S.E.C.A.M.P.

ZERO carbon dioxide FOOTPRINT WITH ROBUST REGENERATIVE GASIFICATION

De Moravia Wellness

10ACITY®

HYDROGEN INFUSED 3.0 - 4.0 ppm NATURAL SPRING WATER

Benefits of Drinking 10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water

SPEC-MKT-177.1

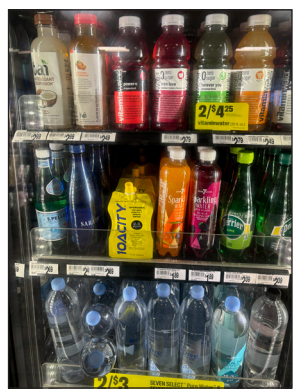
10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water Packaging Configurations and Display Options

10acity® 7-PaQ™:
Contains 7 x 10acity® Pouches
Available in a 28-PaQ

10acity® 6-PaQ™:
Contains 6 x 10acity® Pouches
Available in a 30-PaQ

- 10acity® Single Pouch
- 10acity® Hydrogen Infused Natural Spring Water complies with FDA requirements
- Water source: from Aquifers in Central Florida

10acity® Pouch
End-of-Aisle Floor Display



10acity® Pouch
In C-Store Refrigerator

Please note that product images depicted might not reflect the final design.

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10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water

Water is the most important substance on our planet as far as life is concerned. In humans, water is needed for a long list of biological and biochemical reactions in the body, most of which take place at the molecular level.

From regulating your body temperature to keeping our cells/tissues supple, lubricating the joints, energy production, and helping organs to get rid of toxins, the human body requires water for lots of functions.

This is the key reason we are advised to stay hydrated and drink lots of pure water daily.

During the process of purification, elements may be added to the water to make it superior in providing a number health benefits, a key element is molecular hydrogen, which is known to have lots of benefits to one's health.

Remember, from your high school chemistry class you came to know the periodic table.

Hydrogen is the first element you learned about, with an atomic number of **1**. Hydrogen is the simplest and most abundant element in the Universe. When two (2) atoms of Hydrogen fuse, they form a Hydrogen molecule (gas), or H_2. It is the lightest molecule and since it is tiny, molecular hydrogen can be available in the body in its atomic or ionic forms.

Scientists have found that molecular hydrogen has lots benefits in the body and can easily penetrate sub-cellular structures. Molecular hydrogen is a safe, odorless, colorless, and non-metallic gas that played a crucial role in the formation of life and the creation of the Universe.

Lots of studies demonstrate how it improves cell signaling and acts as a selective antioxidant once inside the body. It has also been shown to help boost immunity by turning on the body's natural anti-oxidants.

In addition to inhalation systems and hydrogen-based skincare products, hydrogen-infused water is gaining huge popularity as a way to reap the many benefits of molecular hydrogen in and on the human body.

The Big Q: What is hydrogenated water?

The Big A: Back to high school chemistry, ordinary water contains hydrogen since water is created from the fusion of hydrogen and oxygen atoms/ions.

But in molecular hydrogen water, additional hydrogen gas is dissolved in the water without altering its structure, pH, taste, color, or odor.

To get hydrogen infused water, pure hydrogen gas is bubbled in natural spring water or through the process of electrolysis.

There is a huge difference between drinking hydrogen infused water and plain water. Because, in plain water, the hydrogen is bound to oxygen, and thus less bio-available to the body. When additional hydrogen is dissolved in water, the body can absorb it more effectively, providing benefits discussed below.

Molecular hydrogen water is stored in aluminum cans or pouches and not in plastic containers. Because, in plastic containers, the dissolved hydrogen gas can escape considering its light, tiny nature.

Hydrogen infused water provides certain health benefits to the drinker. These range from fighting inflammation to reducing pain, boosting energy, and enhancing cognitive function.

Just like water obtained from some springs around the planet, it has some amazing healing properties, which is why people refer to it as the “healing water”.

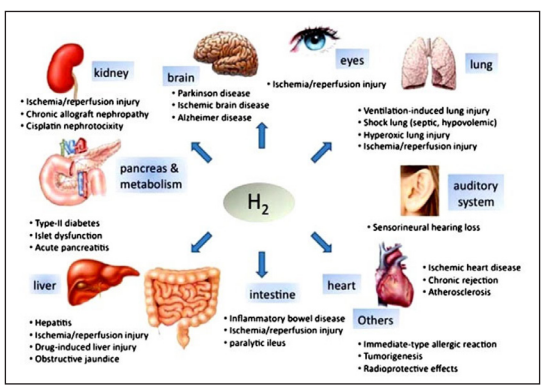
Some of these benefits have been shown in research studies, even though research is ongoing to provide more information and proof for some of the beneficial effects.

Oxidative stress is one of the most common causes of inflammation and disease in the body. This is caused by free radicals, which are unstable molecules formed in the body from various biochemical reactions.

And one of the key benefits of molecular hydrogen is that it combats free radicals, just like other anti-oxidant substances we get from a regular diet and supplements. But, the best thing about molecular H_2 is that it is smaller and lighter compared to anti-oxidants like vitamins C and E.

When consumed in water, the hydrogen molecule does not need to be digested and processed before enters the cells. It is readily absorbed in the stomach lining and can access the cells instantaneously.

This makes molecular hydrogen more effective in fighting free radicals and protecting the cells from the damaging effects of oxidative stress. It has been shown that once in the body, just one molecule of H_2 separates into two (2) H atoms that neutralize one (1) free-radical each. The process also leads to the formation of water as a byproduct, which hydrates the cells. Additionally, molecular hydrogen selectively targets the bad free radicals in the body, such as the super-oxide and oxygen radicals.



Molecular hydrogen infused water is said to have the ability to enhance athletic performance.

For instance, it has been shown to help reduce the accumulation of lactate after working out, which often leads to fatigue, muscle damage, and a decline in endurance. By slowing down the lactic acid formation and reducing inflammation, the H_2 can help improve recovery time and overall performance in the athlete. Also, more oxygen is used up when we exercise, and this often leads to increased oxidative stress from the higher number of oxygen radicals generated. So, the anti-oxidant properties of molecular hydrogen infused water can benefit an athlete by protecting their cells and muscles from free radical damage.

Molecular hydrogen infused water increases hydration in the body, which helps fight fatigue and pain while enhancing flexibility.

Studies show that molecular hydrogen boosts the production of Adenosine Triphosphate (ATP), the major component required to keep the cells fueled. This means higher energy levels and better performance for the athlete.

10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can help boost athletic performance by:

- Fighting inflammation and fatigue
- Protecting the cells from oxidative stress
- Boosting recovery time
- Improving energy levels
- Keeping the body hydrated

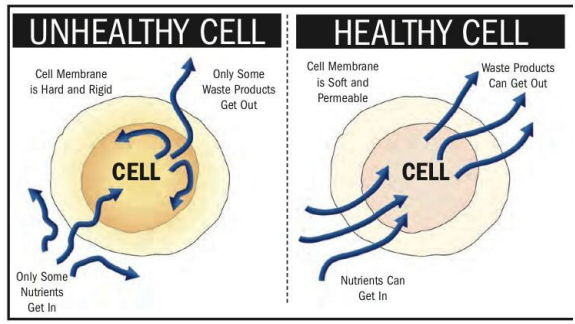
Healthy and Wellness: Metabolic syndrome is a complex medical condition composed of several medical issues occurring together. These include high blood sugar, elevated blood pressure, excess fat around the waist, high triglyceride levels, and increased cholesterol. These conditions increase one's risk of Type 2 Diabetes, heart disease, and stroke. Studies suggest that chronic inflammation is a key contributing factor in metabolic syndrome.

Anti-aging Effects: Owing to poor nutrition and other unhealthy practices of the modern lifestyle, poor general health, and chronic diseases have been on the rise. With too many health challenges and increased oxidative stress, the modern-day human beings age at a faster rate compared to some decades ago. Thanks to the various health-promoting benefits of molecular hydrogen, **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water has been seen as a way to naturally slow down the process of aging or fight the decline that comes with it.

Some anti-aging effects we can get from **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water include the following:

- Combating pain and inflammation – As we age, body aches, pains, and inflammation become more common. Molecular hydrogen can help soothe the muscles and joints, improve flexibility, keeping pain and inflammation at bay.
- Cognitive boost – The brain is among the most susceptible organs of the body to oxidative stress. But it requires oxygen to keep functioning and as is expected, free oxygen radicals are constantly formed in the brain. Drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can help fight those free radicals, leading to a boost in cognitive function. In addition to this, research has also shown that hydrogen infused water could help improve mood, fight anxiety, and boost nerve function. All these benefits are key as we get older and could help improve one's quality of life.

- Better cellular health – As we age, various parts of the body become less effective in playing their roles. For instance, the cells become larger, and their ability to divide/multiply faces a decline. Cellular health deteriorates with aging. Molecular hydrogen benefits cellular health in many ways. It alters cell metabolism, promotes cell signaling, and improves gene expression. All these are beneficial for our overall wellness and can help reduce the rate at which cells age.



- The anti-oxidant effect – Apart from acting as an anti-oxidant, hydrogen also activates the natural production of anti-oxidants in the body. It specifically triggers the activation of enzymes such as super-oxide dismutase, catalase, and glutathione peroxidase, which are crucial in protecting the cells from different kinds of free radical damage.

10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water is FDA-approved and does not have any harmful effects on the body.

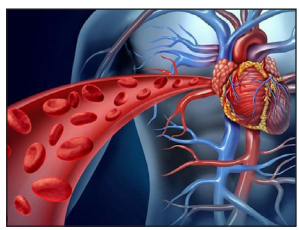
It is important to note that **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water is not a substitute for a proper diet and a healthy lifestyle. It also should not substitute Rx medication for those with health issues related to the benefits it provides.

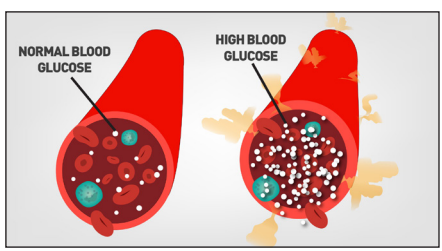
10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water is best consumed as a supplement to enhance one's overall health and wellness. It is more expensive compared to other kinds of drinking water, but it is worth it.

So, we have lots of reasons to start drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water.

10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water is regular spring water with extra hydrogen molecules added, and here are the reasons to drink it, in summary:

1. A huge anti-oxidant. Free radicals are unstable molecules that contribute to oxidative stress, a major cause of disease and inflammation. 50 fl. oz or 1.5 liters is equal to eating 500 apples or 38 carrots or 700 bananas or 136 lemons to reach the same anti-oxidant properties of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water.
2. Regulates metabolism.
3. Effectively lowers blood sugar, promotes cell detoxification.
4. Assists with ulcers and healing of sores.
5. Helps flush heavy metals from the body.
6. Helps in absorption of other supplements.
7. Helps improve allergies and asthma conditions.
8. Helps improve blood circulation.
9. Lowers saturated fat levels.
10. Lessens body fatigue.
11. Fastens recovery from diseases.
12. Improves peripheral circulation.
13. Helps reduce cellulite and wrinkles.
14. Helps improve brain power.
15. Reduces acidic blood environment.
16. Improves blood glucose.
17. And, in the case of cancer patients, it helps the body handle chemotherapy and radiation treatment.
18. Studies have found that regularly drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water for over an extended period will slow cellular aging and may lead to a longer life.
19. Immune System Boost: Long-term consumption of Molecular Hydrogen has been linked to promotion of natural synthesis of human fibroblast collagen, neutralization of harmful free radicals, reduction in the death rate of certain cells, and fortification of the immune system.





20. Alleviates Fatigue: Long-term consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water promotes metabolic activity and reduces fatigue.

21. Improves Skin Health: Long-term consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water has been found to improve skin elasticity, reduce formation of spots and freckles, reduce the death rate of keratinicytes (the primary cell type that makes up skin), and enhance skin texture.

22. Increase in Anti-oxidants: Long-term consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water increases the presence of anti-oxidants in the body, increasing the neutralization of malignant active oxidants and helping the body repair and maintain itself at the cellular level.

23. Aids Restful Sleep: Long-term consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water has been linked to improved quality of sleep.

24. The biggest advantage of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water over other waters is the natural Anti-oxidizing Power of Molecular Hydrogen, which is proven to fight Free Radicals in the body and protect cells from the effects of Oxidative Stress.

25. Anti-oxidants are molecules that fight free radicals in your body by donating their extra electrons.

26. Anti-oxidants include vitamins such as Vitamin A, C, and E, Lycopene, Lutein and Beta-carotene which are all found in various fruits and vegetables, Selenium which can be found in most grain and meat products, and of course Molecular Hydrogen.

