrelin

459

00:43:46,310 --> 00:43:51,050
secretion. So ghrelin has some
anti-inflammatory properties. It's a

460

00:43:51,050 --> 00:43:55,920
hormone. It's very beneficial and in fact, one
of the reasons why fasting or

461

00:43:55,920 --> 00:44:00,480
intermittent fasting may be good for you is because
you have high levels of this ghrelin.

462

00:44:00,480 --> 00:44:04,619
Ghrelin mediates some of the benefits of
fasting and interestingly, like I said, a

463

00:44:04,619 --> 00:44:08,670
hydrogen rich water can also increase
ghrelin levels. Well,

464

00:44:08,670 --> 00:44:14,730
ghrelin, this hormone is actually the
hormone that makes you feel hungry and

465

00:44:14,730 --> 00:44:19,710
so for some people maybe they're getting
higher ghrelin levels and so they're eating more

466

00:44:19,710 --> 00:44:23,640
and because of eating more they're
finally able to gain more weight they've

467

00:44:23,640 --> 00:44:29,760
been wanting to. That additionally
ghrelin, the hormone itself just GHRELIN

468
00:44:29,760 --> 00:44:34,290
It stands for stand for growth hormone
releasing, you know, hormone. That's what it.

469
00:44:34,290 --> 00:44:39,089
And growth hormone of course is an
anabolic hormone and it helps to build

470
00:44:39,089 --> 00:44:44,309
muscle mass, helps to conserve muscle
mass and different things, lots of

471
00:44:44,309 --> 00:44:53,400
benefits. So maybe hydrogen increases
growth hormone a little bit by the

472
00:44:53,400 --> 00:44:58,049
ghrelin secretion and the growth hormone in turn
could help to build a more

473
00:44:58,049 --> 00:45:03,690
muscle. So for the athletes in different
areas you're able to help

474
00:45:03,690 --> 00:45:08,190
gain weight if you're eating more if the
growth hormone is going on. And then

475
00:45:08,190 --> 00:45:12,089
you have the other group where they
don't really have any effect on their

476
00:45:12,089 --> 00:45:15,720
weight loss and maybe that's because
they didn't need any or maybe they do

477
00:45:15,720 --> 00:45:20,400
want but it's just it's not having that
effect. Everybody is different so

478

00:45:20,400 --> 00:45:24,869

maybe some people won't have such a dramatic weight loss effect that's been

479

00:45:24,869 --> 00:45:29,849

reported anecdotally or even at some of the studies or vice-versa if this other

480

00:45:29,849 --> 00:45:37,200

idea of gaining weight.

Here an interposed question from Mr. Yasin Akgün.

481

00:45:37,200 --> 00:45:44,520

He would like to know how you personally are holding up with fasting? Do you

482

00:45:44,520 --> 00:45:53,910

recommend it and if so when and for how long should one fast or rather adhere

483

00:45:53,910 --> 00:45:59,010

to meal breaks? ---- That's the thing that I'm asked about is fasting in general

484

00:45:59,010 --> 00:46:03,450

because I've talked about how hydrogen rich water can induce gastric ghrelin

485

00:46:03,450 --> 00:46:08,040

secretion and fasting also increases ghrelin levels and so they're mediated by

486

00:46:08,040 --> 00:46:10,670

this same

second messenger molecule ghrelin, some of

487

00:46:10,670 --> 00:46:16,370

those benefits. So do I fast? Is fasting good for you? Is it good to do it in

488

00:46:16,370 --> 00:46:24,500

conjunction with hydrogen? Probably, I fast between meals all the time. Haha. But

489

00:46:24,500 --> 00:46:30,920

fasting is certainly good for you.

We see studies in animals. We do need to

490

00:46:30,920 --> 00:46:34,910

see some more studies in humans to see
the real benefits of the instrument in

491

00:46:34,910 --> 00:46:38,660

fasting and different things that are going
on. The caloric restriction in general

492

00:46:38,660 --> 00:46:42,710

is a good thing, especially if people are
suffering from obesity or different

493

00:46:42,710 --> 00:46:45,860

things that caloric restriction could be
very beneficial, we see you know,

494

00:46:45,860 --> 00:46:51,410

different changes in many
different hormones and molecules, insulin

495

00:46:51,410 --> 00:46:55,300

and IGF, all different things that can
be beneficial in helping DNA repair.

496

00:46:55,300 --> 00:47:02,990

Can hydrogen potentiate the actions of
fasting? I wouldn't doubt it. We see

497

00:47:02,990 --> 00:47:07,520

hydrogen can induce gastric ghrelin
secretion, it can induce fgf21, it can

498

00:47:07,520 --> 00:47:12,740

stimulate other DNA repair mechanisms
which also fasting does. In fact, hydrogen

499

00:47:12,740 --> 00:47:17,540

seems to activate some of the same

metabolic pathways and transcription

500

00:47:17,540 --> 00:47:21,470

factors and things that
fasting does. So maybe there would be an

501

00:47:21,470 --> 00:47:26,690

additive or synergistic effect or
maybe the fasting effect would be so

502

00:47:26,690 --> 00:47:30,740

great that you wouldn't see any of the
effects of hydrogen. We just, we just

503

00:47:30,740 --> 00:47:34,790

don't know. We do see one of the studies
that there wasn't at least an additive

504

00:47:34,790 --> 00:47:38,210

potentially synergistic effect with the
caloric restriction and the drinking of

505

00:47:38,210 --> 00:47:43,250

hydrogen rich water so it's probably a
good idea. But then we have the question

506

00:47:43,250 --> 00:47:46,700

okay so when do we take the hydrogen? So
we take it with the meal, should we take

507

00:47:46,700 --> 00:47:51,620

it while we're fasted, what's the best
way? Again we really don't know, maybe

508

00:47:51,620 --> 00:47:55,460

it's best to take it with the meal
because on this hand, if you take it with the

509

00:47:55,460 --> 00:48:00,670

meal then it's going to help the body
with the metabolism or something and

510

00:48:00,670 --> 00:48:04,370

it's going to be able to, some of
the hydrogen has been shown to

511

00:48:04,370 --> 00:48:09,920
actually be stored a little bit in the
glycogen in the liver and as the

512

00:48:09,920 --> 00:48:15,200
glycogen is burnt and the more the hydrogen
that gets accumulated in there releases

513

00:48:15,200 --> 00:48:18,550
out and so just stays in the body for a
little bit longer and so

514

00:48:18,550 --> 00:48:23,080
maybe that's a good way. But then, maybe
it's better to take it more on an empty stomach

515

00:48:23,080 --> 00:48:28,150
because that way the body is fresh,
the hydrogen does just go right into the

516

00:48:28,150 --> 00:48:33,910
body and there's no other molecules and
food stuff that's in the body

517

00:48:33,910 --> 00:48:38,890
that's changing things or something and
so maybe it's better to do more than fasted.

518

00:48:38,890 --> 00:48:46,690
So I don't know. But for me, I
guess, I prefer to take my hydrogen in

519

00:48:46,690 --> 00:48:55,000
the morning before I eat or at just
different times then with the meal, just

520

00:48:55,000 --> 00:48:59,970
because I typically don't drink a lot
of water with my meals anyway. But

521

00:48:59,970 --> 00:49:05,050
drinking hydrogen rich water with the meal or
in a fasted state we really don't know what's

522

00:49:05,050 --> 00:49:10,240
going to be the most effective if there is
an effective way, but it's possible that

523

00:49:10,240 --> 00:49:15,460
taking in a fasted state do this one
study and some other mechanisms of

524

00:49:15,460 --> 00:49:21,160
action could make it a little bit more effective.
(Q: And when do you eat then best, or when

525

00:49:21,160 --> 00:49:28,090
to fast?) - And then people are also asking
me okay so when should I eat when should

526

00:49:28,090 --> 00:49:37,180
I fast? Well, really there's a lot
of research and it's equivocal. Some

527

00:49:37,180 --> 00:49:40,240
of it is, you know, rather contradictory, you
don't know which one it is and I'm not

528

00:49:40,240 --> 00:49:46,470
an expert in that fasting field even
though I fast, like I said between meals.

