



Molecular Hydrogen

Questions & Answers

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Self Care Starts with Cell Care

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Introduction

Dr. Tyler LeBaron is an expert in Molecular Hydrogen and is the Founder and Executive Director of the Molecular Hydrogen Institute.

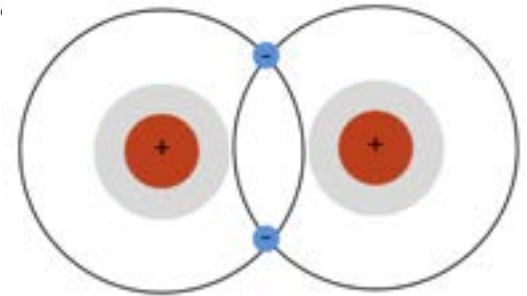
He started studying Molecular Hydrogen in 2009. In 2013 he was honored to have the opportunity to complete a research internship and further study Molecular Hydrogen at the Nagoya University.

Through the years he has been able to study the molecular mechanisms of hydrogen gas on cell-signaling pathways. He has been on board studying and publishing around 50 papers on Molecular Hydrogen.

He has been active collaborating with researchers to help advance the education, research, and awareness of hydrogen as a potential therapeutic medical gas.

What is Molecular Hydrogen?

- Two hydrogen atoms chemically bonded together
- It is an odorless, tasteless, highly flammable gas
- It is neutral, so not negatively or positively charged
- It has two protons (positively charged) and two electrons (negatively charged)
- It goes by several names including: the hydrogen molecule, di (*meaning two*) hydrogen, diatomic hydrogen, or simply hydrogen gas.
- It is designated by its molecular formula as: H_2 (g), where g = g



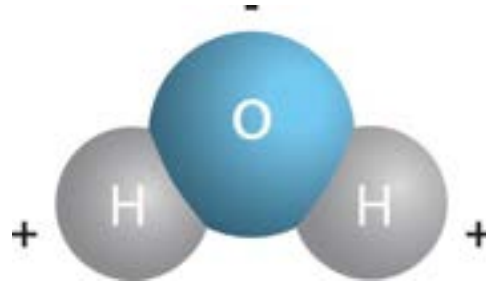
**Molecular Hydrogen
Q&A**



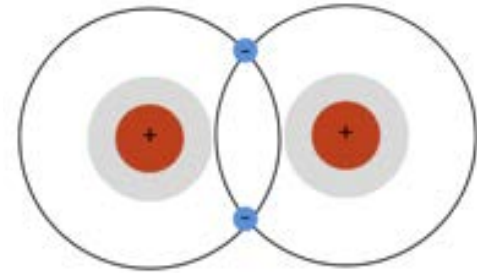
Is Molecular Hydrogen and Hydrogen Water the Same Thing?

- They are different. Water has hydrogen atoms connected to the oxygen, whereas molecular hydrogen has the hydrogen atoms connected to each other

Molecular Hydrogen Q&A



Water Molecule

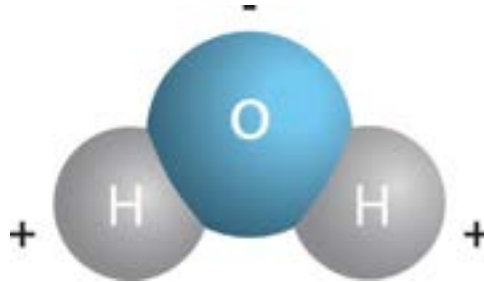


Hydrogen Molecule

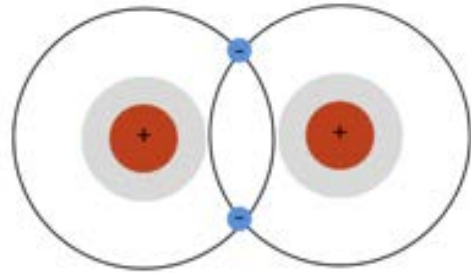


If Water Is H₂O, Doesn't It Mean It Already Has Hydrogen in It?