27. Free radicals are compounds that can cause harm if their levels become too high in your body. They're linked to multiple illnesses, including diabetes, heart disease, and cancer.

28. Free radicals are constantly being formed in your body as a byproduct of daily life. They become much more abundant with strenuous exercise, stress, sickness, disease, and old age.

29. While the body has its own anti-oxidant defense system to keep free radicals in check, you can boost the presence of anti-oxidants in your body by regularly consuming fruits, vegetables, supplements, and drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water.

Staying Hydrated is Vital during this Record Heat to Prevent Illness, so Consuming the most Hydrating Foods and Beverages is Important

According to the Center for Disease Control and Prevention, daily fluid intake is defined as the amount of water consumed from drinking and eating.

When too much water is lost from the body, its organs, cells, and tissues fail to function. If dehydration is not corrected immediately, it may cause shock. The general recommendation is that women need 11.5 cups of fluid daily and men need 15.5 cups, says the Mayo Clinic.

But this amount varies for individuals on-the-go, athletes, and people exposed to high temperatures.

According to the Cleveland Clinic, when you are healthy and hydrated, your urine should fall somewhere between colorless and the color of light straw or honey. When you do not consume enough fluids, your urine becomes more concentrated and turns a darker yellow or amber color.

According to experts, drinking water is not the only way to get enough daily fluids.

These are some foods and drinks that are hydrating in the summer heat:

- Tea and coffee: Iced tea and coffee are excellent for summer hydration, do not overdo the espresso as this can have a diuretic effect and dehydrate the body.
- Water: Best for hydration is natural spring water (Chilling Rocks™) and for a healthy body, drink **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water (with competitor hydrogen water products you have to drink 4 containers to match one **10acity®** pouch benefits!).
- Milk: According to a study by McMaster University, milk is more hydrating than water or sports drinks due to its source of protein, carbohydrates, and electrolytes.
- Smoothies: With the yogurt and fresh fruit like berries whirled together, tasty smoothies can keep you hydrated for hours, make smoothies with hydrating vegetables such as cucumbers, lettuce, bell peppers, and celery.
- Fruits and vegetables: A registered dietitian with The Nutrition Twins, tells us that the food you eat can also help keep you hydrated in the summer heat. “Focus on getting ample fruits and vegetables because they contain as much as 95% water,” she says. “Lettuce, tomatoes, berries, cucumbers, grapefruit, oranges and melons are great options.” She warns not to eat directly before a workout in the heat because digestion requires blood and energy and diverts blood away from the muscles that will be working during exercise.

- Frozen fruit: Fill popsicle molds with a hydrating fruit like blended watermelon and freeze. You can also mix in strawberries and kiwi fruit for an attractive, cooling treat.
- Cold soup: Blend cucumbers, bell peppers, tomatoes, onions and garlic cloves for this satisfying soup, a version of the classic gazpacho.

The Marines learnt that when dehydrated if an electrolyte drink is not available, make your own rehydration solution using:

- ½ teaspoon of salt
- 6 teaspoons of sugar
- 1 liter of water

Be absolutely certain that you're using an accurate measurement. Using too much salt or sugar can be unhealthy!

Hydrogen-enriched Water Reduces Lactic Acid Buildup

When you exercise, your body requires more oxygen than normal; typically, however, your muscles begin to produce energy without oxygen so that your body can use oxygen in other areas. This process is called glycolysis, which converts pyruvate (the result of breaking down glucose) into lactate. Lactate allows glucose to continue to break down, thus continuing to provide your body with energy. As your muscles continue to produce energy in this way, lactate can build up.

Many believe that a buildup of lactate in the muscles results in sore muscles after a workout. However, lactate contributes to the burning sensation that you often experience while actively using your muscles, and which often leads us to stop exercising.

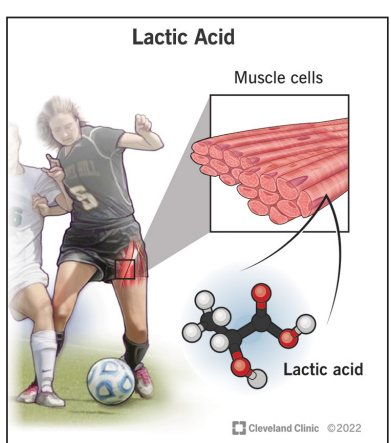
If you want to reduce the amount of lactate that builds up in your muscles during exercise, drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can help.

One study found that drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water before exercising can help reduce blood lactate levels while also improving the exercise-induced decline of muscle function.

Another study also found that drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water before exercising can reduce blood lactate levels when engaging in high-intensity exercises.

A third study supports these findings, concluding that drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water not only reduced the body's lactate response but also aided in delaying the onset of muscle soreness.

10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can help speed up recovery from exercise-related injuries.



Hydrogen-enriched Water Speeds Up Recovery

In addition to supporting a better workout, drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can also help speed up your recovery time from exercise-related injuries. One case study replaced traditional RICE therapy with **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water hydrotherapy sessions for an elite professional athlete with a grade II ankle sprain.

Results found that hydrotherapy treatment decreased ankle swelling by 2.8% and improved range of movement by 27.9% during the first 24 hours after injury. This means that drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water in multiple hydrotherapy sessions after injury can help reduce swelling and pain while also encouraging proper range of motion.

A study also looked at how hydrogen infused water can help treat injury-related inflammation. Results showed that those who added **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water to their treatment had a significantly greater decline in limb circumference than those who didn't. Those who received **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water as part of their treatment also had a decrease in plasma viscosity, an increase of which is a normal response to inflammation. This suggests that drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can help improve injury-caused inflammation in athletes.

How Do I keep My Prostate Gland Healthy?

1. Eat a healthy diet that is rich in fruits, vegetables, and whole grains. These types of foods are high in anti-oxidants, which can help to protect the prostate gland. **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water is an excellent anti-oxidant.

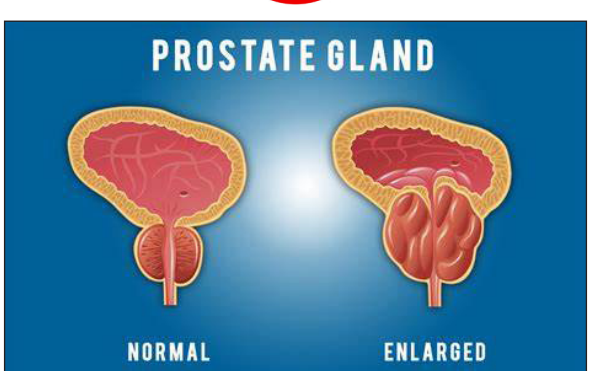
2. Exercise regularly. Exercise can help to improve circulation and reduce the risk of prostate problems.

3. Get regular check-ups. It is important to have regular check-ups with your healthcare provider to ensure that your prostate gland is healthy.

4. Limit your intake of caffeine and alcohol. These substances can increase the risk of prostate problems.

5. Quit smoking. Smoking has been linked to an increased risk of prostate cancer.

6. Consider taking a supplement. Some supplements, such as saw palmetto and zinc, may help to support prostate health. However, it is important to talk to your healthcare provider before taking any supplements, as they may interact with other medications you are taking or have potential side effects.



10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water - Benefits for your Body

- **Increase in Anti-oxidants**

Prolonged consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water boosts the levels of anti-oxidants in the body, enhancing the neutralization of harmful reactive oxidants and supporting cellular repair and maintenance.

- **Immune System Boost**

Continuous consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water has been associated with stimulating the natural synthesis of human fibroblast collagen, counteracting detrimental free radicals, decreasing the mortality rate of specific cells, and strengthening the immune system.

- **Alleviates Fatigue**

Sustained consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water enhances metabolic activity and diminishes fatigue.

- **Improve Skin Health**

Extended consumption of **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water has been discovered to enhance skin elasticity, decrease the formation of spots and freckles, lower the mortality rate of keratinocytes (the predominant skin cell type), and improve skin texture.

- **Cellular Aging**

Research has revealed that consistent consumption of Hydrogen Water over an extended period can decelerate cellular aging and potentially extend one's lifespan.

- **Aids Restful Sleep**

Drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water over an extended period has been associated with enhanced sleep quality.

The Biggest Advantage of 10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water

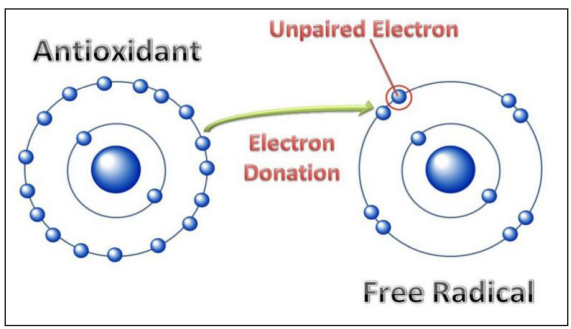
- In comparison to other waters, **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water possesses inherent anti-oxidant capabilities, substantiated to combat free radicals within the body and shield cells against the consequences of oxidative stress.

- Anti-oxidants comprise substances that counteract free radicals in your body by offering their surplus electrons. These encompass vitamins like Vitamin A, C, and E along with natural compounds like Lycopene, Lutein, and Beta-carotene, commonly present in various fruits and vegetables. Additionally, Selenium, readily available in most grain and meat products, is also present in **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water.

- Free radicals are substances that can potentially harm your body when their concentrations rise excessively. They are associated with various health conditions, including diabetes, heart disease, and cancer.

- These free radicals are continually generated in your body as a natural byproduct of daily living. Their levels tend to increase significantly during strenuous physical activity, periods of stress, illness, disease, and as you age.

- While your body possesses its inherent defense mechanism against these free radicals, you can enhance the abundance of antioxidants in your system by incorporating regular consumption of fruits, vegetables, dietary supplements, and **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water.



10acity® Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water Compared to Alkaline Water

Below is why we made **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water to help the body recover from free radical damage. Alkaline waters are designed for hydration but our eating habits changed to obtain pH of 8.0 and below.

- Both waters are man-made. The below paragraph is simple and accurate. Hydrogen water is best for the human body.

- However, when comparing the two types of waters based on scientific studies conducted solely on each type separately without combining them together into one product yet still showing positive results; it seems like molecular hydrogen-rich ($2H_2O$) waters may offer more potential health benefits than alkaline waters alone due to their ability to reduce oxidative stress as well as inflammation throughout various parts within our bodies according to multiple clinical studies conducted worldwide specifically researching molecular hydrogen therapy effects on human subjects.

- One study published in Medical Gas Research found that drinking molecular-hydrogen rich (H_2) water reduced oxidative stress markers in patients with metabolic syndrome after just four weeks compared to those who drank plain drinking-water alone without any added chemicals or minerals present within them used for making ordinary bottled-waters widely available today across most stores globally!

- Another study published in Free Radical Research showed similar results where researchers found that consuming molecular-hydrogen rich (H_2) water resulted in significant reductions of oxidative stress markers after just eight weeks among healthy adults compared to those who drank plain drinking-water alone without any added chemicals or minerals present within them used for making ordinary bottled-waters widely available today across most stores globally!

- In contrast to these findings regarding molecular-hydrogen rich (H_2) waters' effects on reducing oxidative stress levels throughout various parts within our bodies; there isn't much evidence supporting claims made by some advocates of alkaline-water regarding its ability to help balance acidity levels and prevent diseases such as cancer or osteoporosis at this time according scientific research data available currently.

- Following, I am going to give a much larger explanation on both waters. Hydrogen for health and alkaline for hydration cleaning of toxins in your body but requires correct eating habits.

- There is much confusion around whether we should be drinking hydrogen infused water or alkaline water and if one is indeed better for you.

What is Hydrogen Water?

- Hydrogen water is 'regular' drinking water that has hydrogen gas added. This is typically done through electrolysis or bubbling pure hydrogen gas into the water, decomposing the molecules into molecular hydrogen gas. This is the patent we have making pleasant water to drink. See below comments with alkaline water.

- There are currently two main methods to obtain hydrogen-rich water via electric flow through systems. Alkaline water ionizers and neutral pH hydrogen water generators. Alkaline water ionizers use a process of electrolysis to produce hydrogen gas and alkaline water. Many people have reported benefits from using alkaline water ionizers but it wasn't until around 2010 that scientists understood the therapeutic property in alkaline ionized water was the hydrogen gas. Once the hydrogen gas is created it is very quickly diminished in effectiveness and in order to push the pH higher, the alkaline water produced becomes very unpalatable. This makes the alkaline water ionizers a very inconsistent and impractical home tool for creating hydrogen-rich water.

