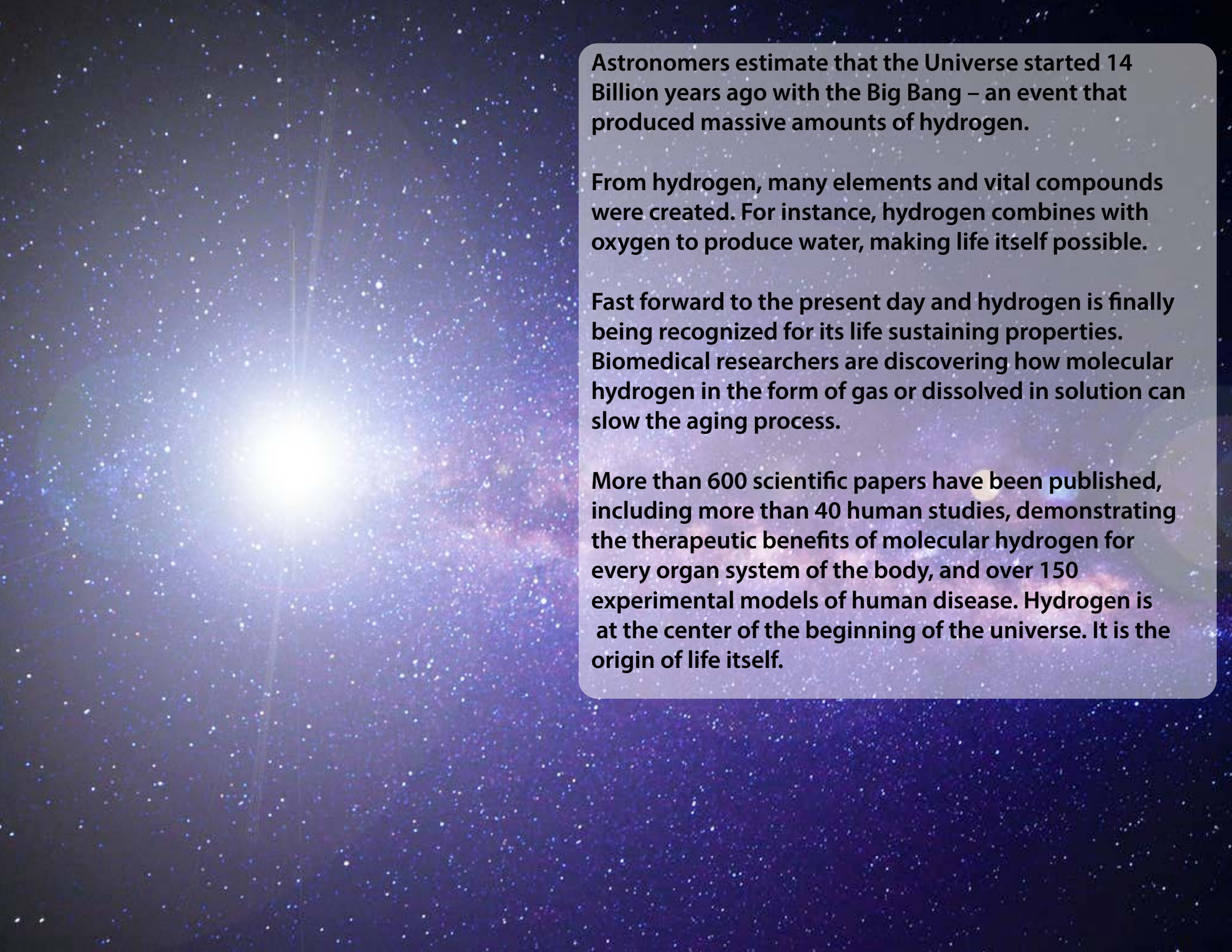


Hydrogen-infused Water: The Fountain of Youth





Astronomers estimate that the Universe started 14 Billion years ago with the Big Bang – an event that produced massive amounts of hydrogen.

From hydrogen, many elements and vital compounds were created. For instance, hydrogen combines with oxygen to produce water, making life itself possible.

Fast forward to the present day and hydrogen is finally being recognized for its life sustaining properties. Biomedical researchers are discovering how molecular hydrogen in the form of gas or dissolved in solution can slow the aging process.