529

00:49:46,470 --> 00:49:53,010
But there is an article I remember
reading a bit ago where they found that

530

00:49:53,010 --> 00:49:59,830
they had two groups, both on caloric
restriction and, but one of them ate like

531

00:49:59,830 --> 00:50:03,610
seventy percent of the calories in the
morning maybe 20% at lunch and 10% at

532

00:50:03,610 --> 00:50:07,570

dinner and the other group just the opposite with 10% in the morning 20% at

533

00:50:07,570 --> 00:50:13,660

lunch and 70% at dinner. And at the end of the study they found that they both

534

00:50:13,660 --> 00:50:18,910

lost the same amount of weight but what's interesting about the study was

535

00:50:18,910 --> 00:50:24,430

that the group that had the larger dinner primarily lost fat whereas the

536

00:50:24,430 --> 00:50:29,700

other group lost a lot more muscle. And some of the reasoning is, was suggested

537

00:50:29,700 --> 00:50:35,940

from this smaller human study was that maybe, when we sleep, that's the time

538

00:50:35,940 --> 00:50:39,810

where the body repairs itself, you have increase in the growth hormone, we need

539

00:50:39,810 --> 00:50:43,800

to have enzymes, the body has to build the enzymes which uses the building block of

540

00:50:43,800 --> 00:50:48,930

amino acids to make those proteins, so if you have no substrates or no food in

541

00:50:48,930 --> 00:50:52,680

your blood or in your stomach or something then the body's got to get

542

00:50:52,680 --> 00:50:56,820

those amino acids from somewhere so it can break down the muscles to get those

543

00:50:56,820 --> 00:51:02,070

amino acids to make the proteins and the enzymes that it needs so it can do its

544

00:51:02,070 --> 00:51:08,040

repair mechanisms and things so, maybe going to bed in a fasted state is not the

545

00:51:08,040 --> 00:51:14,400

best idea and in the morning you are already really busy anyway. So even from a

546

00:51:14,400 --> 00:51:19,080

psychological perspective for those who are trying to lose weight and do a caloric

547

00:51:19,080 --> 00:51:24,840

restriction it makes sense to me that eating a smaller, even skipping breakfast

548

00:51:24,840 --> 00:51:28,860

could be the easiest thing, because you're already so busy trying to rush out the door and get to

549

00:51:28,860 --> 00:51:33,420

work and different things. And then lunch is just small and mild. And then in the

550

00:51:33,420 --> 00:51:39,780

evening you have a good nutritious healthy meal. And that's also a very social

551

00:51:39,780 --> 00:51:44,310

time where you are with your family, you are with friends and you can go ahead and

552

00:51:44,310 --> 00:51:48,650

eat the majority of your calories at that time and then you go to sleep.

553

00:51:48,650 --> 00:51:53,160

And you're fasting if you will until the

next time. But you're not starved, you

554

00:51:53,160 --> 00:51:59,130

have actually substrate for your body to work off of. Again more research needs

555

00:51:59,130 --> 00:52:03,450

to be done on the ideas of fasting the intermittent fasting, what's

556

00:52:03,450 --> 00:52:06,630

going to work the best and all these different things. It is a very

557

00:52:06,630 --> 00:52:12,720

interesting area and it does have some carryover to this hydrogen therapy.

558

00:52:12,720 --> 00:52:18,990

Mr. Akgün has a very interesting follow-up question which is to be expected of a

559

00:52:18,990 --> 00:52:27,560

water that is saturated with the energy rich hydrogen gas and so far as I know

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00:52:27,560 --> 00:52:34,440

it has so far not been answered. The hydrogen in water, which signifies an

561

00:52:34,440 --> 00:52:42,040

excess of electrons, which can be measured as a negative ORP,

562

00:52:42,040 --> 00:52:49,330

could it be a type of nourishment in the end and due to that could one renounce

563

00:52:49,330 --> 00:52:58,240

the usual ways of staving off hunger with the usual calorie rich foods? – So with the

564

00:52:58,240 --> 00:53:02,980

fasting and the hydrogen also people say
hey when I drink hydrogen water, I just

565

00:53:02,980 --> 00:53:08,800

feel so much more energy, I could say, it's
a food to me. Where I just get this

566

00:53:08,800 --> 00:53:13,690

energy? I don't have to eat anymore.
Ah, potentially maybe that's placebo

567

00:53:13,690 --> 00:53:19,630

effect. We do see hydrogen can help
increase and stimulate the mitochondria

568

00:53:19,630 --> 00:53:23,740

it stimulates energy expenditure so
maybe there's more ATP equivalents or

569

00:53:23,740 --> 00:53:27,280

different energy there that's available
for use and helping to lower

570

00:53:27,280 --> 00:53:32,110

inflammation and oxidative stress and so
you just feel more alert and more clear.

571

00:53:32,110 --> 00:53:37,240

So those are all possible. But
hydrogen in itself is not considered a

572

00:53:37,240 --> 00:53:41,980

nutrient or it's not actually
metabolized by the body and used as an

573

00:53:41,980 --> 00:53:48,040

energy substrate by, you know, NAD⁺ to NADH.
Or in the electron transport chain of the

574

00:53:48,040 --> 00:53:53,620

mitochondria actually used to make ATP.
It's not used directly but we do see

575

00:53:53,620 --> 00:53:58,450
that it can actually increase the
mitochondrial membrane potential that

576
00:53:58,450 --> 00:54:03,160
can increase ATP production and
specifically if the mitochondria is

577
00:54:03,160 --> 00:54:07,630
compromised for one reason or the other.
So it is possible that the drinking of

578
00:54:07,630 --> 00:54:14,680
hydrogen water may give you some sort of
satiety, just because it's able to give

579
00:54:14,680 --> 00:54:18,610
some more mental clarity on things. But
it can also be just because you're

580
00:54:18,610 --> 00:54:23,710
drinking water. Water induces gastric
distension, making the stomach feel

581
00:54:23,710 --> 00:54:29,470
full and gastric distension is one of
the most potent signals for satiety.

582
00:54:29,470 --> 00:54:37,690
And so simply drinking more water can help you
not feel hungry as well. --- I guess one has

583
00:54:37,690 --> 00:54:42,460
to have patience, until science in the
light of new possibilities, which offers

584
00:54:42,460 --> 00:54:51,960
energy rich hydrogen water, the term nourishment
can maybe one day be

585
00:54:51,960 --> 00:55:00,299
redefined or raised to a
higher level of abstraction. Until now

586

00:55:00,299 --> 00:55:09,490

water counts as a foodstuff. In fact, the most important. Yet not as a food, because

587

00:55:09,490 --> 00:55:19,289

it is seen as calorie free. The last word has not been spoken on this matter.

588

00:55:19,289 --> 00:55:25,329

Obviously one wants to assume that released electrons could mean something

589

00:55:25,329 --> 00:55:33,670

like an energy transfer. On the other hand does molecular hydrogen only give

590

00:55:33,670 --> 00:55:39,819

off its electrons under adverse circumstances: namely when it encounters

591

00:55:39,819 --> 00:55:46,809

the very aggressive hydroxyl radical. This can maybe not be understood or seen

592

00:55:46,809 --> 00:55:56,440

as triggered energy metabolism from food. Or can it? This difficult question which

593

00:55:56,440 --> 00:56:00,970

delves into the fundamental and philosophical nourishment definition,

594

00:56:00,970 --> 00:56:10,119

cannot currently be finally answered. Instead, let's shed some light onto what

595

00:56:10,119 --> 00:56:16,930

we already know about hydrogen water which we take in by,

596

00:56:16,930 --> 00:56:25,180

for example, drinking. How long does it take until the gas reaches individual

597

00:56:25,180 --> 00:56:36,309

organs and its effect can unfold? ----

Another question I'm often given is what about

598

00:56:36,309 --> 00:56:42,520

the pharmacokinetics of hydrogen. In other words: when I take my hydrogen water, how

599

00:56:42,520 --> 00:56:46,270

long does it take for the hydrogen to actually get inside of my body and how

600

00:56:46,270 --> 00:56:51,190

long does it stay there for. Well, what we've seen in some of the human studies

601

00:56:51,190 --> 00:56:56,559

is: people can drink hydrogen water and then we see increases in breath hydrogen

602

00:56:56,559 --> 00:56:59,770

because what happens is: you drink the hydrogen water, it goes into the stomach, it goes into the

603

00:56:59,770 --> 00:57:02,049

intestines, goes through like the portal veins, the

604

00:57:02,049 --> 00:57:04,510

liver and then into the venous system of the

605

00:57:04,510 --> 00:57:08,500

blood and directly to the heart and into the lungs and you exhale most of this

606

00:57:08,500 --> 00:57:13,420

hydrogen gas out. And so you can measure increases in breath hydrogen, which also

607

00:57:13,420 --> 00:57:16,750

clearly shows that hydrogen does make it

through the intestinal wall and the cell mucosa

608

00:57:16,750 --> 00:57:22,420
into the bloodstream. And
typically depending on the dose of

609

00:57:22,420 --> 00:57:27,220
hydrogen you're getting you reach the
peak level within your five to fifteen

610

00:57:27,220 --> 00:57:32,560
minutes or so. So it goes through quite
quickly and having such a high rate of

611

00:57:32,560 --> 00:57:37,869
diffusivity being so small it's able to
penetrate to the cell membranes and it's

612

00:57:37,869 --> 00:57:43,450
able to, it's very ubiquitous and
pervasive in that. It can go out through

613

00:57:43,450 --> 00:57:48,700
everything quite easily. And probably in
about an hour or so again depending on the dose,

614

00:57:48,700 --> 00:57:52,390
the bigger the dose and the more you
drink the longer it's going to last or

615

00:57:52,390 --> 00:57:56,740
the longer it will take to get to that
peak level but within an hour or so your,

616

00:57:56,740 --> 00:58:01,180
is typically back down to a basal
level. So if you measured breath, hydrogen in your

617

00:58:01,180 --> 00:58:08,410
breath, you probably have maybe 5 ppm
in the air and then if you drink the

618

00:58:08,410 --> 00:58:13,900

hydrogen water, say 500 milliliters at 1.6 ppm and it jumps up to you know 80

619

00:58:13,900 --> 00:58:20,560
ppm or 115 ppm or something in this range. Then it goes back down and within

620

00:58:20,560 --> 00:58:26,050
an hour you're back to normal you know 4 or 5 ppm of breath hydrogen in the air.