- Neutral-pH hydrogen water generators would seem to be able to produce a more consistent hydrogen concentration. Whilst the technology used for producing hydrogen-rich water is relatively new, it is highly advanced. We have the patent for this.

- While ordinary tap water will hold a degree of hydrogen, the added hydrogen in hydrogen-rich water is said to have a range of potential benefits, including reducing inflammatory responses, supporting cardiovascular function, improving cognitive ability, and more. Hydrogen water is even said to enhance endurance and physical performance, working towards mitigating the onset of fatigue.

- As the name suggests, alkaline water refers to water holding greater alkalinity in its makeup. This can be measured using the pH level – a scale between 0 and 14 stating the acidity or alkalinity of a substance. For example, a substance with a pH level of 0 is highly acidic, a pH level of 14 is highly alkaline, and 7 is neutral.

- The human body naturally has a slightly alkaline pH level, needing a balance (or homeostasis) of approximately 7.35 to 7.45 to survive and flourish. Unfortunately, with our diets and environment growing more acidic, this natural balance is being disrupted, leading to issues like metabolic acidosis, which can cause various complications, such as vomiting, nausea and fatigue.

- But the solution isn't simply bombarding the body with more alkaline substances – some alkaline water products will sit at a 9.5, 10 or even 11 pH level, which, if over consumed, can adversely tip the scale in the other direction. This can lead to metabolic alkalosis, and associated symptoms of light-headedness, confusion, numbness, nausea and vomiting.

- So, it is best to drink waters with pH around 7.5 to maximum 8. Above that, requires change in eating habits.

- Introducing this into your ongoing wellness routine opens you up to the various potential benefits of alkaline water, including:

    - Promoting proper cellular hydration with a selection of electrolyte minerals
    - Improving our bodies pH balance
    - Flushing toxins and preventing diseases
    - Enhancing focus, physical performance, and even sleep quality
    - Assisting with pre-existing conditions, such as reflux disease and blood pressure.

- When reviewing alkaline water vs hydrogen water – namely, the similarities between the two – it helps first to recognize that both are modified forms of tap water. As discussed above, the creation of alkaline water and hydrogen water can both involve the use of electrolysis, with the electric current encouraging a chemical change, such as the free hydrogen gas molecules dissolving. The finer points are a little different, but both sources have received a form of treatment to improve their benefits within the body, whether that be acting as an anti-inflammatory property or to help neutralize excessive amounts of acid present.

- In addition to the range of potential benefits outlined, both hydrogen and alkaline water are cleaner sources of water that can help maintain adequate hydration.

- Hydrogen in water and carefully created alkaline water have their own, distinct properties. For example, hydrogen water is mainly defined by its inclusion of hydrogen gas to perform its anti-inflammatory and anti-oxidant benefits, whereas alkaline mineral water is energized to hold a higher pH level and contain a range of electrolyte minerals needed for optimal cellular hydration.

- Basically hydrogen water is for health and alkaline water is for cellular hydration.

- To decide which option is best, hydrogen water vs alkaline mineral water, requires a deeper understanding of what you are trying to achieve and potentially improve in your health and hydration. If you are looking for greater cellular hydration and an improved mechanism for detoxing from heavy metals or other toxins or simply a better balance with your natural alkaline levels alkaline water could be the better choice.

How Hydrogen-enriched Water Benefits Athletes

Athletes are known for working out hard and taking care of their bodies. But did you know that something as simple as drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can give your exercise routine and athletic training an extra boost?

If you are an athlete, taking care of your body is key. From training to competitions, it is important that you fuel your body with the things it needs to become stronger and perform at its best. The solution? **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water. In recent years, clinical studies have found that molecular hydrogen can help increase your endurance and energy, reduce lactate buildup, and even aid in faster injury recovery.

Hydrogen-Enriched Water Boosts Endurance

Most athletes are looking for natural, effective ways to boost their energy and endurance. Doing so can not only improve your training but can also help you give 100% toward the finish line every time. Drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water has been shown to help reduce fatigue and boost endurance, helping you to get the most out of every workout.

Exercise can increase the number of reactive oxygen species (ROS) in your skeletal muscle. Because ROS are a type of free radical, they can contribute to tissue damage and greater fatigue. According to a 2019 study, molecular hydrogen's anti-oxidant properties helped to "greatly improve" both fatigue and endurance of non-trained participants. This suggests that drinking hydrogen water before your workout can help reduce fatigue and boost your overall endurance.

Another study found that drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water during exercise, particularly endurance exercises, can help reduce the amount of energy expenditure. This means that drinking hydrogen water during your workout can help reduce the amount of energy you use, thus allowing you to workout longer and harder.

Reduce lactate buildup and muscle pain with **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water.

US00D901309S

(12) **United States Design Patent** (10) **Patent No.: US D901,309 S**
Murray (45) **Date of Patent: ** Nov. 10, 2020**

(54) **POUCH**

(71) Applicant: **Pouch Pac Innovations, LLC**, Sarasota, FL (US)

(72) Inventor: **R. Charles Murray**, Sarasota, FL (US)

(73) Assignee: **Pouch Pac Innovations, LLC**, Sarasota, FL (US)

(**) Term: **15 Years**

(21) Appl. No.: **29/688,645**

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(52) **U.S. Cl.**
USPC **D9/708**

(58) **Field of Classification Search**
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CPC . B65D 1/00; B65D 1/02; B65D 1/023; B65D 1/32; B65D 11/00; B65D 11/04; B65D 35/08; B65D 35/00; B65D 33/02; B65D 33/04; B65D 33/24; A61J 1/10; A61J 1/47; A61J 9/001
See application file for complete search history.

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Primary Examiner — Abraham Bahta
(74) *Attorney, Agent, or Firm* — Dinsmore & Shohl LLP

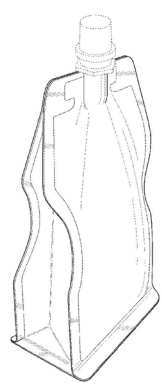
(57) **CLAIM**

The ornamental design for a pouch, as shown and described.

DESCRIPTION

FIG. **1** is a perspective view of a front and a side of a pouch showing my new design;
FIG. **2** is a side elevational view thereof;
FIG. **3** is a front elevational view thereof;
FIG. **4** is a top elevational view thereof;
FIG. **5** is a bottom elevational view thereof;
FIG. **6** is a back elevational view thereof; and,
FIG. **7** is another side elevational view thereof.
It should be appreciated that the broken lines are merely illustrative of the environment of the design, and not part of the claimed design.

1 Claim, 6 Drawing Sheets



Method of Preparing Hydrogen-enriched Water and Method of Filling Flexible Pouches with Hydrogen-enriched Water Patent

US011224239B2

(12) **United States Patent**
Murray

(10) **Patent No.: US 11,224,239 B2**
(45) **Date of Patent: Jan. 18, 2022**

(54) **METHOD OF PREPARING HYDROGEN-ENRICHED WATER AND METHOD OF FILLING FLEXIBLE POUCHES WITH HYDROGEN-ENRICHED WATER**

(71) Applicant: **Pouch Pac Innovations, LLC**, Sarasota, FL (US)

(72) Inventor: **R. Charles Murray**, Sarasota, FL (US)

(73) Assignee: **Pouch Pac Innovations, LLC**, Sarasota, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(22) Filed: **Apr. 27, 2017**

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CPC ***A23L 2/54*** (2013.01); ***A23L 2/74*** (2013.01); ***B65B 3/045*** (2013.01); ***B65B 7/02*** (2013.01); ***B65B 39/12*** (2013.01); ***B65B 55/08*** (2013.01); ***B65B 55/10*** (2013.01); ***B65B 61/025*** (2013.01); ***C02F 9/00*** (2013.01); *A23V 2002/00* (2013.01); *A23V 2250/12* (2013.01); *C02F 1/20* (2013.01);
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(58) **Field of Classification Search**
None
See application file for complete search history.

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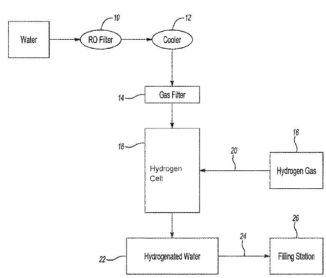
Primary Examiner — Patricia A George
(74) *Attorney, Agent, or Firm* — Dinsmore & Shohl LLP

(57) **ABSTRACT**

A process of producing hydrogen water includes the steps of: cooling water to a temperature where hydrogens atoms of the water molecule expand a space between the hydrogen atoms and contacting the cooled water with hydrogen gas wherein hydrogen atoms of the hydrogen gas are positioned in the space of the expanded hydrogen atoms of the water molecule and then heating the water trapping the hydrogen atoms of the hydrogen gas in the space wherein the hydrogen water has a hydrogen content of from 3 to 10 parts per million. The hydrogen water may be filled into pouches with hydrogen water in the pouch having a hydrogen content of from 1.7 to 4 parts per million.

4 Claims, 6 Drawing Sheets



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Oxidative Stress and ADHD: A Meta-Analysis

Nidhin Joseph[1], **Yanli Zhang-James**[1], **Andras Perl**[1], and **Stephen V. Faraone**[1]

[1]State University of New York Upstate Medical University, Syracuse, USA

Abstract

Objective—To clarify the role of oxidative stress and antioxidant activity in ADHD.

Method—We examined the association of ADHD and oxidative stress by applying random effects meta-analysis to studies of oxidative stress and antioxidant status in medication naive patients with ADHD and controls.

Results—Six studies of a total of 231 ADHD patients and 207 controls met our selection criteria. The association between ADHD and antioxidant status was not significant. We found a significant association between ADHD and oxidative stress that could not be accounted for by publication bias. The significant association lost significance after correcting for intrastudy clustering. No one observation accounted for the positive result.

Conclusion—These results are preliminary given the small number of studies. They suggest that patients with ADHD have normal levels of antioxidant production, but that their response to oxidative stress is insufficient, leading to oxidative damage.

Keywords

ADHD; meta-analysis

Prior research suggests that oxidative stress predisposes to a diverse range of psychiatric conditions, including schizophrenia, bipolar disorder, major depressive disorder, and anxiety disorders (Ng, Berk, Dean, & Bush, 2008). Humans face an "oxygen paradox" (Davies, 1995). We need oxygen to survive, but an increased quantity of free oxygen radicals causes cellular pathologies that lead to disease and aging. During cellular metabolism, the normal oxidation–reduction reactions that create energy lead to the formation of toxic metabolic by-products called oxidants or reactive oxygen species (ROS). These by-products of normal oxidation–reduction reactions are highly unstable and create oxidative stress, which

Corresponding Author: Stephen V. Faraone, State University of New York Upstate Medical University, 750 East Adams St., Syracuse, NY 13210, USA. sfaraone@childpsychresearch.org.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: In the past year, Dr. Faraone received consulting income and/or research support from Shire, Akili Interactive Labs, and Alcobra, and research support from the National Institutes of Health (NIH). His institution is seeking a patent for the use of sodium–hydrogen exchange inhibitors in the treatment of ADHD. In previous years, he received consulting fees or was on Advisory Boards or participated in continuing medical education programs sponsored by Shire, Alcobra, Otsuka, McNeil, Janssen, Novartis, Pfizer, and Eli Lilly. Dr. Faraone receives royalties from books published by Guilford Press: *Straight Talk about Your Child's Mental Health* and Oxford University Press: *Schizophrenia: The Facts*.

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Review Article

Role of Molecular Hydrogen in Ageing and Ageing-Related Diseases

Zhiling Fu, Jin Zhang, and Yan Zhang

Department of Anesthesiology, Shengjing Hospital of China Medical University, Shenyang 110004, China

Correspondence should be addressed to Yan Zhang; zhangyan258050@163.com

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Ageing is a physiological process of progressive decline in the organism function over time. It affects every organ in the body and is a significant risk for chronic diseases. Molecular hydrogen has therapeutic and preventive effects on various organs. It has antioxidative properties as it directly neutralizes hydroxyl radicals and reduces peroxynitrite level. It also activates Nrf2 and HO-1, which regulate many antioxidant enzymes and proteasomes. Through its antioxidative effect, hydrogen maintains genomic stability, mitigates cellular senescence, and takes part in histone modification, telomere maintenance, and proteostasis. In addition, hydrogen may prevent inflammation and regulate the nutrient-sensing mTOR system, autophagy, apoptosis, and mitochondria, which are all factors related to ageing. Hydrogen can also be used for prevention and treatment of various ageing-related diseases, such as neurodegenerative disorders, cardiovascular disease, pulmonary disease, diabetes, and cancer. This paper reviews the basic research and recent application of hydrogen in order to support hydrogen use in medicine for ageing prevention and ageing-related disease therapy.