More than 600 scientific papers have been published, including more than 40 human studies, demonstrating the therapeutic benefits of molecular hydrogen for every organ system of the body, and over 150 experimental models of human disease. Hydrogen is at the center of the beginning of the universe. It is the origin of life itself.

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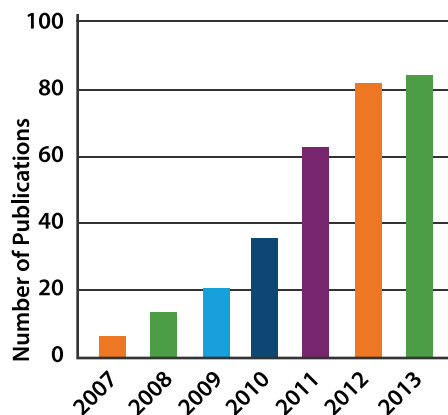
The Fountain of Youth – The Legend of Healing Waters

The legend of the “Fountain of Youth” has been with us since the 16th century. The mythological Fountain was supposed to return who drank from it to a youthful state of being.

Water from locations around the world have been deemed Miracle Waters and millions of people have visited these famous springs – Lourdes (France), Nordenau (Germany), Tlacote (Mexico) and Nadana (India) – reporting various health benefits from drinking the water.

Researchers in Japan were intrigued by these reports, and they analyzed samples collected from these locations to see if they could discover the secret. What was unique about these waters?

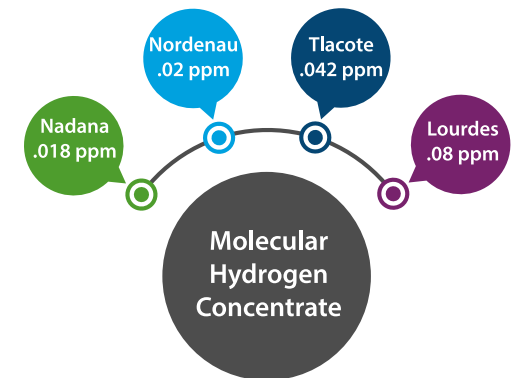
Well, they found a variety of trace minerals, but nothing that explained the miraculous healing stories. Finally they discovered the difference: the presence of an unexpected, unique molecule –Molecular Hydrogen (H_2).



H_2 – or diatomic molecular hydrogen – does not exist very often in nature. However, it was present in the waters of these legendary healing springs. Researchers measured molecular hydrogen concentrations of up to 0.08 parts per million (PPM).

Historically, molecular hydrogen had been of little interest to scientists. It was thought to be simply an inert gas with no effect on the body. It was well known that the gut microbiome produced hydrogen gas as microbes digest fiber in the gut. But there was no presumed impact on human health. That these legendary healing springs contained H_2 sparked a wave research interest in the ‘forgotten molecule’.

That wave of research has exploded! In the past 10 years, the number of molecular hydrogen research studies have grown exponentially, totaling more than 600 published research studies. By observing how molecular hydrogen behaves in cells, we are beginning to understand the variety of ways we can benefit from molecular hydrogen. Molecular hydrogen – diatomic molecular hydrogen gas – is the subject of an increasing number of scientific research publications. It has been shown to have a potential therapeutic effect on over 130 human diseases.



Molecular Hydrogen is found in significant amounts in the waters of legendary healing springs.

What is Molecular Hydrogen?

From the smallest molecule comes a huge impact on life! Molecular hydrogen is the most abundant, lightest and simplest element consisting of one electron and one proton. It is colorless, odorless, non-metallic, non-toxic and tasteless.

The single hydrogen atom (H - atomic hydrogen) is neutral and has an unpaired electron. It is a free radical and is extremely unstable. Hydrogen is not present on earth in its mono-atomic form. It's either diatomic – molecular hydrogen gas or H_2 – or it's bound with another molecule. That fact makes it available to participate in a variety of chemical reactions. Its size makes it extremely bioavailable to the cells and intracellular structures such as the mitochondria; it can even cross the blood-brain barrier.

Electrolysis of water produces atomic hydrogen and it immediately bonds with another hydrogen atom to form molecular hydrogen.

- Hydrogen makes up 75% of the universe's mass.
- The earth's atmosphere contains less than 1 part per million of hydrogen gas.
- Hydrogen can be dissolved in water up to 0.8 ppm under atmospheric pressure.