621

00:58:26,050 --> 00:58:32,800
So that's basically the pharmacokinetics of the hydrogen from drinking hydrogen rich water.

622

00:58:32,800 --> 00:58:37,510
Then of course there's inhalation and, of course, that's very, very rapid. If you

623

00:58:37,510 --> 00:58:43,180
inhale the hydrogen gas it does depend on what percentage. Many of the studies

624

00:58:43,180 --> 00:58:49,210
they use a percentage below 4% because at a 4.6% that's when it's flammable

625

00:58:49,210 --> 00:58:53,619
and so if there's a spark or there's some sort of ignition source that can

626

00:58:53,619 --> 00:58:59,140
incite the gas and fire and that would not be so good. So while the studies are

627

00:58:59,140 --> 00:59:03,970
below that time and the hydrogen is going to just follow the blood flow and

628

00:59:03,970 --> 00:59:08,830
it can go throughout the body quite quickly and it does reach the muscles and

629

00:59:08,830 --> 00:59:14,200
the brain and different things and
reaches an equilibrium depending on the

630
00:59:14,200 --> 00:59:17,650
concentration that you're continuously inhaling within

631
00:59:17,650 --> 00:59:23,590
maybe a half an hour or so. And then
as soon, once you stop inhalation,

632
00:59:23,590 --> 00:59:28,270
again within about an hour it typically
goes back down to baseline again

633
00:59:28,270 --> 00:59:33,940
depending on the volume you're inhaling.
There are some studies that actually use

634
00:59:33,940 --> 00:59:43,330
a 66% hydrogen concentration, 33% oxygen.
And those ones, of course, will stay in

635
00:59:43,330 --> 00:59:47,950
the blood a lot longer and then the
question is well which one is better, to

636
00:59:47,950 --> 00:59:53,260
inhale the greater or to inhale the
less. Well again, we don't know we need to

637
00:59:53,260 --> 00:59:57,250
see more human studies in order to
figure out which one's going to be

638
00:59:57,250 --> 01:00:03,450
better. Maybe - we do know
that it is a difference if you inhale

639
01:00:03,450 --> 01:00:11,680
let's say point 1 percent hydrogen gas
for all the time, say for 24 hours, that

640

01:00:11,680 --> 01:00:16,110
may not ever be effective or therapeutic
because it never actually reaches the

641
01:00:16,110 --> 01:00:23,560
concentration at the cellular level high
enough to this therapeutic protective effect.

642
01:00:23,560 --> 01:00:29,890
So we typically see in animal studies at
least and then extrapolate to the cell

643
01:00:29,890 --> 01:00:34,720
culture that the concentration needs to
be closer to one percent or higher,

644
01:00:34,720 --> 01:00:39,850
you know, typically 2 to 3 percent or so
or a lot of those studies are the big

645
01:00:39,850 --> 01:00:44,680
study in Japan for example as they, the
government recently approved hydrogen

646
01:00:44,680 --> 01:00:49,360
inhalation as a medical procedure for
post cardiac arrest patients, they're

647
01:00:49,360 --> 01:00:52,450
using about 2 to 3 percent hydrogen
concentration so it's below the flammability

648
01:00:52,450 --> 01:00:58,660
level. And the point is that we know
we have to get to a certain cellular

649
01:00:58,660 --> 01:01:03,490
concentration for the hydrogen to be
effective. And then the question is: okay

650
01:01:03,490 --> 01:01:07,540
so now say that you are to that therapeutic
level now does it matter I'm inhaling

651

01:01:07,540 --> 01:01:15,490

the 3% hydrogen or 66% hydrogen?

Well, then we need to consider okay what

652

01:01:15,490 --> 01:01:18,640

disease are we talking about? Does this

disease have a dose-dependent effect,

653

01:01:18,640 --> 01:01:24,730

does not? And then what is the, what kind

of a tangent or impulse type

654

01:01:24,730 --> 01:01:28,650

intermittent exposure does this

need in order to optimize the effects? We

655

01:01:28,650 --> 01:01:33,569

just don't know at this point where

there's more anecdotal reports of what

656

01:01:33,569 --> 01:01:39,210

we should do than there are scientific data

and evidence suggesting what we

657

01:01:39,210 --> 01:01:45,720

need to do. So we're still in the

research process of this. So because we

658

01:01:45,720 --> 01:01:49,260

talked about the pharmacokinetics and that

when we drink the hydrogen rich water

659

01:01:49,260 --> 01:01:55,589

that it reaches a peak plasma and breath

level within 5 to 15 minutes and then goes

660

01:01:55,589 --> 01:02:01,079

back to baseline within an hour, then people

say: Oh so maybe I should be drinking

661

01:02:01,079 --> 01:02:06,869

hydrogen rich water every hour so that

we go up and they go down and we go up

662

01:02:06,869 --> 01:02:12,660

and then they go down. Maybe that makes sense but we don't know and there could

663

01:02:12,660 --> 01:02:17,309

be some other things to consider maybe it's actually better to let it go up

664

01:02:17,309 --> 01:02:21,720

really high like that and then go back down and then we wait and give it no

665

01:02:21,720 --> 01:02:27,990

signal. Nothing there for an extended period of time and then we we hit the

666

01:02:27,990 --> 01:02:32,069

cell again with the higher concentration after the, because you have you

667

01:02:32,069 --> 01:02:37,890

know metabotropic effect that, you know, the changes in gene expression different

668

01:02:37,890 --> 01:02:43,260

things, all these take time to change back to how it was or to make the

669

01:02:43,260 --> 01:02:47,849

changes and so we don't know, if it's best to just drink it on the hour or

670

01:02:47,849 --> 01:02:52,079

maybe just have it once a day or have it three times a day and then again

671

01:02:52,079 --> 01:02:55,529

like we said should we have it with the food without the food? How does that all

672

01:02:55,529 --> 01:03:00,359

make, we just don't know. What we're

seeing in the animal and human studies

673

01:03:00,359 --> 01:03:05,520

is: the drinking of hydrogen rich water is effective and it's probably not

674

01:03:05,520 --> 01:03:09,869

necessarily a wrong way to do it but there probably is a better way to do it

675

01:03:09,869 --> 01:03:16,140

we just don't know, what that better way is at this point. ---- Back again to the

676

01:03:16,140 --> 01:03:23,250

intake of hydrogen after drinking. How much of it enters the bloodstream and

677

01:03:23,250 --> 01:03:30,450

how much floods the body directly as a gas so that everything is penetrated and

678

01:03:30,450 --> 01:03:36,210

not dependent on transportation through the blood vessels?

679

01:03:36,210 --> 01:03:41,460

We talked about the pharmacokinetics of the drinking hydrogen rich water that it goes

680

01:03:41,460 --> 01:03:46,170

to the portal vein, into the systemic circulation to the venous

681

01:03:46,170 --> 01:03:51,740

blood. How much of that hydrogen in just, we exhale it out and how much actually

682

01:03:51,740 --> 01:03:58,260

goes throughout the rest of the body? Well most of it actually is just simply

683

01:03:58,260 --> 01:04:06,119

exhaled out and 95% of it is exhaled out or even higher than that and so the

684

01:04:06,119 --> 01:04:11,250
question is of how much actually gets to my tissues, to my muscles, to my

685

01:04:11,250 --> 01:04:15,000
knee, how much of that hydrogen molecule that actually gets there? Probably a very

686

01:04:15,000 --> 01:04:19,020
small amount and so that suggests that we have other secondary messenger

687

01:04:19,020 --> 01:04:22,260
systems that are probably work like ghrelin that we talked about earlier.