1. Introduction

Ageing is a physiological process of progressive decline in an organism's functional reserve. It is almost universal throughout the living world [1]. Researchers have focused on exploring the underlying cellular mechanisms of ageing for decades [2] and have found that a variety of metabolic, biochemical, and molecular alterations that occur at a cellular level contribute to functional losses during the ageing process [3]. Nine candidate pathways contributing to the process of ageing have been identified and categorized as the "hallmarks of ageing" [4] (Figure 1).

Ageing represents a continuous risk of chronic noncommunicable diseases, such as neurodegenerative diseases, cardiovascular diseases (CVDs), diabetes, and cancer [5], although it is not the only factor. Over the past decades, the average human life expectancy has become substantially longer [6]. In particular, the absolute number of elderly people has increased in many countries [7]. Understanding the ageing mechanism and then further delaying the ageing process and the onset of age-related pathologies are of great importance.

Molecular hydrogen (H_2) is a colorless, odorless gas and is the lightest among all gas molecules. Its therapeutic effect was first demonstrated in skin squamous carcinoma treatment [8]. In some bacteria, H_2 can be enzymatically catabolized as an electron source. It can also be a product of anaerobic metabolism. In mammalian cells that have no functional hydrogenase genes, it was determined to be an inert gas that does not react with any biological compounds [9]. However, in 2007, investigators have discovered that H_2 has antioxidant properties after selectively neutralizing hydroxyl radicals (•OH) and peroxynitrite ($ONOO^-$) in cultured cells. It also prevented ischemia-reperfusion (I/R) injury and stroke in a rat model [10]. To date, prosurvival properties of some antioxidants have been demonstrated in some disease models [11]. H_2 has been shown to improve lipid and glucose metabolism in patients with mild type 2 diabetes mellitus or impaired glucose tolerance [12]. Moreover, a recent study has shown that hydrogen-rich water (HRW) intake favorably affected several ageing-related features in healthy elderly, including extended mean telomere length, and tended to improve DNA methylation [13]. This review discusses the possible underlying mechanisms of H_2

The Effects of 6-month Hydrogen-rich Water Intake on Molecular and Phenotypic Biomarkers of Aging in Older Adults Aged 70 Years and Over: A Randomized Controlled Pilot Trial

Dragana Zanini, Nikola Todorovic, Darinka Korovljev, Valdemar Stajer, Jelena Ostojic, Jelena Purac, Danijela Kojic, Elvira Vukasinovic, Srdjana Djordjievski, Miron Sopic, Azra Guzonjic, Ana Ninic, Sanja Erceg, Sergej M Ostojic

Affiliations Expand
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Abstract

In this randomized controlled pilot trial, we investigated the effects of a 6-month intake of hydrogen-rich water (HRW) on several molecular and phenotypic biomarkers of aging in older adults aged 70 years and over. Forty older adults (20 women) were randomly allocated in a parallel-group design to receive 0.5 L per day of HRW (15 ppm of hydrogen) or control drink (0 ppm of hydrogen) during a 6-month intervention period. The biomarkers assessed at baseline and 6-month follow up were molecular markers in the blood (DNA and chromosomes, nutrient sensing, protein, and lipid metabolism, oxidative stress and mitochondria, cell senescence, inflammation), brain metabolism, cognitive functioning, physical function and body composition, resting blood pressure, facial skin features, sleep outcomes, and health-related quality of life. The mean age, weight, and height of study participants were 76.0 ± 5.6 years, 78.2 ± 16.1 kg, height 167.5 ± 11.5 cm, respectively. A significant treatment vs. time interaction was found for telomere length ($P = 0.049$), with the length increased after HRW intervention (from 0.99 ± 0.15 at baseline to 1.02 ± 0.26 at follow up) and decreased after drinking control water (from 0.92 ± 0.27 to 0.79 ± 0.15). A marker of DNA methylation (Tet methylcytosine dioxygenase 2, TET2) expression at 6-month follow-up increased in both groups, yet the degree of elevation was significantly higher in HRW (from 0.81 ± 0.52 at baseline to 1.62 ± 0.66 at follow up) comparing to the control water (from 1.13 ± 0.82 to 1.76 ± 0.87) ($P = 0.040$). A strong trend for treatment vs. time interaction was found for a degree of DNA methylation ($P = 0.166$), with the methylation increased in the HRW group (from 120.6 ± 39.8 ng at baseline to 126.6 ± 33.8 ng at follow up) and decreased after taking control water (from 133.6 ± 52.9 ng to 121.2 ± 38.4 ng). HRW was superior to control water to increase brain choline and NAA levels in the left frontal grey matter, brain creatine at the right parietal white matter, and brain NAA at the right parietal mesial grey matter ($P < 0.05$). No significant differences were found between interventions for other outcomes ($P > 0.05$), except for a significantly improved chair stand performance after HRW intervention compared

to the control water (P = 0.01). Owing to pleiotropic mechanisms of hydrogen action, this simple biomedical gas could be recognized as a possible anti-aging agent that tackles several hallmarks of aging, including loss of function and telomere length shortening. The study was registered at ClinicalTrials.gov (NCT04430803).

Hydrogen Water for Athletes

- Clinical research demonstrates hydrogen water's selective antioxidant properties that target harmful reactive oxygen species without disrupting beneficial cellular signaling[
- Studies show potential improvements in power output (5-15%), reduced muscle damage markers, and faster recovery times in trained athletes
- Eight days of hydrogen-rich water supplementation significantly improved muscular endurance performance during resistance training
- Acts through multiple mechanisms: reducing oxidative stress, modulating inflammation, protecting mitochondrial function, and supporting cellular energy production
- Training status influences response — trained athletes show more pronounced benefits than untrained individuals
- Individual variability exists; approximately 18% of athletes may experience more substantial benefits as "positive responders"
- Safe and well-tolerated with no known adverse effects or banned substance concerns

Introduction: The Evolution of Athletic Recovery Science

The pursuit of optimal athletic performance has driven innovation in sports science for decades. Athletes continually seek evidence-based interventions that can provide competitive advantages while supporting long-term health. Hydrogen-rich water (HRW) has emerged as a promising ergogenic aid, backed by a growing body of peer-reviewed research demonstrating its unique antioxidant properties and potential performance-enhancing effects.

Unlike conventional approaches to athletic recovery, hydrogen water works at the molecular level to address one of the fundamental challenges facing athletes: exercise-induced oxidative stress. This innovative approach represents a paradigm shift in how we think about hydration, recovery, and cellular health in athletic populations.

Understanding Hydrogen Water: Composition and Molecular Properties

Hydrogen infused water is regular drinking water infused with molecular hydrogen gas (H_2). This simple modification creates a beverage with distinctive biological properties that differ fundamentally

from regular water or traditional sports drinks.

Molecular hydrogen is the smallest molecule in the universe, consisting of two hydrogen atoms bonded together. This diminutive size grants H_2 unique capabilities: it can readily cross cell membranes, penetrate the blood-brain barrier, and access mitochondria — the cellular powerhouses where energy production occurs. These properties enable molecular hydrogen to exert biological effects throughout the body's tissues and organs.

The production of hydrogen water typically employs electrolysis technology, which uses electrical current to split water molecules into their constituent elements. Advanced systems like the H2 Impact utilize specialized electrolysis methods to generate high concentrations of dissolved molecular hydrogen.

The Science Behind Hydrogen Water: Molecular Mechanisms of Action

Selective Antioxidant Properties

The biological effects of hydrogen water stem primarily from molecular hydrogen's role as a selective antioxidant. During intense physical activity, athletes generate substantial quantities of reactive oxygen species (ROS) and reactive nitrogen species (RNS) as natural byproducts of increased oxygen metabolism. While some ROS serve important signaling functions, excessive production creates oxidative stress—a state linked to muscle fatigue, inflammation, tissue damage, and impaired recovery

Research published in a 2024 comprehensive review examining studies from 1980 to April 2024 revealed that hydrogen-rich water specifically targets the most harmful reactive species, particularly hydroxyl radicals (•OH) and peroxynitrite ($ONOO^-$), while preserving beneficial ROS involved in cellular signaling and immune function. This selectivity distinguishes molecular hydrogen from conventional anti-oxidants like vitamins C and E, which may indiscriminately neutralize both harmful and beneficial oxidative species.

Anti-Inflammatory Effects

Beyond its anti-oxidant properties, molecular hydrogen demonstrates significant anti-inflammatory capabilities. Exercise-induced inflammation, while necessary for adaptation, can become problematic

when excessive or prolonged. Studies have documented hydrogen water's ability to modulate inflammatory cytokines — signaling proteins that orchestrate immune responses — thereby supporting balanced recovery processes without suppressing the beneficial aspects of training-induced inflammation.

Understanding hydrogen's relationship to inflammation provides critical insight into how molecular hydrogen supports the body's natural healing processes without suppressing beneficial inflammatory responses necessary for adaptation.

Mitochondrial Protection and Energy Metabolism

Mitochondria face particular vulnerability to oxidative damage during intense exercise. Recent research suggests that prolonged hydrogen supplementation (seven days or more) may contribute to increased mitochondrial biogenesis — the formation of new mitochondria — and enhanced endogenous antioxidant systems. This adaptation could explain improvements in muscular endurance performance observed in multiple studies, as greater mitochondrial density and function directly support sustained energy production during exercise.

Modulation of Cellular Signaling Pathways

Emerging evidence indicates molecular hydrogen influences critical cellular signaling pathways, particularly the Nrf2/Keap1 pathway — a master regulator of antioxidant defenses. Through a process called hormesis, molecular hydrogen induces mild, transient oxidative stress that activates Nrf2, promoting expression of genes encoding antioxidant enzymes such as superoxide dismutase (SOD), glutathione peroxidase (GPx), and heme oxygenase-1. This hormetic mechanism primes cells for improved resilience to subsequent oxidative challenges.

Effects on Athletic Performance: What the Research Shows

Muscular Endurance and Fatigue Resistance

A 2024 randomized controlled trial published in Frontiers in Physiology investigated the effects of eight days of hydrogen-rich water intake on muscular endurance during resistance training. The study, which enrolled 26 participants engaged in regular resistance training, found that HRW supplementation significantly improved performance on half-squat exercises—a key measure of lower body muscular endurance.

Participants consuming hydrogen water completed more repetitions and demonstrated enhanced work capacity compared to the placebo group. The researchers attributed these improvements to hydrogen's ability to reduce exercise-induced oxidative stress and support mitochondrial function, allowing muscles to maintain performance for longer durations.

These findings align with broader research on molecular hydrogen for endurance athletes, which suggests sustained aerobic performance benefits across multiple athletic disciplines.

Anaerobic Power and High-Intensity Performance

Research examining trained cyclists revealed particularly striking results for anaerobic performance. After seven days of hydrogen water consumption, trained athletes exhibited significant increases in peak power (from 766.2 ± 125.6 to 826.5 ± 143.4 watts) and mean power output (from 350.0 ± 53.5 to 380.2 ± 71.3 watts) during maximal anaerobic testing. Importantly, these ergogenic effects were specific to trained individuals — untrained participants showed no significant improvements, suggesting that training status modulates hydrogen water's performance-enhancing capabilities.

Elite athletes in clinical studies showed improved anaerobic performance and reduced muscle soreness within just seven days of hydrogen-rich water consumption—learn how long hydrogen water takes to work for your specific wellness goals.

Reduced Muscle Damage and Accelerated Recovery

A groundbreaking 2024 double-blind, placebo-controlled trial involving 22 female elite athletes (handball players and skeleton athletes) demonstrated that 28 days of hydrogen-rich water supplementation produced multiple beneficial effects. Athletes in the hydrogen water group exhibited decreased muscle damage markers (creatine kinase), improved body composition (reduced body fat percentage, increased muscle mass), and enhanced maximal torque production following exercise.

Most notably, the study documented a significant increase in torque after a warm-up performed during biomechanical testing—evidence suggesting reduced muscle fatigue induced by hydrogen water. These findings were published in the Journal of Lifestyle Medicine in February 2025 and represent some of the most rigorous evidence to date for hydrogen infused water's effects in elite athletic populations.

Enhanced Recovery in Multi-Session Training Days

Elite fin swimmers participating in a 2024 crossover trial demonstrated improved recovery when consuming hydrogen water during demanding training protocols. The study examined athletes performing two strenuous training sessions on the same day — a common scenario in competitive swimming. Results showed that hydrogen infused water supplementation promoted faster muscle recovery, reduced perceived muscle soreness, and helped maintain performance across both training sessions.

For a deeper dive into the science behind these recovery mechanisms, our guide on exploring recovery with hydrogen water examines the physiological pathways in greater detail.