How Molecular Hydrogen Works

Science has known about the health benefits of molecular hydrogen as early as 1798. Yet, as noted, for most of modern history the belief persisted that hydrogen was inert in the body. It was only in the late 20th century (ca. 1975) that it gained the attention of medical researchers, and only in the past 10 years has evidence for the health effects of molecular hydrogen gained critical mass in the scientific literature.

The science regarding benefits to health of molecular hydrogen (H_2) has advanced rapidly in recent years thanks to the pioneering efforts of research scientists around the globe. Now hydrogen science is moving quickly beyond theory to practical applications. Moreover, new products exist allowing medical professionals and consumers to leverage the health benefits of hydrogen.

H_2 has a number of advantages as a potential antioxidant: H_2 rapidly diffuses into tissues and cells, and it is mild enough neither to disturb metabolic redox reactions nor to affect reactive oxygen species (ROS) that function in cell signaling, thereby, there should be little adverse effects of consuming H_2 .

H_2 shows not only effects against oxidative stress, but also various anti-inflammatory and anti-allergic effects.

Evidence Based

Over 600 peer reviewed studies in over 150 disease models regulating over 200 biomolecules have been published on the benefits of diatomic hydrogen, ranging from its superb antioxidant capabilities to its remarkable ability to increase energy and reduce recovery time after exercise.

Scientific research has looked at the impact of H₂ on humans, animals, and individual cells. H₂ operates on human metabolism in three primary areas:

- It rapidly converts toxic hydroxyl radicals to water ($H_2 + 2 \cdot OH \rightarrow 2H_2O$)
- It maintains antioxidant homeostasis. In other words, the body's antioxidants are leveraged

Hydrogen is Safe and Natural

H₂ is not foreign to the body like a pharmaceutical drug. Your body is already producing hydrogen gas every single day from the bacteria in your gut that is digesting vegetable fiber. That gas diffuses into the bloodstream and produces a variety of beneficial effects, although research suggests that delivering H₂ in concentrated amounts might be more effective. In fact, drinking water infused with H₂ may be the most effective way to deliver the benefits.

Why Do We Need Supplemental H₂?

The simple truth is – you can live without it. However, modern civilization has increased the oxidative stress on our body, leading to increased rates of cardiovascular disease, diabetes, and obesity. Neurological disorders are showing up with alarming frequency: autism, ADD, depression, Alzheimer's, etc.

We are out of balance. There's a need for something that will address the chronic conditions of aging like never before. It should be natural, and of course, safe. The science is clear; the long-forgotten molecule – molecular hydrogen – could be a novel foundation for a revolution in health, wellness, and slowing the aging process.

OVER 600 PEER-REVIEWED STUDIES



"The effects have been reported in essentially all organs covering 31 disease categories that can be subdivided into 166 disease models, human diseases, treatment-associated pathologies, and pathophysiological conditions of plants with a predominance of oxidative stress-mediated diseases and inflammatory diseases."

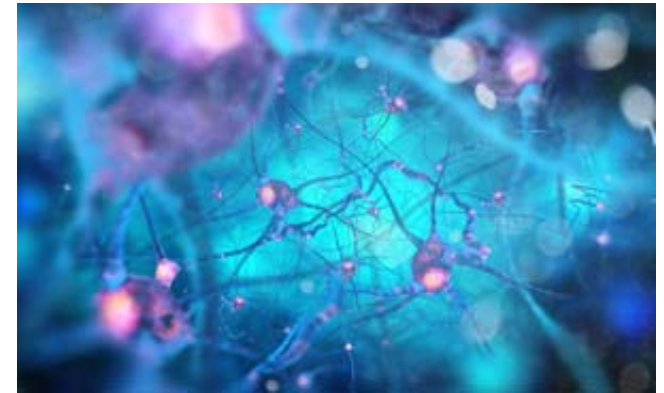
Beneficial Biological Effects and the Underlying
Mechanisms of Molecular Hydrogen -
Comprehensive review of 321 original articles:
Med Gas Res 2015; 5:12



Benefits of Supplemental Molecular Hydrogen

The following section will review the potential impact of supplemental H₂ on the body. If your health is less than optimal, free radical oxidative stress is probably the root cause. In our modern society, we have no idea just how good we're capable of feeling! We've been less than healthy for so long we're used to the aches and pains and low energy and mental fatigue.