688

01:04:22,260 --> 01:04:27,240
.....We also have the counter multiplier effect in the kidney where

689

01:04:27,240 --> 01:04:32,609
even small amounts of hydrogen but it's passing through the kidneys so often. So we're,

690

01:04:32,609 --> 01:04:37,050
that's one reason we're seeing benefits to the kidneys with oxidative stress

691

01:04:37,050 --> 01:04:43,290
and kidney function and the glomerular filtration rate and different things. So

692

01:04:43,290 --> 01:04:49,710
again we need to see more studies on, you know, what the dosing is and the reasons

693

01:04:49,710 --> 01:04:56,309
for why this works better than this works, or if it even does.

694

01:04:56,309 --> 01:05:04,290

So now we know that we know relatively little about how the intake of hydrogen in the

695

01:05:04,290 --> 01:05:11,760

body should be dosed. One issue though, which has been long discussed, even

696

01:05:11,760 --> 01:05:19,400

before the pharmacological effect of hydrogen gas in water was even known, is

697

01:05:19,400 --> 01:05:32,819

that the antioxidant effect of water has a negative redox potential, or ORP. What does

698

01:05:32,819 --> 01:05:39,900

the antioxidant effect consist of actually and what differentiates it from

699

01:05:39,900 --> 01:05:46,710

other antioxidants? ----

I'm often asked the question of hydrogen as an antioxidant

700

01:05:46,710 --> 01:05:49,510

because

we only get so many antioxidants that are

701

01:05:49,510 --> 01:05:52,210

available in our food and by supplements and everything.

702

01:05:52,210 --> 01:05:57,460

Why take hydrogen? Just another antioxidant. Well, in reality I would say

703

01:05:57,460 --> 01:06:02,410

that's kind of a misleading... I don't really consider hydrogen as an

704

01:06:02,410 --> 01:06:07,059

antioxidant. It is a reductant, has a reducing property by nature because if

705

01:06:07,059 --> 01:06:12,250
it's hydrogen gas but it's not a
conventional antioxidant and in any way

706

01:06:12,250 --> 01:06:16,720
shape or form. Antioxidant is some
marketing term, burning, get it out there.

707

01:06:16,720 --> 01:06:21,760
The nature medicine publication in 2007
you know the title was: Hydrogen acts

708

01:06:21,760 --> 01:06:28,240
as a therapeutic antioxidant by
selectively scavenging cytotoxic oxygen

709

01:06:28,240 --> 01:06:33,069
radicals. And that really maybe helped
get a lot of press, a lot of interest,

710

01:06:33,069 --> 01:06:37,839
because everyone knows the antioxidant
buzzword. But it's a much more complicated,

711

01:06:37,839 --> 01:06:42,880
elaborate and amazing story than that. But we
should talk about that a little bit more,

712

01:06:42,880 --> 01:06:49,240
because really it should not be
considered an antioxidant. Really what's

713

01:06:49,240 --> 01:06:53,770
going on is: First let's look at the
antioxidant property of hydrogen. An

714

01:06:53,770 --> 01:07:00,250
antioxidant is ... a molecule that is
able to donate its electrons to an

715

01:07:00,250 --> 01:07:06,819
oxidant and neutralize that. So like
vitamin C, ascorbic acid or vitamin E,

716

01:07:06,819 --> 01:07:12,069
tocopherol or other polyphenols, are
antioxidants, because they can lose their

717

01:07:12,069 --> 01:07:16,540
electron from what's called a conjugated
pi-system and be rather stable, lose that

718

01:07:16,540 --> 01:07:20,920
electron, donate it to that free radical
and neutralize that free radical so it

719

01:07:20,920 --> 01:07:24,069
doesn't wreak havoc in the body. Because,
of course, free radicals they are linked

720

01:07:24,069 --> 01:07:29,190
to you know, aging, diseases and so many other
problems because they can just oxidize and

721

01:07:29,190 --> 01:07:34,180
damage your DNA in your proteins and
cell membranes and of course that's what

722

01:07:34,180 --> 01:07:38,619
you'll make the Apple turn brown or
causes the rust. It's all this oxidation

723

01:07:38,619 --> 01:07:45,280
and that can cause problems on the body.
So that's what antioxidants are so how does

724

01:07:45,280 --> 01:07:50,250
hydrogen gas compare as an
antioxidant to these other antioxidants.

725

01:07:50,250 --> 01:07:56,380
Well, if we just look at the molecules
first themselves, okay, hydrogen gas is a

726

01:07:56,380 --> 01:07:59,599
very small molecule, it's a smallest

molecule that there is.

727

01:07:59,599 --> 01:08:05,359

And so things that are going to dictate cellular bioavailability is the size of

728

01:08:05,359 --> 01:08:09,559

the molecule in order to scavenge any free radical it actually has to get to where that free radical is

729

01:08:09,559 --> 01:08:14,209

being produced. And most radicals are produced in the, near the mitochondria

730

01:08:14,209 --> 01:08:20,000

and various complexes 1 and 3 and in different places hydrogen the gas

731

01:08:20,000 --> 01:08:23,239

actually has got to get there which it can very easily to any office to get there

732

01:08:23,239 --> 01:08:27,380

but because hydrogen is so small it's able to defuse the cell membrane into the

733

01:08:27,380 --> 01:08:30,859

substitute compartments of the mitochondria, the nucleus and different areas

734

01:08:30,859 --> 01:08:33,889

very easily. Where some of the other molecules, they need to go through

735

01:08:33,889 --> 01:08:37,880

transporter mechanisms or maybe because like vitamin C is more hydrophilic, water

736

01:08:37,880 --> 01:08:43,310

soluble, it has a difficult time getting it through the cell membrane or maybe

737

01:08:43,310 --> 01:08:47,029

Vitamin E which is more fat soluble,
hydrophobic, wants to stay in the cell

738

01:08:47,029 --> 01:08:50,449
membranes, so it doesn't want to be in the
water space very much. So

739

01:08:50,449 --> 01:08:55,099
it makes it a bit more difficult for
those molecules. So just on the physical

740

01:08:55,099 --> 01:08:59,929
properties, chemical properties of
hydrogen, the other antioxidants hydrogen

741

01:08:59,929 --> 01:09:05,599
is superior because it really can get
into the cells very easily and where it

742

01:09:05,599 --> 01:09:10,940
can potentially scavenge these radicals.
But does it really scavenge the free

743

01:09:10,940 --> 01:09:15,739
radicals? Well, first off hydrogen and the
Nature Medicine paper said this,

744

01:09:15,739 --> 01:09:21,699
is a selective antioxidant. So what is
a selective antioxidant? Well,

745

01:09:21,699 --> 01:09:27,380
basically we have lots of free radicals
or a better term that includes free

746

01:09:27,380 --> 01:09:31,670
radicals is reactive oxygen species and
that includes like hydrogen peroxide, which is

747

01:09:31,670 --> 01:09:37,190
not a free radical but is a reactive
oxygen species or ROS, includes all of

748

01:09:37,190 --> 01:09:43,339
these and these ROS molecules are both
bad for you and they're good for you.

749
01:09:43,339 --> 01:09:46,359
Kind of like cholesterol, you know for a
long time people we're saying: Hey,

750
01:09:46,359 --> 01:09:49,880
cholesterol is just bad for you lets get
rid of all of it. And they're like oh

751
01:09:49,880 --> 01:09:53,389
wait there's HDL and there's LDL. And now we're
finding there's different patterns of

752
01:09:53,389 --> 01:09:58,550
the LDL and the HDL. Now some of them are better
or worse. Same thing with the ROS,

753
01:09:58,550 --> 01:10:03,290
Reactive Oxygen Species, some reactive
oxygen species are good for you, some of

754
01:10:03,290 --> 01:10:08,659
them are bad for you. A lot of the
cell communication and the way the cells

755
01:10:08,659 --> 01:10:12,389
work are based upon this redox
chemistry

756
01:10:12,389 --> 01:10:19,079
okay, of transferring electrons and free
radicals. In fact, the vasodilatation or

757
01:10:19,079 --> 01:10:24,389
widen the blood vessels, is caused
by a free radical known as nitric oxide

758
01:10:24,389 --> 01:10:28,469
which many of you are familiar with.
Nitric oxide is a free radical.