Remarkably, hydrogen infused water exerted no substantially negative effects on any measured variable, supporting its safety profile The researchers concluded that HRW could be recommended as a supplement to accelerate muscle recovery in professional athletes, particularly during intensive training periods.

Lactate Metabolism and Exercise Acidosis

One of the most consistently reported effects of hydrogen water relates to blood lactate dynamics during and after exercise. Multiple studies have documented reductions in blood lactate accumulation following hydrogen water consumption, though the mechanisms remain under investigation.

Early research, including a 2012 pilot study with elite athletes, observed that hydrogen-rich water consumption before exercise reduced blood lactate levels and attenuated the exercise-induced decline in muscle function. More recent systematic reviews and meta-analyses have confirmed these initial observations, with hydrogen supplementation demonstrating favorable effects in reducing lactate accumulation, particularly during aerobic endurance exercise.

Scientists hypothesize that molecular hydrogen may accelerate lactate transport to the liver for storage and oxidation, while simultaneously increasing lactate utilization as fuel by working muscles. Additionally, hydrogen's effects on intracellular and extracellular buffering capacity during vigorous exercise may contribute to improved tolerance of high-intensity efforts.

Cognitive Function and Mental Fatigue

The impact of oxidative stress extends beyond physical capabilities to encompass mental performance — a critical factor in competitive athletics. Athletes experiencing high levels of oxidative stress may encounter difficulties with concentration, decision-making, and reaction time — all essential elements of sporting success.

Athletes seeking comprehensive information can discover health benefits of inhaling hydrogen that extend beyond physical performance to include neuroprotective applications relevant to mental acuity during competition.

Molecular hydrogen's neuroprotective properties have garnered increasing attention in recent research. Studies indicate that H_2 acts as a neuroprotective agent, facilitating restoration of neuronal oxidative damage by reducing oxidative stress and neuroinflammation in brain tissue. While research specifically examining hydrogen water's effects on athletic cognitive performance remains limited, the documented neuroprotective mechanisms suggest potential benefits for maintaining mental acuity during prolonged training or competition.

Individual Responses and Training Status Considerations

The Concept of "Positive Responders"

Not all athletes respond identically to hydrogen water supplementation — a reality consistent with most nutritional interventions. Research has identified what scientists term "positive responders" — individuals who demonstrate particularly pronounced benefits from hydrogen water consumption.

In the elite fin swimmer study, researchers identified four positive responders across different measured variables, though no participant responded positively to all variables simultaneously. While the small sample size precluded detailed analysis, this finding highlights the individualized nature of hydrogen water's effects. Currently, no reliable method exists for predicting which athletes will experience the most substantial benefits, though some association between participant characteristics and hydrogen water effectiveness has been documented.

Training Status as a Moderating Factor

Multiple studies have demonstrated that training status significantly influences hydrogen water's ergogenic effects. Trained athletes consistently show more pronounced performance improvements compared to their untrained counterparts—a finding with important practical implications.

This training-dependent response likely reflects trained athletes' greater capacity to utilize the cellular benefits provided by hydrogen supplementation. Trained individuals possess enhanced mitochondrial networks, superior oxidative enzyme activity, and more developed recovery mechanisms — physiological adaptations that may synergize with hydrogen's molecular effects to produce observable performance gains.

Practical Application: Implementing Hydrogen Water in Training Regimens

Optimal Dosing and Timing Strategies

While research continues to refine optimal protocols, current evidence suggests several practical approaches for athletes interested in hydrogen water supplementation:

Pre-Exercise Consumption

Consuming 500 - 1,000 ml of hydrogen infused water 15-30 minutes before training or competition may help establish favorable anti-oxidant conditions prior to the oxidative stress generated by exercise. Several studies have employed this pre-exercise timing with positive results, particularly for high-intensity or prolonged activities.

For guidance on preparation methods and concentration optimization, our resource on drinking perfect hydrogen rich water covers best practices for athletic applications.

During Exercise

For training sessions or competitions lasting over 60 minutes, maintaining hydrogen water consumption throughout the activity can provide continuous antioxidant support. This approach proves particularly relevant for endurance athletes engaged in prolonged efforts that generate sustained oxidative stress.

Post-Exercise Recovery

Immediate post-exercise consumption (within 30 minutes) may optimize recovery by addressing oxidative stress and inflammatory responses during the critical early recovery window. Some protocols recommend a second serving 2-3 hours post-exercise to support ongoing recovery processes.

Multi-Day Supplementation

Research demonstrating significant performance benefits typically employed sustained supplementation protocols lasting 7-28 days. This suggests that consistent daily consumption may be necessary to realize hydrogen infused water's full ergogenic potential, likely due to the time required for adaptive responses like enhanced anti-oxidant enzyme expression and mitochondrial biogenesis.

Hydrogen Infused Water vs. Traditional Sports Nutrition Strategies

Traditional sports drinks have served athletes for decades, primarily focusing on fluid replacement, electrolyte balance, and rapid carbohydrate delivery. While these functions remain essential for performance and recovery, hydrogen water operates through entirely different mechanisms — making it complementary rather than contradictory to conventional sports nutrition approaches.

Sports drinks excel at addressing acute hydration needs and providing quick energy during prolonged exercise. Hydrogen infused water, conversely, targets cellular-level processes: oxidative stress reduction, inflammatory modulation, and mitochondrial protection. These distinct mechanisms suggest potential synergistic effects when both strategies are employed judiciously.

Unlike some anti-oxidant supplements that may interfere with beneficial training adaptations, hydrogen infused water's selective anti-oxidant properties appear to spare beneficial ROS while neutralizing harmful reactive species. This selectivity theoretically preserves important exercise-induced signaling while providing protection against excessive oxidative damage — a balance that conventional antioxidants often fail to achieve.

For those interested in understanding how hydrogen infused water differs from other popular hydration options, our guide on alkaline water vs hydrogen infused water provides detailed comparisons.

Safety Profile and Regulatory Considerations

Extensive research has established molecular hydrogen's excellent safety profile. Studies consistently report no adverse effects from hydrogen water consumption, even with extended use at high doses. Molecular hydrogen is not listed on the World Anti-Doping Agency's Prohibited List, making it permissible for use by competitive athletes at all levels.

The physiological safety of molecular hydrogen reflects its natural presence in the human body. Gut bacteria normally produce hydrogen gas through fermentation of dietary fibers, with some of this endogenous hydrogen absorbed into circulation Therapeutic doses provided by hydrogen water simply augment this naturally occurring process.

As with any supplement or ergogenic aid, athletes should consider individual health status and consult with sports medicine professionals or registered dietitians specializing in athletic performance before incorporating hydrogen water into training regimens. This precaution proves particularly important for athletes with specific medical conditions or those taking medications that might interact with supplements.

When evaluating hydrogen infused water as a potential addition to your athletic program, consider these factors:

Training Level and Goals

Current evidence suggests trained athletes experience more pronounced benefits than recreational exercisers. If you engage in regular, structured training with specific performance objectives—particularly in endurance sports or high-intensity activities —hydrogen infused water may provide meaningful advantages. Conversely, if you exercise casually or are just beginning an athletic program, focusing on fundamental nutrition and training principles may yield greater returns initially.

Competitive Context

Elite and competitive athletes seeking marginal gains that could influence performance outcomes may find hydrogen water's documented 5-15% improvements in certain metrics significant. Even small performance enhancements can prove decisive in competitive contexts where victory margins are razor-thin.

Recovery Demands

Athletes facing intensive training loads, competing in multiple events with limited recovery time, or managing high training volumes during preparation phases may particularly benefit from hydrogen water's documented recovery-enhancing properties. The elite fin swimmer study specifically demonstrated benefits during same-day multiple training sessions—a scenario common in many competitive programs.

Budget and Resources

Professional-grade hydrogen generation systems represent an investment. The H2 Impact provides long-term value through permanent output capability and minimal ongoing costs (only periodic cleaning supplies like the H2 Impact Deep Cleaning Kit). When amortized over years of use, the cost becomes more modest, but initial outlay requires consideration within your overall athletic budget.

Willingness to Experiment

Individual variability in response means you cannot guarantee specific outcomes. Approaching hydrogen infused water with realistic expectations — as a potentially beneficial addition rather than a miraculous solution — enables objective evaluation of its effects on your unique physiology and performance.

Existing Nutrition Strategy

Hydrogen infused water should complement, not replace, fundamental nutrition practices. Ensuring adequate calorie intake, appropriate macronutrient distribution, proper hydration, and strategic nutrient timing remains paramount. If significant gaps exist in basic nutrition, addressing these foundation elements will likely yield greater benefits than adding advanced supplements.

Selective Antioxidant Action

Targets harmful reactive species while preserving beneficial cellular signaling, supporting recovery without compromising training adaptations.

Performance Enhancement

Research documents 5-15% improvements in strength output, enhanced power generation, and increased muscular endurance in trained athletes.

Recovery Optimization

Reduces muscle damage markers, decreases soreness, and accelerates recovery between training sessions through multiple cellular mechanisms.

Individual Consideration

Response varies among athletes; training status, genetics, and individual physiology influence outcomes — consultation with sports nutrition professionals recommended.

Conclusion: An Evidence-Based Addition to the Athletic Toolki

t

Hydrogen-rich water represents a scientifically supported ergogenic aid with a growing evidence base demonstrating benefits for athletic performance and recovery. Its unique mechanism of action—selective antioxidant activity combined with anti-inflammatory effects and mitochondrial protection — distinguishes it from traditional sports nutrition interventions.

The research trajectory shows progression from early pilot studies to more rigorous randomized controlled trials involving elite athletic populations. While not all studies show universally significant effects, the preponderance of evidence supports hydrogen infused water's potential to enhance specific aspects of athletic performance, particularly in trained individuals engaged in high-intensity or endurance activities.

Key advantages include its excellent safety profile, permissibility under anti-doping regulations, and complementary relationship with conventional sports nutrition strategies. The documented absence of adverse effects and the inability of molecular hydrogen to disrupt beneficial training adaptations make it a relatively low-risk addition to athletic programs.

Athletes and coaches should approach hydrogen infused water as one component of a comprehensive performance optimization strategy. It functions most effectively when integrated into programs already incorporating sound training principles, adequate recovery, appropriate nutrition, and proper periodization. Rather than expecting transformative effects, realistic expectations involve incremental improvements that, when combined with other evidence-based practices, contribute to overall performance enhancement.

For athletes committed to exploring cutting-edge recovery and performance technologies, investing in a professional-grade system like the H_2 Impact provides access to the therapeutic hydrogen concentrations employed in research studies. The convenience of on-demand hydrogen water generation, combined with multiple delivery methods (drinking water, inhalation, topical application), offers flexibility for various training and competition scenarios. For detailed guidance, see our comprehensive article on how to use the H_2 Impact.

As research continues advancing our understanding of molecular hydrogen's effects in athletic populations, evidence-based protocols will become increasingly refined. Current knowledge supports hydrogen water as a promising tool in the modern athlete's arsenal—one that merits serious consideration by individuals and teams seeking every legitimate advantage in the competitive arena.

The fusion of ancient wisdom about water's fundamental importance with modern molecular science creates an intriguing paradigm for athletic optimization. Whether hydrogen infused water becomes a staple of sports nutrition or remains a specialized intervention for certain athletic populations, its emergence reflects the ongoing evolution of performance science and our deepening understanding of how molecular interventions can support human athletic achievement.

Hyfrogen Infused Water Experiment: Autism

j.r.

My son with ASD was becoming increasingly more defiant and having horrible rages. We were terrified. After starting on hydrogen-rich water, we also heard about Dr Allen and she fit him into her brain camp. After those 2 weeks he came home a different child. Rages and defiance completely gone. He's a sweet boy getting ready to graduate High School.

c.m.

I have two special needs children that are on the Autism Spectrum. My youngest has been for the most part non-verbal his whole life, he is 10 and although he can say a fair amount of single words like mommy, daddy, water, McDonald's, school, chocolate etc.

He has never been capable of stringing words together to form any type of sentences. He has also very rarely ever answered a direct question with a relevant answer. Just know what I see now is a child who for the first time in his life is able to express himself, who can ask for what he wants, who can participate in a conversation.

Changing his water for ERW changed his life and mine. Something I have waited 10 years for something I thought I would never have.

t.s.h

Our oldest son has Down Syndrome. Unbelievable behavior, allergy and sinus infection gone. He is a different kid today, after switching is water to ERW.

b.b.

My son has high functioning autism and he drinks ERW. It has made a world of a difference in my son. Also, I can note since drinking the water he went from 5 meds to 3 with the lowest dose!

a.s

My son is autistic, ADHD, ODD, OCD and is on medication. He drinks H_2 water all day everyday He's less hyper, he sleeps better. First time I took him off all medication since starting the water and he was amazingly not that bad. I thought he would be so off like before starting meds but he was okay. None of my kids drank water much before. Now it's all they want and ask for.

dr. p.c.