Everyone will experience the impact of H₂ differently, depending on their genetic predisposition, lifestyle choices, and home or work environment. But the benefits are well documented and the damage is clear regardless of your lifestyle or environment.



"It is not an overestimate to say that hydrogen's impact on therapeutic and preventative medicine could be enormous in the future".

[Free Radical Research 2010](#)



- Powerful Antioxidant
- Increases Antioxidant Levels
- Helps Improve Energy Levels
- Improves Exercise Recovery Time
- Improves Your Hydration
- Helps Promote Cellular Health
- Supports Cellular Signaling
- Reduces Inflammation and Pain
- Supports Optimal Cognitive Function

Molecular Hydrogen – Powerful Antioxidant

Chronic oxidative stress has been identified as one of the major causes of aging and modern chronic diseases. A number of compounds – either in our food or produced by the body – have been identified as antioxidants that neutralize ROS. However, they have shown only limited success in therapeutic trials.

Molecular hydrogen has some distinct advantages, causing researchers to propose it as a NOVEL antioxidant with therapeutic and preventive applications.

It's the smallest molecule. Other antioxidants such as Vitamin C or Vitamin E are very large by comparison. They also have a longer route to travel; they must be digested, absorbed, transported and taken up by the cells. H₂ penetrates the stomach lining quickly and acts inside the cells immediately. It's able to get into every part of the cell, and even cross the blood brain barrier.

Each molecule of H₂ neutralizes two hydroxyl radicals. It easily separates into two slightly charged atoms that neutralize the free radicals created from our daily oxidative stress. In the process it creates water, hydrating the cells.

H₂ is selective and targets only hydroxyl radicals. It doesn't mess with the free radicals your body uses for other purposes. Other antioxidants neutralize both the good and the bad free radicals, disrupting the balance needed for health. And they become weak free radicals themselves once they've done their job.

Molecular hydrogen is effective against hydroxyl radicals (OH). The hydroxyl radical is the radical species that causes much of the oxidative damage in the body. While vitamin C, glutathione, and certain plant-based antioxidants are somewhat effective against this radical, there is no Nrf2-induced enzyme that effectively quenches the hydroxyl radical. This positions molecular hydrogen as a uniquely effective antioxidant against the hydroxyl radical. Notably, when molecular hydrogen quenches the hydroxyl radical, it produces water, which is non-toxic in the body.



- Smallest Molecule
- Selective Antioxidant
- Targets Hydroxyl Radicals
- Reduces Oxidative Stress
- Increases Native Antioxidants

Reduces Oxidative Stress

Chronic oxidative stress relates to reactive oxygen species (ROS) generated in the body throughout life. For example, during exercise, exposure to pollutants and toxins or UV light, as well as physical and psychological stresses, and the aging process itself. As aerobic organisms, we generate ROS when breathing consumes oxygen.

Acute oxidative stress arises from a multitude of causes, including inflammation, cardiac or cerebral infarction, organ transplantation, heavy exercise, cessation of operative bleeding, and many other causes.

Molecular hydrogen easily diffuses into sub-cellular compartments where it scavenges cytotoxic oxygen radicals, thereby protecting DNA, RNA, and proteins against oxidative stress. Molecular hydrogen reduces oxidative stress as a selective antioxidant and by maintaining homeostatic levels of glutathione, super-oxide dismutase, catalase, and other free-radical scavenging nutrients.

The antioxidant capacities of molecular hydrogen are such that it is beneficial for persistent and acute oxidative stress.

Increases Native Antioxidant Levels

Molecular hydrogen triggers activation or up-regulation of antioxidant enzymes that are native to the body (e.g., glutathione peroxidase, super-oxide dismutase, catalase, and others) and/or cell protective proteins of the body. Each one of these enzymes takes care of different kinds of free radicals, and they work together to keep the cells healthy.

This is really beneficial for athletes. Exercise requires more oxygen than most activities. Increases in oxygen can produce free radicals, leading to chain reactions and cell damage. Oxidation is literally the aging process while antioxidants prevent or slow down the oxidative damage. Most antioxidants neutralize bad radicals, but they can also neutralize the good ones that your body needs. Molecular hydrogen selectively targets only the damaging oxygen radicals, leaving behind the good radicals. This makes it a superior antioxidant.