759

01:10:28,469 --> 01:10:31,889

It's rather stable, of course its not stable as a free radical but it's more stable,

760

01:10:31,889 --> 01:10:37,050

but it's produced at a specific location and it reacts with its target

761

01:10:37,050 --> 01:10:42,209

and it causes all of the benefits that nitric oxide does. And of

762

01:10:42,209 --> 01:10:46,499

course if that radical nitric oxide gets too high then it wrecks a lot of

763

01:10:46,499 --> 01:10:51,419

havoc, nitro-oxidative damage, reacts with superoxide radicals to form peroxy-

764

01:10:51,419 --> 01:10:56,880

nitrite and peroxy-nitrite is an oxidant that's very damaging very very

765

01:10:56,880 --> 01:11:03,499

harmful for you. And when we, our immune system, uses reactive oxygen species, then

766

01:11:03,499 --> 01:11:09,479

to kill the pathogens, so we need these free radicals. Even when we

767

01:11:09,479 --> 01:11:14,159

exercise we produce more free radicals through breathing so much more oxygen. So we have

768

01:11:14,159 --> 01:11:18,929

more free radical production and these free radicals are actually what likely

769

01:11:18,929 --> 01:11:25,559

mediate the actual benefits of exercise. Because these free radicals activate

770

01:11:25,559 --> 01:11:29,189
transcription factors that induce like
mitochondrial biogenesis, more mitochondric,

771

01:11:29,189 --> 01:11:32,849
more energy producing
organelles than ourselves. So a lot of these

772

01:11:32,849 --> 01:11:38,340
benefits are produced by these free
radicals. So what dictates, if the free

773

01:11:38,340 --> 01:11:43,199
radical or reactive oxygen species is
good for you or bad for you? Well, the

774

01:11:43,199 --> 01:11:48,630
main thing that dictates that is the
reactivity of that free radical, so like I

775

01:11:48,630 --> 01:11:52,409
said nitric oxide is a free radical but
it's not as reactive as, say another

776

01:11:52,409 --> 01:11:58,289
radical such as the hydroxyl radical
which is just OH neutral, has a lone pair

777

01:11:58,289 --> 01:12:04,139
electron, it's very reactive, very
cytotoxic or cell damaging and this

778

01:12:04,139 --> 01:12:08,909
hydroxyl radical, it can be produced when
there's an excess amount of of other

779

01:12:08,909 --> 01:12:13,079
free radicals like super oxide in the
Fenton reaction or through the

780

01:12:13,079 --> 01:12:19,079
hydrogen peroxid, through various ***

mechanisms that can produce hydroxyl

781

01:12:19,079 --> 01:12:22,369
radicals. This hydroxyl radical is just
very damaging, in fact there's

782

01:12:22,369 --> 01:12:27,199
really no known benefit for it and
there's no detoxification enzymes

783

01:12:27,199 --> 01:12:33,499
specific for that. So you have radicals
like superoxide anion radical there is

784

01:12:33,499 --> 01:12:38,629
a specific enzyme the body produces to
handle that free radical, called superoxide

785

01:12:38,629 --> 01:12:43,309
dismutase, or SOD aside. And you have
other things like hydrogen peroxide

786

01:12:43,309 --> 01:12:49,939
which is a oxidant and you have the
glutathione peroxidase or catalase

787

01:12:49,939 --> 01:12:53,840
that can handle those oxidants. But there
isn't anything like that for the

788

01:12:53,840 --> 01:12:57,499
hydroxyl radical. Hydroxyl radical is just
very reactive and reacts with

789

01:12:57,499 --> 01:13:04,340
everything and anything in its path. Well
a hydrogen gas is a very mild, very weak

790

01:13:04,340 --> 01:13:10,699
antioxidant, if you will. And it doesn't
react with anything. In fact, in order for

791

01:13:10,699 --> 01:13:13,669

hydrogen gas to react with anything
something has to react with it very

792

01:13:13,669 --> 01:13:19,249
powerfully and the only radical that is
strong enough to do that is the hydroxyl

793

01:13:19,249 --> 01:13:24,289
radical. It's so powerful that it can
actually react with hydrogen gas and

794

01:13:24,289 --> 01:13:29,300
when it does it forms water, that's the
reaction, so it's kind of a neat story

795

01:13:29,300 --> 01:13:34,070
just like that. It forms the water as the
byproduct. So hydrogen gas will not,

796

01:13:34,070 --> 01:13:39,860
indeed it cannot react and scavenge all
the other radicals and reactive oxygen

797

01:13:39,860 --> 01:13:43,909
species many of which may be very
beneficial for our body that we don't

798

01:13:43,909 --> 01:13:50,899
want to scavenge. And so actually that
could help explain why some of these,

799

01:13:50,899 --> 01:13:57,499
these clinical and humans, large studies
using antioxidants have shown a taking

800

01:13:57,499 --> 01:14:01,519
high levels of these exogenous
antioxidants often have deleterious

801

01:14:01,519 --> 01:14:08,869
effects, can be harmful to our health, maybe
because they are scavenging too

802

01:14:08,869 --> 01:14:13,879
many of these beneficial molecules and
beneficial reactive oxygen species that

803
01:14:13,879 --> 01:14:20,749
we actually need and it's perturbing or
exacerbating this dysregulation of this

804
01:14:20,749 --> 01:14:25,820
redox balance. So hydrogen if it scavenges
anything it's only going to scavenge

805
01:14:25,820 --> 01:14:29,750
this hydroxyl radical and the Nature
Medicine paper also mentioned

806
01:14:29,750 --> 01:14:36,290
potentially then peroxy nitrite molecule
which is very oxidizing as well. But even

807
01:14:36,290 --> 01:14:44,990
with that: the benefits of hydrogen
cannot really be attributed to the

808
01:14:44,990 --> 01:14:49,970
scavenging of hydroxyl radicals.
There's too many explanations and

809
01:14:49,970 --> 01:14:54,830
reasons and evidence that it just it
doesn't make very much sense that it's,

810
01:14:54,830 --> 01:14:58,460
that's where it's doing all the benefits. Really
what we're seeing the benefits of

811
01:14:58,460 --> 01:15:05,060
hydrogen is in this cell modulating
activity of hydrogen or where it's acting as

812
01:15:05,060 --> 01:15:09,260
more of a gaseous signal modulator
like other gaseous molecules. Nitric

813

01:15:09,260 --> 01:15:14,570

oxide is a gas, hydrogen sulfide, carbon monoxide, these are well-recognized

814

01:15:14,570 --> 01:15:20,300

gaseous signaling molecules and hydrogen has a similar idea where they can do

815

01:15:20,300 --> 01:15:27,080

that. And there was an article just published in May of 2017 where it showed

816

01:15:27,080 --> 01:15:32,660

that hydrogen could actually, has a in the mitochondria increase in mitochondrial

817

01:15:32,660 --> 01:15:36,170

membrane, potential increase in ATP production, but it was doing this because

818

01:15:36,170 --> 01:15:41,210

it had a transit increase in a superoxide radical production in the

819

01:15:41,210 --> 01:15:46,580

mitochondria and this radical increased production, then activated other

820

01:15:46,580 --> 01:15:51,110

transcription factors including like the NRF 2 - pathway which induces as a

821

01:15:51,110 --> 01:15:57,080

transcription factor which induces more antioxidant enzymes like glutathione and

822

01:15:57,080 --> 01:16:01,370

superoxide dismutase.

So, maybe this is one of the mechanisms

823

01:16:01,370 --> 01:16:05,960

that hydrogen works it's more of a hormetic or hormesis mechanism, mitohormetic

824

01:16:05,960 --> 01:16:13,700

which is able to transit,
increase in ROS production and that is,

825

01:16:13,700 --> 01:16:18,740

mediates many of the benefits of
hydrogen. So if rightly understood one

826

01:16:18,740 --> 01:16:23,470

could consider that hydrogen is good for
you because one, it is a very weak

827

01:16:23,470 --> 01:16:28,520

antioxidant it doesn't scavenge all the good ones,
if it scavenges anything it's only going to

828

01:16:28,520 --> 01:16:34,820

scavenge the very bad radicals that cause
the most damage and two, it's kind of like

829

01:16:34,820 --> 01:16:39,650

a potentially a pro-oxidant
and then it actually can increase, very

830

01:16:39,650 --> 01:16:42,690

small amounts, not enough to be toxic.
Just

831

01:16:42,690 --> 01:16:49,560

enough to induce transcription factors,
it produces just enough oxidants, the

832

01:16:49,560 --> 01:16:54,989

superoxide radical in the mitochondria.
We've seen with lactose instead of

833

01:16:54,989 --> 01:17:00,870

glucose, but we see that it can increase
transiently small amounts of ROS and

834

01:17:00,870 --> 01:17:04,020

that in turn mediates a lot of these benefits.

So again

835

01:17:04,020 --> 01:17:08,850

If properly understand hydrogen is beneficial not because it's a powerful antioxidant but

836

01:17:08,850 --> 01:17:14,130

because it's a very, very weak antioxidant that only goes up to the bad

837

01:17:14,130 --> 01:17:19,860

guys and is a small Pro oxidant that works kind of like how exercise does.