Cameron age 9 - autistic. Hair analysis revealed high levels of aluminum, mercury and arsenic. Very low minerals in all categories calcium, magnesium, sodium, iron, chromium, selenium. Cameron continues to become more verbal, more alert, calm and attentive. Protocol of balancing out heavy metals blood brain barrier and using H_2 water for removal of oxidative stress, provides mom with much hope.

j.m

The water is working. So I've written about ERW water in the past and talked about the changes I have seen in our boys. We started drinking ERW about 6 months ago and we noticed that with the boys they started sleeping through the night. Max would wake up every two to three hours. Cohen would wake up maybe once or twice. After starting drinking H_2 water THEY SLEPT THE WHOLE NIGHT. The boys have been drinking H_2 water fresh every morning. Over the last two weeks I have been amazed with Cohen. He is communicating more. He is talking like crazy. He is even trying to sing and come up with songs on his own. I see more and more personality in his eyes. It's like he is catching up a bit with his development. Since being on ERW I think we have done pretty well at getting them properly hydrated.

The Benefits of Hydrogen-rich Water for Children

Hayden Xu
Olansi Healthcare Co., Ltd - Area Sales Manager
June 12, 2018

Do you know that hydrogen rich water also has many benefits for children?

Improve Children's Memory
Long-term drinking of hydrogen-rich water can supplement electrolytes and calcium, promote the development of cerebral cortex and improve memory.

Easier to Absorb
The calcium deficiency in modern people is universal: calcium deficiency in children leads to poor development of bones and teeth; in pregnant women, calcium deficiency causes fetuses to compete for calcium in pregnant women, leading to gestosis and frequent vomiting. Hydrogen-rich water is rich in ionic calcium because of electrolysis, and calcium is more easily absorbed.

Improves Constipation in Children
Because children drink milk easily lead to constipation, hydrogen-rich water for constipation has a good mitigation, because of its small molecular characteristics, solvency and penetration, can promote gastrointestinal reflexes, strengthen intestinal peristalsis, promote excretion, usually Constipation symptoms can be improved in 10 days.

Improve Children's Immunity
Hydrogen-rich water can eliminate pathogenic reactive oxygen species (free radicals) and enhance the body's natural healing power, which is beneficial to the recovery of common diseases.

Helps Develop Water Habits
The hydrogen-rich water tastes sweet and smooth, and taste-sensitive children are particularly fond of drinking, helping to develop good drinking habits while staying away from bicarbonate-like acidic beverages.

Protect Children's Diet Safety
1. Soaking vegetables with hydrogen-rich water can effectively remove residual pesticides from vegetables and protect children's food safety.

2. Hydrogen-rich water to remove chlorine and heavy metal tap water, usually used to cook rice and soup are safe and reliable, can protect children's food safety.

Hydrogen-rich Water Helps with Digestion for Kids

The list of hydrogen-rich water side effects on kids also includes facilitating digestion. Hydrogen-rich water goes beyond what normal water is capable of providing the body by stimulating gastric leptin and ghrelin. These are fat-regulating hormones responsible for various metabolic functions.

When a child indulges in hydrogen-rich water consumption, they're promoting better digestion without even knowing it! Hydrogen-infused water fights against childhood obesity in the process as well.

Research highlights that weight maintenance is promoted in people with metabolic syndrome when they drink hydrogen-rich water. The research shows that the way hydrogen molecules reduce oxidative stress at a cellular level helps to increase the efficiency of some metabolic functions. As a result, children drinking hydrogen-rich water experience the following: a healthier gut, the maintenance of healthy gut bacteria, and overall better wellness.

Hydrogen-rich Water Improves Children's Immune System

The majority of a child's immune system revolves around gut health. With this in mind, when there is damage occurring in the gastrointestinal tract, there's a variety of health problems that can occur. Thus, the immune system's health is essential for a child's overall health.

Hydrogen-rich water promotes a healthy immune system. By assisting in the offsetting of toxins found in the gut and boosting the secretions of healthy hormones, hydrogen-rich water benefits the body by helping it fend off infections and illnesses. In essence, one of the hydrogen-rich water side effects on kids is a more effective immune system.

Benefits of Hydrogen-rich Water Packaging for Kids

One of the unintended hydrogen water side effects on kids is that children are actually interested in hydrating.

Our shaped pouch is perfectly crafted to fit a child's hands. Instead of using a bulky water bottle, we use an aesthetically appealing pouch design. It's unique, sleek packaging at its finest, and the shape alone is enough to captivate the interest of nearly any child.

Our pouches are also super easy to drink from as well. We've incorporated a spout to ensure there's never an issue opening and closing the pouch. As a result, our pouches help children avoid spills, ensuring the **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water hydrates their cells.

Anti-oxidant Power

Hydrogen-rich water is a rich source of anti-oxidants, which can help combat oxidative stress in the body. This can be particularly beneficial for children, as their growing bodies are susceptible to various environmental toxins and stressors. Looking for a way to get your children the antioxidants they need without all that extra sugar? One of parents' favorite hydrogen-rich water side effects on kids is that it's loaded with vital anti-oxidants. Although some anti-oxidants must be obtained from what children eat, hydrogen-rich water gives them the extra anti-oxidants their bodies crave.

Molecular hydrogen helps kids improve upon their antioxidant systems. This additional aid helps to protect the tissues and cells from oxidation damage as a result of the oxygen-reactive radical reduction. In turn, when kids drink hydrogen-rich water, one of the most profound impacts includes how the body's organ and cell quality improves. Enzyme activity rises, resulting in more cellular energy too.

Hydrogen Water has No Negative Side Effects on Kids

To make a long story short, if you're looking for the negative side effects hydrogen-rich water has on kids, you're not going to find them. The truth of the matter is hydrogen-rich water has no detrimental side effects on kids.

So, what about the positive side effects? Let's discuss the incredible side effects that hydrogen-rich water will have on your kids and how this drink is changing child health for the better.

Hydrogen Water Promotes Longer Hydration for Kids

Although it's possible for parents to force children to drink water throughout the day, the list of hydrogen-rich water side effects on kids includes the fact that the molecular hydrogen promotes longer hydration. Allow us to explain this a bit more in-depth.

Approximately two-thirds of the human body is made up of water, with most of the water - between 66 and 80 % - being stored in cells and the lymph system. Maintaining this hydration must be done at a cellular level. And this is where hydrogen-rich water has the most significant impact on children.

Many times, water is simply expelled out of a child's system through urination long before it is absorbed into the child's cells. With this being the case, the children are not receiving proper hydration.

Hydrogen water fixes this issue by promoting the absorption of water at a cellular level. The result is an extension in hydration for kids.

Inflammation, Free Radical Damage, Oxidative Stress, Hydrogen and Cancer

Studies on brain tumors in the past 10 or more years have shown an increase in the incidence of brain tumors in the general population. Can you guess why this is so? Extensive research during last two decades has revealed the mechanism by which continued oxidative stress leads to chronic inflammation, which in turn mediates most chronic diseases including cancer.

Oxidative stress, caused by rivers of free radicals, is a plague on modern man. Whether it's the toxic pollution in the air you breath 24/7, the radiation your doctor exposes you to pharmaceutical medicines, chemotherapy, your cell phone constantly at your brain, or even your WIFI and other EMF pollution generating devices, you expose yourself to oxidative stress,ill which will drag you down into the pit of disease and cancer putting an end to your happiness, health and even life.

Oxidative stress has been associated with numerous health conditions including chronic fatigue syndrome, fibromyalgia, diabetes, Alzheimer's disease, anxiety, insomnia, cancer, and just about every disease you can imagine yet doctors seem to ignore this fact and work as hard as they can to increase your oxidative stress when they know we are already against the wall with toxins and stress. Imagine a patient, newly in remission from cancer, being exposed every three months to CAT or PET scans, which dramatically increase oxidative stress, just begging for the cancer to come back (or a new cancer to emerge) so they can treat the patient again.

Oxidative stress, directly or indirectly caused by chemotherapeutics is one of the underlying mechanisms of the toxicity of anticancer drugs in non-cancerous tissues, including the heart and brain. During cancer chemotherapy, oxidative stress-induced lipid peroxidation generates numerous electrophilic aldehydes that attack many cellular targets. Oxidative stress, generated by almost all prescribed drugs as they are metabolized, acts as a source of origin and progression of many dreadful diseases. Reactive metabolites formed during this process cause oxidative stress and can impair the function of drug metabolizing enzymes leading to toxicity.

Pollution is a greater global threat than Ebola and HIV, according to warnings by the World Health Organization. According to its recent report, one in four deaths among children aged under five are now due to environmental hazards such as air pollution and contaminated water. It is simple; poisons in our air and water create oxidative stress, which leads to disease, cancer and death. Epidemiological studies have shown a clear association between cardiovascular morbidity, decreased lung function, increased hospital admissions, mortality, and airborne concentrations of photochemical and particulate pollutants.

Cellular exposure to ionizing radiation leads to oxidizing events that alter the molecular structures of macromolecules through direct interactions of radiation that target the macromolecules, or via products of water radiolysis. Further, the oxidative damage may spread from the targeted to neighboring, non-targeted bystander cells through redox-modulated inter-cellular communication mechanisms. People who started using cell phones at an earlier age have a greater chance of developing a brain tumor when compared to people who started late (during their adult years).

When certain chemicals in the body have their electron configuration changed, they become very reactive (and are called "free radicals" or "oxidants"). These chemicals roam freely through the rest of the body stealing electrons from other cells. Free radicals damage cellular DNA. The majority of modern science has come to the conclusion that free radical damage in the human body is an important cause of aging. Aging is evidence of the damage to millions of the body's cells through oxidation. This oxidation is due to the lack of anti-oxidants that are available to stop free radical damage.

Reactive oxygen species (ROS) are a byproduct of normal metabolism. Even under pristine conditions when our cells use glucose to make energy we create a cascade of free radicals that cause oxidative stress. The more sugar we consume the greater our oxidative stress. When our immune system is fighting off bacteria and creating inflammation we suffer from increased oxidative stress. When our bodies detoxify pesticides, herbicides, fungicides and cigarette smoke we create oxidative stress.

Pancreatic cancer cells use the sugar fructose to help tumors grow more quickly. Tumor cells fed both glucose and fructose used the two sugars in two different ways, a team at the University of California Los Angeles found. Their findings, published in the journal Cancer Research, helps explain other studies that have linked fructose intake with pancreatic cancer, one of the deadliest cancer types. Researchers concluded that anyone wishing to curb their cancer risk should start by reducing the amount of sugar they eat.

Oxidation increases when we are physically and/or emotionally stressed. However, as long as we have enough anti-oxidants, a careful balance is maintained and damage is prevented. Oxidative stress happens when the amount of free radicals exceeds the amount of anti-oxidants. That's when oxidation damages our cells, proteins and our DNA (genes). Oxidative stress is essentially an imbalance between the production of free radicals and the ability of the body to counteract or detoxify their harmful effects through neutralization by anti-oxidants.

Hydrogen as Key Anti-oxidant against Oxidative Stress and Cancer

Oxidative stress is closely related to all aspects of cancer, from carcinogenesis to the tumor-bearing state, from treatment to prevention. The human body is constantly under oxidative stress arising from many sources. Active oxygen species are involved in carcinogenesis through two mechanisms: (1) the induction of gene mutations that result from cell injury and (2) the effects on signal transduction and transcription factors.

Molecular hydrogen (H_2) functions as an extensive protector against oxidative stress, inflammation and allergic reactions. H_2 reduces the strong reactive nitrogen species peroxynitrite (ONOO-) as well as hydroxyl radicals (OH), but not nitric oxide radical (NO). Molecular hydrogen is a new medical gas that can be dissolved in water and administered through drinking, inhalation, baths, intravenous drip (IV), and has been shown to suppress VEGF (Vascular Endothelial Growth Factor), a key mediator of tumor angiogenesis (the development of new blood vessels), by the reduction of excessive ROS (oxidative stress) and through the down regulation of ERK (key growth factor needed for cellular division).