- Water has hydrogen atoms in it that are connected to the oxygen, but that is very different from molecular hydrogen.



Water Molecule



Hydrogen Molecule





Does Hydrogen Water Change the Water Structure?

- Hydrogen water is simply regular water that has hydrogen gas (molecular hydrogen) dissolved into the water. So the chemical structure of water stays the same. It does not change. The water is acting as the “carrier” for us to get the hydrogen molecules inside our body when we drink it.



Please explain how tablets produce hydrogen in water and is it the same as molecular hydrogen?

Molecular Hydrogen Q&A

- The tablets produce hydrogen gas by the active ingredient magnesium.
- This is not the normal form of magnesium, but a special active form called **metallic or elemental magnesium**. Normal magnesium is a magnesium ion with a positive two charge, written as Mg^{2+} . **Metallic magnesium** still has its two electrons and so it is written as **Mg with no charge**.
- When this special type of magnesium is added to water it **converts the hydrogen already in water to hydrogen gas**. This chemical reaction is written as:
 $Mg + 2H_2O \rightarrow Mg^{2+} + H_2 (g)$.

This is read as: metallic magnesium reacts with water to produce magnesium ions and hydrogen gas.

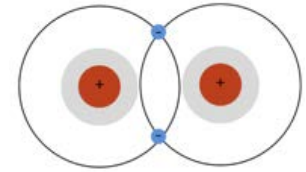


Does Hydrogen Water Have a Different pH (Alkaline Or Acidic)?

Molecular Hydrogen Q&A

It does not. Please remember that:

- Hydrogen water is simply water that contains dissolved hydrogen gas
- Hydrogen gas does not change the pH of water.
- The pH of water refers to the concentration (*power/potential in mathematic terms*) of the positively charged hydrogen ion (H^+).
- The hydrogen ion and hydrogen gas are completely different from each other.



The Hydrogen Molecule



The Hydrogen Ion





If molecular hydrogen doesn't change the pH of water, then why do the tablets have a different pH?

- The tablets have natural organic acids, for example malic acid, which gives apples their tart taste.
- These organic acids facilitate the reaction of the metallic magnesium to produce hydrogen gas as well as alter the pH of the water.



**Molecular Hydrogen
Q&A**



Should I feel molecular hydrogen after I take it?

- It is possible that you will, and many people have felt something such as increased mental clarity, more energy, maybe even an improved mood.
- However, many people, including myself, do not immediately feel the effects of molecular hydrogen.
- H_2 is not like a powerful synthetic ingredient, but a natural and simple molecule that provides carefully and selectively benefits at the cellular level.





How does molecular hydrogen get absorbed into the body?

- When we drink water that contains molecular hydrogen, the H_2 molecule first enters the small intestines and easily diffuses into the blood. It then travels directly to the heart, which pumps the hydrogen-rich blood to the rest of the body and organs including the lungs.
- This is why within only a couple of minutes of drinking hydrogen water, we can measure hydrogen gas being exhaled out from the lungs. This demonstrates that molecular hydrogen is rapidly and easily absorbed into the body.



How can a simple molecule like hydrogen dissolved into water benefit the body?

Molecular Hydrogen Q&A

- We know that many small molecules are important for the body. The one we know the best is oxygen gas (O_2). Our body requires oxygen to live, so an idea that a small and simple molecule can have benefits shouldn't be too surprising.
- We have seen in many studies that hydrogen gas also has many benefits, and we can receive these benefits by simply ingesting the molecular hydrogen that is dissolved in water.





What are the benefits of molecular hydrogen tablets according to the science?

The tablets are an excellent way to get the benefits of molecular hydrogen

- H₂ has been shown to have beneficial effects in every organ of the human body
- H₂ supports antioxidant/oxidative stress
- Protects cells from all sorts of harmful assaults
- Improves the function and activity of the mitochondria, which provides most of the energy to the cell.
- These benefits explain many why hydrogen is also able to support brain health including cognition, resilience to stress, memory, etc.