838

01:17:19,860 --> 01:17:24,120

We increase amount of free radical just a little bit and then we get all the

839

01:17:24,120 --> 01:17:31,610

benefits after that. --- The presence of dissolved hydrogen gas causes a low

840

01:17:31,610 --> 01:17:40,770

negative redox potential which can be measured as ORP but what is surprising

841

01:17:40,770 --> 01:17:48,719

for many people a low and negative ORP does not yet mean that a lot of hydrogen

842

01:17:48,719 --> 01:17:55,980

is dissolved in water. How can this be explained? ---- So often I'm asked about what

843

01:17:55,980 --> 01:18:00,870

about the ORP and meter or the measurement. ORP standing for oxidation

844

01:18:00,870 --> 01:18:05,520

reduction potential and this using to measure the amount of hydrogen in the

845

01:18:05,520 --> 01:18:12,060

water. Well, it doesn't really work that way. It's not specific to hydrogen and

846

01:18:12,060 --> 01:18:16,710

it's not a very accurate method for measuring hydrogen because it's not specific to

847

01:18:16,710 --> 01:18:22,250

hydrogen. The ORP that really how it works, is what it stands for, is

848

01:18:22,250 --> 01:18:27,570

oxidation, okay so we have something oxidized species and reduction so we have

849

01:18:27,570 --> 01:18:31,590

reduced species, potential. Potential means difference, so really it's the

850

01:18:31,590 --> 01:18:36,900

difference between an oxidized species and a reduced species and it's just a

851

01:18:36,900 --> 01:18:42,449

ratio of that. It's actually negative logarithmic ratio of that difference

852

01:18:42,449 --> 01:18:46,620

between the oxidized species and the reduced species and that's based upon

853

01:18:46,620 --> 01:18:53,420

the well known Nernst equation and this can be calculated. And that's really

854

01:18:53,420 --> 01:18:58,969

how it's working with when you add anything to water. So when you have a solution

855

01:18:58,969 --> 01:19:04,849

and you measure the ORP of that water it's going to give you a number and it

856

01:19:04,849 --> 01:19:09,409
could be a positive millivolt number or
a negative millivolt number. If it's a

857

01:19:09,409 --> 01:19:15,429
positive mV number: all that means is
that there are more oxidized species, not

858

01:19:15,429 --> 01:19:20,900
necessarily oxidizing but just more
oxidized species than there are reduced

859

01:19:20,900 --> 01:19:24,650
species and if it's negative there are
more reduced species than there are

860

01:19:24,650 --> 01:19:31,340
oxidized species. So when you get the
negative ORP reading you should first ask

861

01:19:31,340 --> 01:19:39,770
yourself, okay what is responsible for
making this negative ORP? Is it good for

862

01:19:39,770 --> 01:19:43,610
you or is it bad for you? Because you can
add all sorts of things to get a

863

01:19:43,610 --> 01:19:48,679
negative ORP. You can add a number of
chemicals that are toxic for you, whether

864

01:19:48,679 --> 01:19:54,440
you know, ... or dihydropurins or a bit of a kind
of ethanol or different

865

01:19:54,440 --> 01:19:59,119
redox states and metals or different
things: they can all give you a very

866

01:19:59,119 --> 01:20:04,190
negative number but if you were to drink
it it could be rather toxic for your

867

01:20:04,190 --> 01:20:08,659
body! So just because something has a
negative ORP does not in any way, shape

868

01:20:08,659 --> 01:20:12,619
or form mean that it's actually good
for you. So the first question is when

869

01:20:12,619 --> 01:20:17,360
you see a negative ORP number, ask
yourself: what's making the negative ORP?

870

01:20:17,360 --> 01:20:21,199
And now you find out: okay, that's
actually bad for you I don't want it, or you

871

01:20:21,199 --> 01:20:25,309
find hey, this is good for you, such as
maybe it's from vitamin C, maybe some

872

01:20:25,309 --> 01:20:29,030
polyphenols from like a tea or
something or maybe it's from

873

01:20:29,030 --> 01:20:32,719
hydrogen gas itself. Because when you dissolve
hydrogen gas in the water it gives a

874

01:20:32,719 --> 01:20:36,739
very nice negative ORP. So now you know:

875

01:20:36,739 --> 01:20:41,059
Okay, the negative ORP is in there not because
it's bad for you because it's top,

876

01:20:41,059 --> 01:20:45,050
because it's good for you. These
molecules are good for you. Then the next

877

01:20:45,050 --> 01:20:50,900
question to ask yourself is but is the
concentration enough to even be worth my

878

01:20:50,900 --> 01:20:56,869

time? Because again the ORP is not, it's not measuring a concentration, it's

879

01:20:56,869 --> 01:21:01,860

negative logarithm

of the ratio, of that difference and so

880

01:21:01,860 --> 01:21:04,980

it has nothing about concentration in it.

It's just the greater the difference

881

01:21:04,980 --> 01:21:08,940

then, and then this negative log so it's going to make the number even bigger

882

01:21:08,940 --> 01:21:16,050

than it really is. So you get that number whether it's negative 500

883

01:21:16,050 --> 01:21:20,790

millivolts or anything you still actually have no idea, what the

884

01:21:20,790 --> 01:21:24,150

concentration of the active ingredients are. So let's say, we talked about

885

01:21:24,150 --> 01:21:30,330

hydrogen gas. Well, because in this case with just water and hydrogen gas

886

01:21:30,330 --> 01:21:34,740

you have the reduced species which is hydrogen gas, H_2 , and you have the

887

01:21:34,740 --> 01:21:39,660

oxidized species which is H^+ and you know, include oxygen and some

888

01:21:39,660 --> 01:21:43,650

other you know maybe some chlorine in there if it gets in there. These are the

889

01:21:43,650 --> 01:21:50,640

oxidized species. But lets focus on H₂ and the H⁺.
Well H⁺ that is what pH is, we talked

890

01:21:50,640 --> 01:21:57,270

about: the more H⁺ the more acidic and
the less H⁺ the more alkaline. And if

891

01:21:57,270 --> 01:22:02,070

it's H₂ divided by H⁺ well if we
have alkaline water we have very little

892

01:22:02,070 --> 01:22:07,950

H⁺ ions so therefore a numerator
divided by a smaller denominator is

893

01:22:07,950 --> 01:22:12,660

going to give a larger quotient and the
negative log of that quotient is going

894

01:22:12,660 --> 01:22:17,010

to give it more negative number. So you
get something that's very large. So the

895

01:22:17,010 --> 01:22:23,430

more alkaline the pH is the more negative
the ORP becomes. But you didn't notice,

896

01:22:23,430 --> 01:22:26,040

we didn't change anything in this case
with the numerator, with the actual

897

01:22:26,040 --> 01:22:31,230

hydrogen concentration. So theoretically
if everything worked out perfectly then

898

01:22:31,230 --> 01:22:34,770

based on the Nernst equation we can, okay
calculate what the pH is, get the H⁺

899

01:22:34,770 --> 01:22:38,790

concentration and then you know do the

inverse exponent you know and then we

900

01:22:38,790 --> 01:22:41,550
can figure out the concentration of
hydrogen. But it doesn't work that way,

901

01:22:41,550 --> 01:22:46,320
I've tried it. You have totally different
concentrations. And the reason why is

902

01:22:46,320 --> 01:22:53,640
because this ORP-meter again is not
specific to just hydrogen. And we're

903

01:22:53,640 --> 01:22:59,250
talking about changes in concentration
that is very small compared to what's

904

01:22:59,250 --> 01:23:04,140
going on. So for example, in normal tap
water we have hydrogen gas in the

905

01:23:04,140 --> 01:23:09,860
atmosphere, a very little amount, 0,0005%
and that hydrogen also gets

906

01:23:09,860 --> 01:23:12,860
dissolved into the water. So now you have
a concentration of phase zero point zero

907

01:23:12,860 --> 01:23:19,370
0.0000001 ppm. Now, if you
measure the ORP of just your water,

908

01:23:19,370 --> 01:23:24,110
you say you have negative, or sorry, positive
you know, three hundred ORP mV,

909

01:23:24,110 --> 01:23:28,070
positive 300
millivolts, well and you have that much

910

01:23:28,070 --> 01:23:36,199

hydrogen gas in it, 0.000001 ppm. Now if you increase the concentration of hydrogen 1

911

01:23:36,199 --> 01:23:45,620
million times, right, then you will get 0.1 ppm. About 0.1 ppm. You increased the

912

01:23:45,620 --> 01:23:50,210
concentration a million times, so because logarithmic in the ratio and

913

01:23:50,210 --> 01:23:53,780
everything you're going to see that ORP reading is going to go from a

914

01:23:53,780 --> 01:23:59,510
positive 300 to negative 500 because you change that a million times.