"Effects of molecular hydrogen have been observed essentially in all the tissues and disease states including the brain, spinal cord, eye, ear, lung, heart, liver, kidney, pancreas, intestine, blood vessel, muscle, cartilage, metabolism, perinatal disorders, and inflammation/allergy. Among them, marked effects are observed in ischemia/reperfusion disorders as well as in inflammatory disorders. It is interesting to note, however, that only three papers addressed effects on cancers. First, molecular hydrogen caused growth inhibition of human tongue carcinoma cells HSC-4 and human fibrosarcoma cells HT-1080 but did not compromise growth of normal human tongue epithelial-like cells DOK. Second, hydrogen suppressed the expression of vascular endothelial growth factor (VEGF), a key mediator of tumor angiogenesis, in human lung adenocarcinoma cells AS49, which was mediated by down-regulation of extracellular signal-regulated kinase (ERK). Third, hydrogen protected BALB/c mice from developing radiation-induced thymic lymphoma. Elimination of radical oxygen species by hydrogen should reduce a probability of introducing somatic mutations.

H_2 has also been shown to reduce the excessive expressions of MMP genes (MMP proteins are involved in multiple functions in cells, including cell proliferation, cartilage synthesis, apoptosis, angiogenesis, etc.). It has been shown that cancerous cells have a higher expression of MMP genes leading to tumor invasion and tumor angiogenesis. H_2 has been shown to reduce tumor invasion and tumor growth and because of this effect, H_2 has been shown to have anti-tumor effects.

"ERW hydrogen water causes telomere shortening in cancer cells and suppresses tumor angiogenesis by scavenging intracellular ROS and suppressing the gene expression and secretion of vascular endothelial growth factor. In addition, ERW induces apoptosis together with glutathione in human leukemia HL60 cells (Tsai et al. 2009a, b)."

"Treatment with both H_2 waters (HHW and NHW) increased the expression of p-AMPK, AIF and Caspase 3 (cell apoptosis pathways) in colon 26 cells. Thus, H_2 water resulted in cell apoptosis mediated by the AMPK pathway in colon 26 cells."

H_2 may protect healthy tissue/cells from anti-cancer drugs and has been shown through medical studies that molecular hydrogen has a protective effect against chemotherapy drugs. Hydrogen has potential for improving the quality of life of patients during chemotherapy by efficiently mitigating the side effects of cisplatin.

Molecular hydrogen may have the potential to retard the development of some cancers. For example, it was demonstrated that molecular hydrogen may protect and retard the development of thymic lymphoma in mice.

"The radiation-induced thymic lymphoma rate in the H_2 (+) group was significantly lower than in the control group and H_2 treatment significantly increased the latency of lymphoma development after the split-dose irradiation. These data indicated that H_2 protects mice from radiation-induced thymic lymphoma in BALB/c mice."

Conclusion

I have personally observed a patient recover from near death with reoccurring breast cancer years after surgery, which had spread to her lymph system and then on to her brain. She wrote, "After a few visits to the ER, I found out I had a tumor on the cerebellum that was blocking fluid from draining down the spinal cord. On the base of my skull is a 2 cm tumor. It's making me vomit and walk sideways. I could not keep food or water down and I began walking like a crab," she reported on the 9th of September 2017. Understanding the severity of the situation I took a long shot and recommended not only hydrogen water but also a hydrogen inhaler. On the 26th of September, using the full Natural Allopathic protocol with incredible dedication to slowing her breathing down, using the Frolov breathing device, she wrote, and "So I walk now! Eat like crazy, gained 10 pounds, and feel better every day. Don't drive yet but I walk in the neighborhood. Not far. Have not thrown up. Feel stronger every day! Just hope to keep going!" I published her initial success in my essay New Advances in Gas Therapy and will soon report her full testimony. My readers will have to excuse my reporting on this case as it is happening but it is too exciting and too important.

We Know Cancer can be Cured

Two years ago, before I even had heard about the miracles of molecular hydrogen I got a letter from another patient also on the verge of death. This patient reported, “Significant metastases in my spine, hips, ribs, neck, lymph nodes - and my PSA was 2,080,” I entitled my essay, ‘One foot in the grave when I found Dr. Sircus. He wrote, “I wanted to contact Dr. Sircus when I was completely healed and tell him my story. My PSA is now 2.1. If his protocol plus my work and the grace of God could get me off my death bed, and dancing all night with my family well maybe people should consider this wonderful protocol and try it.” I share these cases to show what is possible if people work hard enough doing the right things.

Both of these patients showed extraordinary will successfully and willfully doing the most difficult part of the Natural Allopathic protocol, which is breathing retraining. Another famous case written up in my bestselling book Sodium Bicarbonate was Vernon Johnston, who breathed his way back to life by using sodium bicarbonate perfectly while breathing consciously four hours a day.

Hydrogen is new in medical science and even newer in relationship to the treatment of cancer. Hydrogen is safe, easily administered, a potent anti-oxidant effect, and gets everywhere it is needed because of its small size. I do not know of anyone reporting anything close to a case like this. It should be everyone’s hope that she makes it and recovers fully though a relapse is always possible. There is nothing to lose administering high dosages of hydrogen and everything to gain for cancer patients.

Some common substances with anti-oxidant properties are vitamin C, vitamin E, beta-carotene, selenium, manganese, glutathione, lipoic acid, flavonoids, phenols, polyphenols, phytoestrogen, and many more.

According to Tyler W. LeBaron of the Molecular Hydrogen Foundation/Institute, “The body requires a certain balance/ratio of anti-oxidants and oxidants. We actually require some free radicals, and because H_2 is a stable molecule, it unlike conventional antioxidants. H_2 will not react with these. However, it is clear from animal and human studies that H_2 can decrease oxidative stress via its cell-modulating effects. This may potentially afford protection against radical-induced cancer formation, as suggested by some cell/animal studies.”

According to the National Cancer Institute considerable laboratory, evidence from chemical, cell culture, and animal studies indicates that anti-oxidants may slow or possibly prevent the development of cancer. Anti-oxidants are nutrients (vitamins and minerals) as well as enzymes (proteins in your body that assist in chemical reactions). Hydrogen just happens to be the smallest and as it does its work it promotes full hydration. It also just happens to be the icing on the cake in terms of my protocol. Please note that I never promote a single agent for the treatment of cancer or any other disease. Hydrogen should always be used in the context of a rational protocol.

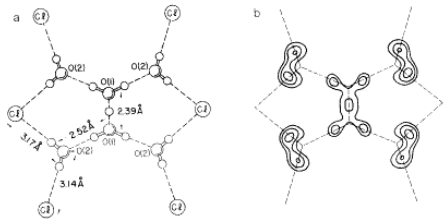

Fig. 2. (a) The $H_5O_6^+$ ion and the surrounding Cl^- ions. (b) Portions of a difference map, showing the electron density associated with the hydrogen atoms. Contours are drawn at 0.2, 0.3, and 0.4 electron/Å^3.

of 5.2 for $n = 951$ reflections measured and $p = 88$ parameters adjusted.

The rather high values of the agreement indexes reflect primarily our inability to obtain satisfactory representations of the C_6H_{18} groups, which are severely disordered. The $[(C_6H_{18})_3(NH)_2Cl]^+$ cation (Fig. 1) somewhat resembles three "C" clamps attached to a single object—the encapsulated Cl^- ion. It has the crystallographic symmetry *mm*2 (C_{2v}), one of the mirror planes passing through one of the clamps and the other lying perpendicular to them. However, for one of the $(CH_2)_6$ "clamping" groups to lie on a mirror plane, the conformations about two of the C–C bonds would have to be eclipsed, which would lead to rather severe H···H repulsions. Moreover, Fourier maps show regions of considerable electron density on both sides of the mirror plane, indicating that the symmetry results from a disorder involving a number of different, nonplanar conformations of the chain. The disorder is apparently very complicated, involving a large number of conformations. The model on which we finally settled requires twofold disorder for four of the chain carbon atoms and large, anisotropic thermal parameters for three others; even so, a difference map indicated residual electron density ranging up to 0.55 electron/Å^3 in some regions of this chain. The other two $(CH_2)_6$ chains were less troublesome, and we were able to obtain a fairly reasonable fit by assuming disorder for only two of the atoms in each chain.

The protonated water cluster $H_5O_6^+$ has crystallographic symmetry $2/m(C_{2h})$, with the central O···H···O hydrogen bond lying across a center of symmetry (Fig. 2a). The O···O distance, 2.39 ± 0.02 Å, is among the shortest such distances yet observed. It would be expected to correspond to a symmetric hydrogen bond, with the hydrogen atom located midway between the two oxygen atoms and with its potential function represented by a curve with a single minimum. A difference electron density map (Fig. 2b) supports this model; however, it cannot rule out the alternative that the hydrogen atom is disordered over two sites slightly displaced to either side of the symmetry center, and hence is better represented by a double-minimum function. As Hamilton and Ibers (*2*) have pointed out, "Clearly it is always possible to propose a degree of asymmetry that will be undetectable." But such a proposal serves little practical purpose; and in view of the extremely short O···O distance and the identical environments (due to crystallographic symmetry) of the two O(1) atoms, we believe that this cluster should be added to the list of examples of symmetric hydrogen bonds.

The O(1)···O(2) distance of 2.52 ± 0.01 Å also represents a very short hydrogen bond, but our difference map (Fig. 2b) clearly indicates that it is asymmetric, with the hydrogen atom covalently bonded to O(1). The angles at O(1) are O(1)···O(1)–O(2), 111°, and O(2)···O(1)–O(2), 132°. The O(2)···H···Cl$^-$ hydrogen bonds are of normal length; however, they are undoubtedly vital to the stability of the $H_5O_6^+$ ion.

The $H_{13}O_6^+$ ion represents the largest protonated cluster of water molecules yet characterized. Examples of smaller clusters include $H_9O_4^+$ (*3*), where a central oxygen atom is surrounded by three other oxygen atoms at distances of 2.50, 2.59, and 2.59 Å; $H_7O_3^+$ (*3*, *4*), a nonlinear array $H_2O···H_3O^+···H_2O$ with O···O distances ranging from 2.47 to 2.54 Å; and $H_3O_2^+$, which has been observed in a variety of crystals (*5*) with O···O distances ranging from 2.41 to 2.57 Å.

ROBERT A. BELL, GARY G. CHRISTOPH
FRANK R. FRONCZEK, RICHARD E. MARSH
Department of Chemistry, A. A. Noyes Laboratory of Chemical Physics, California Institute of Technology, Pasadena 91125

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3 March 1975

Hyperbaric Hydrogen Therapy: A Possible Treatment for Cancer

Abstract. *Hairless albino mice with squamous cell carcinoma were exposed to a mixture of 2.5 percent oxygen and 97.5 percent hydrogen at a total pressure of 8 atmospheres for periods up to 2 weeks in order to see if a free radical decay catalyzer, such as hydrogen, would cause a regression of the skin tumors. Marked regression of the tumors was found, leading to the possibility that hyperbaric hydrogen therapy might also prove to be of significance in the treatment of other types of cancer.*

Over a period of years Dole and his collaborators (*1*) have studied the radiation chemistry of polyethylene (PE) and discovered a pronounced catalytic effect of molecular hydrogen in catalyzing the decay of the alkyl radicals, $-CH_2\dot{C}HCH_2-$ in the solid PE at room temperature. For example, Waterman and Dole (*2*) found that at 24°C an ambient hydrogen pressure of 400 torr increased the first order decay constant of the alkyl radical by about tenfold. Furthermore, the catalytic effect was the result of the hydrogen dissolved in the PE. Wen, Johnson, and Dole (*3*) showed that the tenfold increased catalytic activity of hydrogen at 600 torr in single crystalline mats of PE as compared to that in bulk PE was the result of a tenfold greater solubility of hydrogen in the single crystalline PE.

Free radicals have been thought to be involved in cancerous growths (*4*); we now report the effect of hydrogen gas on cancer (*5*). We chose as experimental animals hairless albino mice on whose skin

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Hello Charles,

I wanted to share this wonderful news with you and thank you for your support!

No Connection between LDL Cholesterol Levels and Heart Disease, according to Researchers

By University of South Florida

A new review of published research from an international group of physicians and researchers is challenging the half-century long belief that LDL, the so-called 'bad kind' of cholesterol, causes heart disease.

Published in Expert Review of Clinical Pharmacology, the review also questions the use of statins as the primary prevention tool for Cardiovascular Disease (CVD). The study could have widespread implications as tens-of-millions of Americans currently take statins to help lower their cholesterol levels and risk of heart attack.

"There have been decades of research designed to deceive the public and physicians into believing that LDL causes heart disease, when in fact, it doesn't," said David Diamond, Ph.D., a professor in USF's Departments of Psychology and Molecular Pharmacology & Physiology, and a co-author of the article. "The research that has targeted LDL is terribly flawed. Not only is there a lack of evidence of causal link between LDL and heart disease, the statistical approach statin advocates have used to demonstrate benefits has been deceptive."