Role of Native Antioxidants

Glutathione peroxidase – neutralizes peroxide into water.

Super-oxide dismutase – neutralizes super-oxide anion.
into hydrogen peroxide

Catalase – neutralizes hydrogen peroxide into water.

Contributes to Optimal Athletic Performance



... hydrogen therapy may be an effective and specific innovative treatment for exercise-induced oxidative stress and sports injury, with potential for the improvement of exercise performance.

[Int J Sports Med. 2015 Apr;36\(4\):273-9](#)

Helps improve energy levels

Adenosine Triphosphate (ATP) is the fuel that powers your cells during physical activity. Drinking H₂ infused UltraWater helps maintain the high ATP production needed during exercise - providing optimal strength, endurance and recovery.

Improves recovery time after exercise

When you exercise, your lactic acid increases. Lactic acid buildup leads to fatigue, muscle damage, decreased endurance, reduced performance, and poor training results. Peer-reviewed research on athletes shows that molecular hydrogen decreases lactic acid levels. Leading to reduced muscle fatigue

Improves your Hydration

When H₂ molecules combine with and neutralize damaging oxygen radicals, they are transformed into water (H₂O) – increasing your cellular hydration. The ionization also creates a light, silky-smooth tasting water that is easy to drink.

Helps Promote Cellular Health Supports Cellular Signaling

Molecular hydrogen may be a novel signaling molecule that alters cell signaling, cell metabolism, and gene expression. This may explain its apparent anti-inflammatory, anti-allergic, and anti-apoptotic (or anti-cell death) effects.

Beyond this, molecular hydrogen, like other gaseous signaling molecules such as NO, CO, H₂S, appears to exhibit cell signal-modulating activity that confers it with anti-inflammatory, anti-obesity, anti-allergy, and many other benefits.



Hydrogen is extremely unique since it has the capability to act at the cellular level. Hydrogen is qualified to cross the blood brain barrier, to enter the mitochondria, and even has the ability to translocate to the nucleus under certain conditions. Once in these ideal locations of the cell, previous studies have shown that hydrogen exerts antioxidant, anti-apoptotic, anti-inflammatory, and cytoprotective properties that are beneficial to the cell.

[Med Gas Res. 2013 May 16;3\(1\):10](#)



Reduces Inflammation and Pain

When cells are exposed over and over to molecules or substances that cause inflammation, the genes that regulate inflammatory response proteins get switched on, leading to a sustained state of inflammation. Several modern, chronic diseases and health conditions have been linked to inflammation. H_2 indirectly impacts gene expression because it reacts with these inflammation-producing molecules.

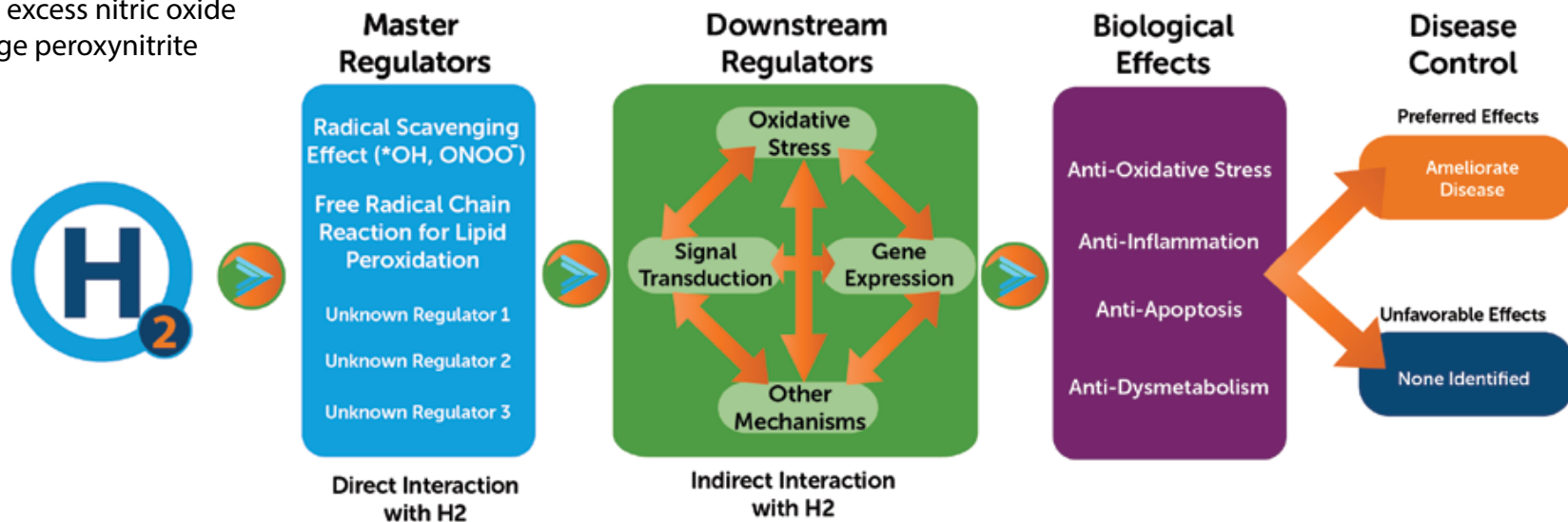
For acute inflammation, such as in injury, molecular hydrogen has been shown to be an anti-inflammatory. It is also can potentially modify the switched on genes that create a constant state inflammation.