915

01:23:59,510 --> 01:24:04,250
Now, let's say you're going to go from 0.1 to 1 ppm,

916

01:24:04,250 --> 01:24:10,370
so you change it 10 times. If you change it just 10 times you're not really going

917

01:24:10,370 --> 01:24:14,719
to see much of a change at all in the ORP. It's still going to be around

918

01:24:14,719 --> 01:24:21,320
negative 500 millivolts. So we just don't see very much change at all with increasing

919

01:24:21,320 --> 01:24:24,980
the concentration of hydrogen and that is why, and I've done this many times, you can do

920

01:24:24,980 --> 01:24:31,310
as well, you can actually say, have two glasses of water, one of them, both of them

921

01:24:31,310 --> 01:24:36,679
have an ORP of say negative 500
millivolts but one of them has a

922
01:24:36,679 --> 01:24:41,300
hydrogen concentration of 1 ppm which
can be therapeutic. The other

923
01:24:41,300 --> 01:24:46,300
concentration is say 0.1 ppm which
may or may not be therapeutic.

924
01:24:46,300 --> 01:24:52,370
But the ORP is the same. You can
actually have it where one is 1 ppm, the

925
01:24:52,370 --> 01:24:58,429
other is 0.1 ppm but the one is 0.1 ppm
has an ORP of negative eight hundred

926
01:24:58,429 --> 01:25:05,300
millivolts. Why? Because one of 1 ppm is a
neutral pH, you can have 0.1 ppm could be

927
01:25:05,300 --> 01:25:11,570
a pH of 10 and all of a sudden that'll
show a much higher concentration.

928
01:25:11,570 --> 01:25:18,139
Because again: pH is also logarithmic. So
if you go from a pH 7 to a pH of 10

929
01:25:18,139 --> 01:25:23,619
that's 7, 8, 9, 10. That's
ten, hundred, thousand times less

930
01:25:23,619 --> 01:25:29,239
H⁺ ions. So you have a 1000 times less
smaller number on the denominator and

931
01:25:29,239 --> 01:25:33,829
now the numerators, you can stay the
same, all these things make the changes

932

01:25:33,829 --> 01:25:38,480
so it's reflected exponentially
because it is an exponential problem, a

933

01:25:38,480 --> 01:25:45,349
logarithm and that changes. So you cannot
use the ORP meter to see which

934

01:25:45,349 --> 01:25:52,790
concentration is higher. Now: there can be
some benefits of using an ORP meter. In

935

01:25:52,790 --> 01:25:58,639
general fresh fruit and different things,
fresh juices should often have a

936

01:25:58,639 --> 01:26:04,040
negative ORP reading. And so you could say if it's fresh
they have a negative ORP reading, that's fine.

937

01:26:04,040 --> 01:26:09,560
When it comes to the hydrogen, you can't use it at all
in any way to see

938

01:26:10,560 --> 01:26:16,980
which one has more hydrogen than
another. But I will say this, that

939

01:26:14,780 --> 01:26:19,790
you cannot, if you have a high
concentration of hydrogen, say 1 ppm

940

01:26:19,790 --> 01:26:26,750
or greater, you'll always have a rather low
negative ORP say negative 400, negative 500

941

01:26:26,750 --> 01:26:33,469
millivolts or less. So if you have a
negative 4 negative 500 millivolts you

942

01:26:33,469 --> 01:26:39,469
know that you have a concentration of
hydrogen that's maybe, could be 0.05 ppm

943

01:26:39,469 --> 01:26:44,739
to 10 ppm. It could be all those numbers
but if you have an ORP of say negative

944

01:26:44,739 --> 01:26:51,980
10 or positive 100 then you know there
is no hydrogen in that glass of water.

945

01:26:51,980 --> 01:26:57,079
So, really it has a negative ORP, there's
hydrogen, you just have no idea how much. Sorry, if

946

01:26:57,079 --> 01:27:02,239
you have a negative ORP and you know
that the chemical species in the

947

01:27:02,239 --> 01:27:06,590
the water is hydrogen, then you know that
there's hydrogen in there. You don't know

948

01:27:06,590 --> 01:27:11,420
how much there is in there. So you have to
measure that and you can use like I

949

01:27:11,420 --> 01:27:17,030
mentioned earlier the redox titration
reagent. So that's very important

950

01:27:17,030 --> 01:27:21,469
to remember. The whole benefit is, if you
use the ORP meter, you measure the water,

951

01:27:21,469 --> 01:27:25,429
that claims to be hydrogen, and you're only
getting, you know, negative 50 or a

952

01:27:25,429 --> 01:27:29,210
positive number, you don't even need to
worry about measuring the hydrogen because

953

01:27:29,210 --> 01:27:37,170
there isn't going to be any suitable concentration.

---- Some do believe that they do not

954

01:27:37,170 --> 01:27:45,780

have to laboriously measure if hydrogen is dissolved in water. They then show, for

955

01:27:45,780 --> 01:27:53,340

example, how the water flows out of a water ionizer, all milky, and say then

956

01:27:53,340 --> 01:28:02,460

that the hydrogen can be seen after all. Or they hold a lighter to the water outlet

957

01:28:02,460 --> 01:28:11,250

of the device and there are small explosions. Or if you look at one of

958

01:28:11,250 --> 01:28:18,540

these small hydrogen boosters with a PEM cell, there you can see how more or less

959

01:28:18,540 --> 01:28:25,620

bubbles move through the water and appear to dissolve. Then, on the other

960

01:28:25,620 --> 01:28:31,140

hand, there are people that say, it depends on the size of the bubbles, that

961

01:28:31,140 --> 01:28:39,930

they dissolve in water. What exactly happens there, when hydrogen dissolves in

962

01:28:39,930 --> 01:28:50,610

water and can the hydrogen be seen? Often I get a question about the hydrogen

963

01:28:50,610 --> 01:28:54,480

gas dissolved in the water because it was emitting. Some of these products out

964

01:28:54,480 --> 01:28:58,710

there when they make their hydrogen water
they see just tons of gases, bubbles in

965

01:28:58,710 --> 01:29:04,740

there. It's just milky water. Why? It's foggy, you
see all these gas bubbles. Does that mean

966

01:29:04,740 --> 01:29:08,100

the hydrogen what does that mean that
means that there's so much hydrogen there

967

01:29:08,100 --> 01:29:12,780

that's supersaturated and the gas just
coming out, or what's going on? Is this a

968

01:29:12,780 --> 01:29:16,290

good sign?

Well if you see the gas bubbles in there

969

01:29:16,290 --> 01:29:22,800

you know that hydrogen is being produced
but if you see the bubbles, those bubbles

970

01:29:22,800 --> 01:29:27,240

you see is the gas that is not dissolved.
And really it's not going to offer you

971

01:29:27,240 --> 01:29:30,570

any benefit because it's not in the
water, it's just when you see bubbles,

972

01:29:30,570 --> 01:29:34,440

micro bubbles, they go through two things
these are going to go in,

973

01:29:34,440 --> 01:29:37,710

they're going to continue shrinking,
shrinking until and the gas molecules go

974

01:29:37,710 --> 01:29:41,900

into the water until it's dissolved or
they'll coalesce together and get larger and then

975

01:29:41,900 --> 01:29:46,830
evaporate out of the water. So those are the
two options when you see that. So when

976

01:29:46,830 --> 01:29:53,699
you see that. So when you see those big macro bubbles in
the water, well it's not dissolved in the

977

01:29:53,699 --> 01:29:58,550
water. So you don't know what the
concentration is. And in fact I've seen

978

01:29:58,550 --> 01:30:04,380
you can make water that is so foggy: it
looks just like milk. And then when

979

01:30:04,380 --> 01:30:08,520
you go to measure the concentration,
assuming it's going to be really high,

980

01:30:08,520 --> 01:30:14,610
you can't even measure 0.1 ppm. So
just because something has tons of

981

01:30:14,610 --> 01:30:18,719
bubbles in it's milky and it's foggy and
everything does not mean that the

982

01:30:18,719 --> 01:30:22,770
hydrogen is actually been dissolved in
water. It just means that there's lots of

983

01:30:22,770 --> 01:30:25,679
bubbles there.
So you actually still have to measure

984

01:30:25,679 --> 01:30:31,350
the concentration of hydrogen. Because
it's the unseen bubbles, if you will, that

985

01:30:31,350 --> 01:30:37,800
matter not this not the ones that are
seen. And similarly there are various

986

01:30:37,800 --> 01:30:41,790

devices where you can you can light a lighter for example and hold it

987

01:30:41,790 --> 01:30:46,380

underneath where the water comes out and you can hear the sparks and crack, crack, crack and

988

01:30:46,380 --> 01:30:52,080

that's a great demonstration showing that it really is producing hydrogen.