(Chen, W. et al. *Neurosci. Bull.* 2021;**37**:389–404.).

(Pictures are not to be reproduced)



Caffeine is considered the most widely used stimulant in the world and used for alertness. Does molecular hydrogen have similar benefits?

- Of course, caffeine is a strong stimulant with many biological effects not just in increased alertness. However, it turns out that yes, some studies indicate that hydrogen water can provide some similar effects as we see on the next slide.
- Remember that Hydrogen water is the provided by tablets dropped into the water.



**Molecular Hydrogen
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[Published: 18 June 2020](#)

Hydrogen vs. Caffeine for Improved Alertness in Sleep-Deprived Humans

[D. Zanini, V. Stajer & S. M. Ostojic](#) 

[Neurophysiology](#) **52**, 67–72 (2020) | [Cite this article](#)

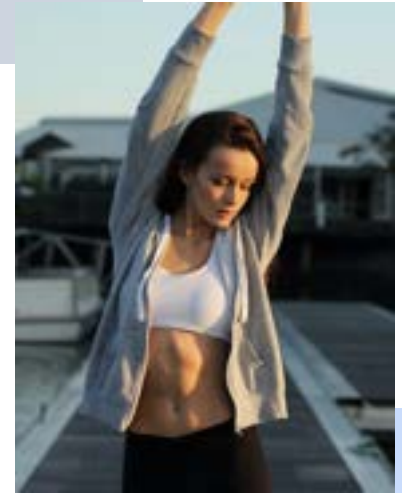
- Alertness was tested in 23 healthy subjects following 24 hours of no sleep under the following conditions
 - Baseline testing
 - 100 mg caffeine
 - HRW tablets
- Results
 - Caffeine and HRW improved alertness compared to baseline
 - HRW was just as effective as caffeine

*(Agudelo LZ et al, 2014).
(Pictures are not to be reproduced)*

Can you explain how Molecular Hydrogen helps the nervous system?

- Yes, there is a lot of research on hydrogen for the nervous system. It goes back to the basic effects of hydrogen to help:
- Reduce oxidative stress
- Support the Body's Inflammatory Response
- Improve the mitochondria
- Protect cells from outside toxins and injuries

Molecular Hydrogen
Q&A



(Iketani M, Ohsawa I. Curr Neuroparmacol. 2017;15(2):324-331)

(Pictures are not to be reproduced)



Mizuno K, Sasaki AT, Ebisu K et al. Hydrogen-rich water for improvements of mood, anxiety, and autonomic nerve function in daily life. Medical gas research. *Med Gas Res.* 2017;7:247-255.

This was a double-blinded, placebo-controlled, randomized study with a two-way crossover design. The study concluded that the H₂ product after 4 weeks may have improved the quality of life for adults. There was an improvement in mood and anxiety and reduced activity of the sympathetic nervous system at rest.

The authors stated that H₂ extremely had positive effects on QOL because of increased central nervous system functions, which involved anxiety, mood and autonomic nerve function.

The investigators shared that the attenuation of sympathetic nervous system activity may have occurred because of a reduced inflammatory response and lower oxidative stress.





Is molecular hydrogen safe for consumption?

Yes, and there are several reasons that we know this.

- H₂ has been approved as GRAS (Generally Recognized As Safe) by the FDA, as well as in the EU as a food packaging gas. These approvals mean that its approved for human consumption and not known to cause harm.
- H₂ is naturally produced by our intestinal bacteria when we have a healthy microbiome and eat plenty of vegetables that have fiber.
- H₂ has been studied and used in deep sea diving at extremely high concentrations with no known harmful effects
- H₂ has been investigated by hundreds of studies and there are no reports of harmful effects.





Conclusion & Take Away

If you do have any health concerns or on medication, it is best to check with your doctor prior to taking any dietary supplements.

Molecular Hydrogen Q&A

Please check out other presentations at CalerieHealth® University that will be helpful to you on body systems, nutrition, exercise & supplement research.

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Thank You For Watching!

Dr. Judi Q & Dr. Tyler W. LeBaron