Some of the molecules in Reduces Inflammation and Pain the body that can instigate a change in gene expression that fuels inflammation are: $Nf-kB$, $TNF\alpha$, and reactive nitrogen species such as nitric oxide and peroxynitrite.



Molecular hydrogen mechanism of action includes:

- Impede release of $NF-kB$
- Reduce $TNF\alpha$
- Reduce excess nitric oxide
- Scavenge peroxynitrite



Supports Optimal Cognitive Function

The brain is 2-4% of your body's weight but consumes 20-40% of the oxygen you breathe. Since 2-5% of the oxygen you breathe turns into free radicals, your brain is highly susceptible to oxidative stress damage. This is why Molecular Hydrogen is so important in neutralizing the excess free radicals that occur in the brain.

The Role of Ghrelin

The hunger hormone, ghrelin, is related to more than appetite control. It also plays a role in cognitive function, weight regulation, and anti-inflammatory pathways. Research has demonstrated that H_2 stimulates ghrelin secretions. This is accomplished in the hippocampus and hypothalamus in the brain. Neurologic pathologies such as Parkinson's, Alzheimer's, and autism can be impacted by stimulating ghrelin secretion.



Molecular Hydrogen can easily pass through the blood-brain barrier because of its small size. Other antioxidants are too large to pass.



Molecular Hydrogen in Medicine

The scientific literature discusses the use of molecular hydrogen for many clinical applications, including the following:

- **METABOLIC SYNDROME** including diabetes, hyperlipidemia, arteriosclerosis, hypertension, and obesity
- **ISCHEMIA / REPERFUSION** injuries including cerebral and myocardial infarctions, organ transplants, post-cardiac arrest
- **NEUROPROTECTION** including applications for dementia, Parkinson's disease, depression, and anesthesia
- **INFLAMMATION** including applications for polymicrobial sepsis, rheumatoid arthritis, wound healing, and bowel diseases
- **MITOCHONDRIAL DISEASES**
- **HEMODIALYSIS / VENTILATION**
- **AGING** including cognitive decline
- **EXERCISE** including applications for fatigue, lactic acid, recovery, and oxidative stress related to heavy exercise
- **SIDE EFFECTS OF CANCER THERAPIES** including radiotherapy and chemotherapy

Plus, It's SAFE

The great thing about Molecular Hydrogen is that even if you take too much, any excess molecular hydrogen will simply dissipate, leaving nothing to break down and no toxicity.



Inflammation & Immune Response

Anti-allergy
Anti-inflammatory



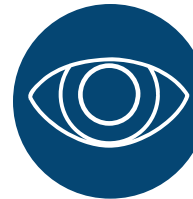
Brain

Neuro-protective, Supports Cognitive Function
Ischemia/Stroke Damage, Parkinsons' and
Alzheimer's Disease



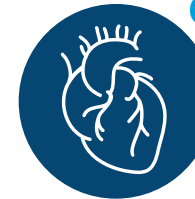
Eye

Ischemia/reperfusion injury



Heart & Circulation

Ischemic Heart Disease
Atherosclerosis
Chronic Rejection
Stabilizes Cholesterol levels
Prevents Lipid peroxidation