989

01:30:52,080 --> 01:30:57,030

But it's a very big difference between producing hydrogen and dissolved

990

01:30:57,030 --> 01:31:00,570

hydrogen. And the therapeutic benefits come from the dissolved hydrogen so

991

01:31:00,570 --> 01:31:04,560

really that's just something that you have hydrogen that's not dissolved in

992

01:31:04,560 --> 01:31:08,610

the water. Now you may have hydrogen that's also dissolved in the water but again you'll

993

01:31:08,610 --> 01:31:13,590

have to test that. So just because it's making cracking sounds doesn't mean

994

01:31:13,590 --> 01:31:19,619

anything. I mean you could even put the argument that a machine that makes water

995

01:31:19,619 --> 01:31:23,489

with no cracking is more effective because it, all the gas ends up getting

996

01:31:23,489 --> 01:31:26,429

dissolved into the water instead of being wasted with the atmosphere you

997

01:31:26,429 --> 01:31:31,290

know. It's all marketing stuff, if you will. But point is, is you need to

998

01:31:31,290 --> 01:31:35,850

actually measure the concentration of hydrogen in the water and can't just look

999

01:31:35,850 --> 01:31:40,050

at something say yes it's foggy yes it's milky yes it makes a cracking sound and

1000

01:31:40,050 --> 01:31:45,690

therefore has hydrogen in it. We don't know that. The gas dissolution takes time.

1001

01:31:45,690 --> 01:31:51,270

We, in our body for example we dissolve carbon dioxide in our blood very quickly

1002

01:31:51,270 --> 01:31:54,760

and it has to get get out of the blood, we exhale it

1003

01:31:54,760 --> 01:31:58,330

and that has to happen very rapidly. And that's why we have an enzyme called

1004

01:31:58,330 --> 01:32:02,140

carbonic anhydrase to do that: So it can dissolve the gas very quickly and

1005

01:32:02,140 --> 01:32:06,520

release it very quickly. If we did have an enzyme which works very, very fast.

1006

01:32:06,520 --> 01:32:10,690

One of the fastest enzymes that there are. If we didn't have that enzyme we would die

1007

01:32:10,690 --> 01:32:15,520

so quick because we would not be able

to dissolve the gas into the water or

1008

01:32:15,520 --> 01:32:20,830

release it out of our bloodstream and so again with hydrogen gas it's got to

1009

01:32:20,830 --> 01:32:24,820

dissolve in the water and it doesn't just happen by just simply bubbling, it takes

1010

01:32:24,820 --> 01:32:30,130

time to reach that equilibrium. ----

What type of water is best suited for producing

1011

01:32:30,130 --> 01:32:36,400

hydrogen water? Is it rather mineral rich water or the opposite RO water, also

1012

01:32:36,400 --> 01:32:45,490

known as reverse osmosis water? ----

I'm often asked also which water is the best to

1013

01:32:45,490 --> 01:32:50,560

make our hydrogen rich water and it's a very difficult question because it depends

1014

01:32:50,560 --> 01:32:53,260

on how you're making the hydrogen water.

Are you, do

1015

01:32:53,260 --> 01:32:57,340

you just have a, take a gas and bubble it into the water or do you have a machine

1016

01:32:57,340 --> 01:33:01,660

what kind of machine is it? All these different things. It depends, for some

1017

01:33:01,660 --> 01:33:07,600

machines the electrolysis process you only use like a doubly distilled water, very

1018

01:33:07,600 --> 01:33:13,360

pure, no ions, because the membrane itself is the electrolyte and that's how that

1019

01:33:13,360 --> 01:33:16,990
works. Other things you have to have electrolytes in there and so the more

1020

01:33:16,990 --> 01:33:20,140
minerals you have the better conductivity and the more effective

1021

01:33:20,140 --> 01:33:24,760
you're going to be able to make your hydrogen gas. So there's so many variables when

1022

01:33:24,760 --> 01:33:30,910
it comes to that. All I could say is: you can measure the concentration of hydrogen with

1023

01:33:30,910 --> 01:33:33,940
your device, you can measure the concentration of hydrogen to see what's

1024

01:33:33,940 --> 01:33:38,230
going to work better you can check with your company or manufacturer and see

1025

01:33:38,230 --> 01:33:44,200
what they recommend, if it matters at all, and then if you just look at watch a

1026

01:33:44,200 --> 01:33:54,130
quality in general. Drinking water with minerals in it, is good for you.

1027

01:33:54,130 --> 01:33:57,010
The minerals are very bioavailable, that's one of the best ways to get

1028

01:33:57,010 --> 01:34:03,120
minerals and there's been very large epidemiological studies showing that

1029

01:34:03,120 --> 01:34:09,070
water that contains minerals in them is
good for your health, it's a great way to

1030
01:34:09,070 --> 01:34:14,500
get minerals from from your source water
and for your dietary needs.

1031
01:34:14,500 --> 01:34:22,030
So RO water is not toxic for you,
it's, even though people say oh it's acidic or

1032
01:34:22,030 --> 01:34:26,800
something, it's not a it's not a
dangerous acid, it's not a buffered acid

1033
01:34:26,800 --> 01:34:31,329
or something where it can really harm
you, it's just it's lacking minerals and

1034
01:34:31,329 --> 01:34:36,639
your body needs minerals and there's not
going to be a big issue but it could be

1035
01:34:36,639 --> 01:34:41,590
wise to drink mineral water,
I think there's sufficient evidence to

1036
01:34:41,590 --> 01:34:46,480
suggest that drinking water rich in
minerals is a good option for you, but

1037
01:34:46,480 --> 01:34:55,119
certainly not required for life. ----
I would like to have a couple of technical questions

1038
01:34:55,119 --> 01:35:03,909
explained about the different
electrolysis devices which can be used

1039
01:35:03,909 --> 01:35:11,980
to produce hydrogen water. One is the
most interesting, there are the new PEM

1040

01:35:11,980 --> 01:35:20,199
cells and the multiple cells of water
ionizers that have been longer on the

1041

01:35:20,199 --> 01:35:28,840
market. Can you explain the difference? ----
So when it comes to the field of

1042

01:35:28,840 --> 01:35:34,150
electrolysis to make hydrogen for
medical or therapeutic use there are a

1043

01:35:34,150 --> 01:35:39,520
number of ways to do it. You have
your, your conventional electrolysis

1044

01:35:39,520 --> 01:35:45,219
chambers that have no membranes, that just
have an anode and a cathode. Hydrogen is

1045

01:35:45,219 --> 01:35:50,199
produced at the cathode and electrolysis
and oxygen... is

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01:35:50,199 --> 01:35:53,949
produced at the anode and the water is all mixed
together and there you have it. And

1047

01:35:53,949 --> 01:36:00,280
then there's units that have a special
membrane between it, that acts like the

1048

01:36:00,280 --> 01:36:04,599
salt bridge and it prevents the mixing
of the cathodic water from the analyte

1049

01:36:04,599 --> 01:36:09,820
water and that's, what your ionizers (do)
that make alkaline and acidic water,

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01:36:09,820 --> 01:36:14,250
that's how they work is: they have that
membrane and it separates the two and

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01:36:14,250 --> 01:36:18,280

then there's other
membranes that use the PEM or a proton

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01:36:18,280 --> 01:36:26,140

exchange membrane that allows only the
protons, the H⁺ ions to migrate in between

1053

01:36:26,140 --> 01:36:34,780

and then those protons react, get to the
cathode and produce hydrogen gas. So then

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01:36:34,780 --> 01:36:41,380

there's different ways to assemble these
types of chambers into a hydrogen water

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01:36:41,380 --> 01:36:49,030

product. For example with this use of the
SPE or solid polymer electrolyte, using this

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01:36:49,030 --> 01:36:55,450

PEM membrane style you could make the
pure hydrogen gas and then it's just

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01:36:55,450 --> 01:36:59,740

pure hydrogen gas that's made at the cathode
and the hydrogen gas is then infused

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01:36:59,740 --> 01:37:05,740

into the bulk drinking water and should
go through some sort of dissolver or

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01:37:05,740 --> 01:37:10,750

dissolving mixture of some sorts what
actually get into the water. So

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01:37:10,750 --> 01:37:16,060

those are the two methods of
electrolysis that's being used to make

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01:37:16,060 --> 01:37:20,590

hydrogen gas. Which one is better? Well, it

depends on how good the design the best

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01:37:20,590 --> 01:37:24,010

design of another is always going to be better than the worst design of the

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01:37:24,010 --> 01:37:29,380

other, right? So again you can simply measure the concentration and then there

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01:37:29,380 --> 01:37:33,580

other things to look at. You can have calcification and scale issues with this you

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01:37:33,580 --> 01:37:39,910

have to use this special water or not? Or do you run the risk of having

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01:37:39,910 --> 01:37:43,870

electrode degradation? You have to have pierced electrodes or you can

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01:37:43,870 --> 01:37:50,560

have the metal particles that get into the water can be harmful for you.

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01:37:50,560 --> 01:37:55,900

Those, there's so many questions to consider when looking at all of these things, and it is

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01:37:55,900 --> 01:38:10,170

just, it's still a new field of work that's being developed right now.