Lungs

Ventilation-induced injury
Shock lung(septic, hypovolemic)
Hyperoxic lung injury
Ischemia/reperfusion injury



Digestion

Inflammatory Bowel Disease



Liver

Ischemia/reperfusion
injury



Pancreas

Supports Glucose
Homeostasis
Type II Diabetes
Metabolic Syndrome
Islet Dysfunction
Acute Pancreatitis



Kidneys

Ischemia/reperfusion
injury



H

2

How to Get the Benefits of Molecular Hydrogen



Research scientists have used several methods to ingest H_2 :

- Inhaling hydrogen gas;
- Taking a hydrogen bath;
- Injecting H_2 -dissolved saline (hydrogen saline);
- Dropping hydrogen saline onto the eye;
- Increasing the production of intestinal H_2 by bacteria; and
- Drinking H_2 -infused water

Truth and Confusion About Alkaline, Ionized Water

Electrolytically Reduced Water (ERW), commonly known as alkaline, ionized water, was identified as a source of molecular hydrogen in 2007 (Nature Medicine). Research results showed it to be effective in selectively reducing one of the most reactive free radicals known; the hydroxyl ($OH\cdot$) radical. It explained why millions of people world-wide have reported profound benefits to drinking ERW for decades. Researchers also documented that when H_2 is absent from ERW the benefits are eliminated; when it is increased, the benefits also increase.

Until 2007, most thought that the alkaline pH of ERW, the presence of the hydroxide (OH^-) molecule, the negative Oxidation-Reduction Potential, or the purported microclustering of the water were responsible for the wide range of positive benefits seen in research studies and reported by individual users of the water. In fact, you will still hear these reasons today from misinformed owners of water ionizers or distributors of the machines!

We now know the truth – negative ORP is simply an indicator of the presence of dissolved molecular hydrogen, not a measurement of the concentration. Negative ORP alone does not contribute to the health benefits. The pH of the water is more basic than the tap water that goes into the machine, but it does not have a greater alkalinity in that it does not increase the concentration of dissolved alkaline minerals. And the OH^- hydroxide ion simply makes the water more alkaline; it is not an antioxidant.



Three Ways to Get H₂-infused Water



Electrically Ionized Water

Molecular hydrogen water is most efficiently produced on demand by using an electric water ionizer. Water ionizers produce hydrogen gas via electrolysis. Most water ionizer brands typically produce 0.1 to 0.8 ppm. The Vesta H₂ has been tested to show a range of 0.6 to 1.3 ppm (depending on water source).



Non-electric Ionizer Filters

When water is in contact with metallic magnesium, H₂ is produced. The elita CT-700 produces the highest level of dissolved molecular hydrogen of any non-electric ionizer tested. This is an affordable way to obtain H₂-infused water, but it has one drawback ... it is not produced continuously on demand. The water must stay in contact with the magnesium filtration media for a period of time to generate H₂.



Metallic Magnesium Tablets

Tablets are a convenient way to generate H₂-infused water. Magnesium metal reacts with water to produce hydrogen gas [$\text{Mg} + 2\text{H}_2\text{O} \gg \text{H}_2 + 2\text{OH}^-$]. It's often used in scientific studies to create H₂-infused water because it is able to achieve near saturation levels (1.6 ppm). Having a higher concentration of H₂ means you don't have to drink as much water to get the benefits. It's also convenient for when you are traveling or if you do not have a water ionizer.



Ionized, alkaline hydrogen infused water is a consistent, every day contributor to optimal health and wellbeing. Why?

- The water is free of toxins and contaminants,
- It tastes great,
- It's easy to drink without bloating,
- It has alkaline minerals, and
- It delivers powerful antioxidant activity in the form of H₂.

"The hydrogen gas concentration from water ionizers varies significantly from less than 0.05 ppm to over 2.5 ppm depending on source water, flow rate, design, and cleanliness of the electrodes. Importantly alkaline water ionizers were developed decades before it was known of the therapeutic importance of molecular hydrogen, thus these units were optimized for alkaline pH not high dissolved hydrogen concentration. Typically, at normal flow and normal source water the concentration of H₂ from an alkaline water ionizer is around 0.1 ppm to 0.7 ppm. By running the water very slowly, these machines may increase the molecular hydrogen concentration."

[The Molecular Hydrogen Foundation](#)