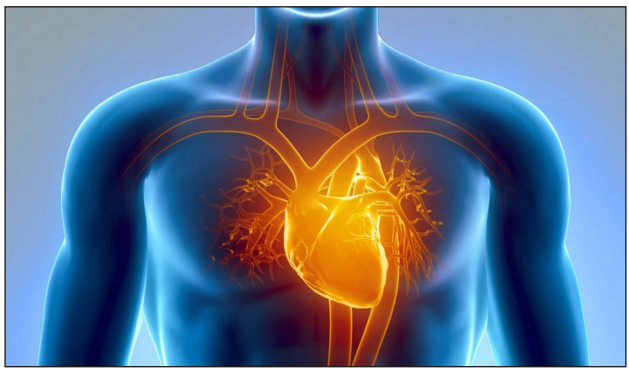
Diamond, along with more than a dozen doctors, including cardiologists, from the U.S., Sweden, the United Kingdom, Italy, Ireland, France and Japan, reported that the current narrative that LDL causes CVD is based on "misleading statistics, exclusion of unsuccessful trials and ignoring numerous contradictory observations."

The effectiveness of statin treatment as a primary prevention method has been heavily debated by researchers for years. This latest study analyzed three recently published reviews of roughly 50 years of research, refuting a number of claims and hypotheses made about the connection between LDL and heart disease, and the value of statins for preventing CVD.

While Diamond is careful not to give any medical advice, he says his goal is "to share this information with people, so they can make an informed decision when they're considering taking cholesterol lowering medication."

A neuroscientist by training, Diamond first began looking into diet and heart disease research over a decade ago, when he was diagnosed as being at high risk for developing CVD and his doctor recommended he take statins. With a Ph.D. in Biology, he began studying research on heart disease

and realized that the emphasis on LDL as a cause of CVD was not based on sound research. Diamond has published half a dozen papers on CVD and continues to be a vocal opponent of statin treatment. Diamond reports that he lost weight and dramatically improved his heart disease risk markers by following a low carbohydrate diet instead of taking statins.



“Bad Cholesterol” not as bad as People think, Study shows

Date: May 8, 2011

Source: Texas A&M University

Summary:
The so-called “bad cholesterol” – low-density lipoprotein commonly called LDL – may not be so bad after all, according to a new study that casts new light on the cholesterol debate, particularly among adults who exercise.

Steve Riechman, a researcher in the Department of Health and Kinesiology, says the study reveals that LDL is not the evil Darth Vader of health it has been made out to be in recent years and that new attitudes need to be adopted in regards to the substance. His work, with help from colleagues from the University of Pittsburgh, Kent State University, the Johns Hopkins Weight Management Center and the Northern Ontario School of Medicine, is published in the Journal of Gerontology.

Riechman and colleagues examined 52 adults from ages to 60 to 69 who were in generally good health but not physically active, and none of them were participating in a training program. The study showed that after fairly vigorous workouts, participants who had gained the most muscle mass also had the highest levels of LDL (bad) cholesterol, “a very unexpected result and one that surprised us.”

“It shows that you do need a certain amount of LDL to gain more muscle mass. There’s no doubt you need both – the LDL and the HDL – and the truth is, it (cholesterol) is all good. You simply can’t remove all the ‘bad’ cholesterol from your body without serious problems occurring.

Cholesterol is found in all humans and is a type of fat around the body. A person’s total cholesterol level comprises LDL (low-density lipoprotein) and HDL (high-density lipoprotein) cholesterol.

LDL is almost always referred to as the “bad” cholesterol because it tends to build up in the walls of arteries, causing a slowing of the blood flow which often leads to heart disease and heart attacks.

HDL, usually called the “good cholesterol,” often helps remove cholesterol from arteries.

“But here is where people tend to get things wrong,” Riechman says. “LDL serves a very useful purpose. It acts as a warning sign that something is wrong and it signals the body to these warning signs. It does its job the way it is supposed to.

"People often say, 'I want to get rid of all my bad (LDL) cholesterol,' but the fact is, if you did so, you would die," the Texas A&M professor adds. "Everyone needs a certain amount of both LDL and HDL in their bodies. We need to change this idea of LDL always being the evil thing – we all need it, and we need it to do its job."

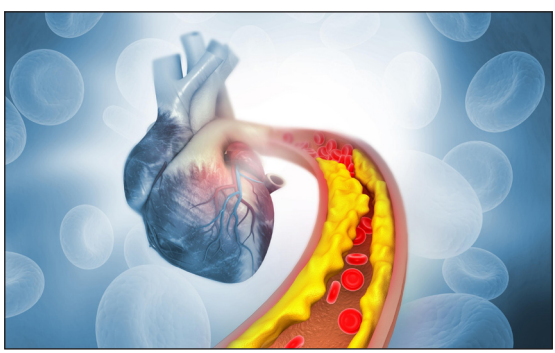
According to the American Heart Association, about 36 million American adults have high cholesterol levels.

"Our tissues need cholesterol, and LDL delivers it," he notes. "HDL, the good cholesterol, cleans up after the repair is done. And the more LDL you have in your blood, the better you are able to build muscle during resistance training."

Riechman says the study could be helpful in looking at a condition called sarcopenia, which is muscle loss due to aging. Previous studies show muscle is usually lost at a rate of 5 percent per decade after the age of 40, a huge concern since muscle mass is the major determinant of physical strength. After the age of 60, the prevalence of moderate to severe sarcopenia is found in about 65 percent of all men and about 30 percent of all women, and it accounts for more than $1 billion of health care costs in the United States.

"The bottom line is that LDL – the bad cholesterol – serves as a reminder that something is wrong and we need to find out what it is," Riechman says.

"It gives us warning signs. Is smoking the problem, is it diet, is it lack of exercise that a person's cholesterol is too high? It plays a very useful role, does the job it was intended to do, and we need to back off by always calling it 'bad' cholesterol because it is not totally bad."



Hydrogen-rich Water Alleviates Inflammation and Fatigue in COVID-19: A Pilot Study

Aleksandra Milovancev, Jovana Avakumovic, and Sergej M Ostojic
https://orcid.org/0000-0002-7270-2541 sergej.ostojic@uio.no+3

Molecular hydrogen (H_2) has been recently put forward as a possible adjunct therapeutics in COVID-19 due to its anti-inflammatory and pulmo-protective effects. An open-label randomized trial in 44 patients with laboratory-confirmed COVID-19 from seven hospitals in China demonstrated that 3-day hydrogen inhalation resulted in significantly more patients with improved disease severity and reduced dyspnea comparing to patients who received standard-of-care treatment.

The authors suggested that the clinical benefits were likely due to the ability of hydrogen to decrease the inspiratory efforts that consequently reduces chest distress and pain in COVID-19 patients. A recent report suggested that the administration of H_2 dissolved in water to patient with COVID-19-like symptoms improves oxygen levels and exercise tolerance. However, whether the amelioration of respiratory symptoms after hydrogen administration was accompanied by other clinician- and patient-reported outcomes remained undetermined. In this case series, we evaluated the effects of drinking hydrogen-rich water (HRW) on various patient-reported outcomes, oxygen saturation, and bio-markers of inflammation and coagulation in COVID-19 patients.

A total of 24 COVID-19 patients (age 46.7 ± 10.6 years, 15 women) with mild to moderate disease severity (no hospital admission required at the enrollment) and no other co-morbidities were allocated to drink 1.5 liters of HRW per day for 14 days in a double-blind randomized placebo-controlled design, with super-saturated HRW (hydrogen level 8 ppm) administered three times per day. Molecular hydrogen in HRW was produced by the following reaction $Mg + H_2O \rightarrow H_2 + Mg(OH)_2$ and placebo drink was normalized for total magnesium amount and effervescent appearance. Both study participants and research personal were blinded to the treatment assignment. The primary outcomes (patient-reported symptoms and oxygen saturation) were assessed at baseline (pre-intervention) and at every 24-h interval during the duration of the trial; the secondary outcomes (circulatory bio-markers) were assessed at baseline and at 14-day follow-up. The study design was approved by the local IRB at the University of Novi Sad (# 2-CFHRW/2020 46–06-01/2020-1e1), with the study systematized following the Declaration of Helsinki and International Conference of Harmonization Efficacy Guidelines E6.

All patients were enrolled as soon as possible after a positive COVID-19 test, and the average delay for initiating the intervention was 3.1 ± 1.6 days (95% CI from 2.4 to 3.8 days), and the duration of the intervention was 13.4 ± 2.3 days (95% CI from 12.4 to 14.4 days). Regarding hospital admissions, bilateral severe pneumonia was developed in one patient (male, 62 years) from the control group who eventually was hospitalized; one patient from HRW group (woman, age 54) was hospitalized due to a COVID-induced relapse of thrombophlebitis. A two-way mixed ANOVA

(treatment vs. time interaction) revealed no significant differences for patient-reported outcomes (e.g. cough, dyspnea, headache, chest pain) and oxygen saturation ($p > 0.05$), except for an attenuated fatigue after HRW intervention ($p = 0.01$). HRW significantly affected prothrombin time (12.9 ± 0.94 s at baseline vs. 13.4 ± 1.1 s at follow-up; $p = 0.01$) and INR (international normalized ratio) (0.97 ± 0.08 vs 1.01 ± 0.09; $p = 0.01$). Serum interleukin six dropped for 5.8% after HRW intervention and increased for 16.2% in the control group ($p = 0.04$) (Figure 1); the levels were reduced in all female patients after HRW intervention (10 out of 10 patients), and in 60.0% of women (3 out of 5 patients) in the control group ($p = 0.02$). No significant differences were found between interventions for other circulatory bio-markers (e.g. ferritin, tumor necrosis factor alpha, fibrinogen, D-dimer). No patients reported any side effects from any intervention or disturbances in liver and kidney function.

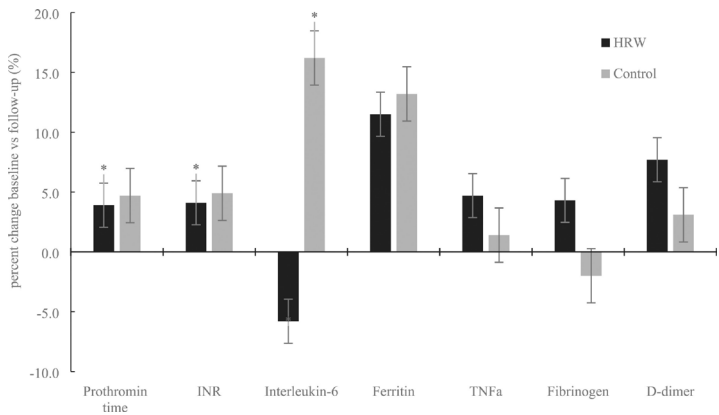


Figure 1. Percent changes in biochemical markers during the study. Error bars indicate standard error. Asterisk (*) indicates significant differences at $p < 0.05$ between baseline and follow-up for each circulatory bio-marker

This pilot case series with a convenient sample suggests possible beneficial effects and favorable safety of hydrogen-rich water in COVID-19 patients. Since placebo drink was normalized for total magnesium amount in this trial, the effects demonstrated in the HRW group (hydrogen plus magnesium) are likely due to biological effects of hydrogen owing to the fact that no significant effects were seen in the placebo group (magnesium only). It appears that HRW alleviates disease-related fatigue and modulates blood coagulation bio-markers, with possible anti-inflammatory effects being gender specific. Interleukin-6 dropped significantly after HRW intake which perhaps indicates an anti-inflammatory potential of the intervention. However, the changes in inflammatory response during COVID-19 are complex, and whether drop in interleukin-6 is beneficial by itself remains to

be addressed. Our results are in line with previous studies showing anti-fatigue potential of HRW after sleep deprivation, heavy exertion, and other stress-related conditions. Still, we recruited here a rather small number of COVID-19 patients, with gender disbalance (e.g. women were 1.5 times as many as men), limited age range (e.g. no younger people or elderly were included), along with a short list of biochemical indicators related to inflammation and fatigue monitored in this pilot trial.

Hydrogen-Rich Water Reduces Cravings, Improves Sleep, and Raises GLP-1 in Obese Adults

Analysis by Dr. Joseph Mercola

Story at-a-glance

- Drinking hydrogen-rich water daily for eight weeks reduced food cravings, improved sleep quality, and increased GLP-1, helping your body naturally regulate hunger, and fullness without strict dieting
- The biggest appetite changes occurred in physical hunger signals, meaning you feel less driven to eat even when food is available, making it easier to stay in control without relying on willpower
- Sleep improvements included falling asleep faster, fewer nighttime disruptions and better daytime energy, which directly supports healthier food choices and metabolic stability
- Hydrogen works at the cellular level by improving energy production, reducing oxidative stress, and restoring communication between your gut and brain, which resets how your body manages hunger and energy
- Supporting this process with the right habits — including hydrogen-rich water, avoiding seed oils, daily sunlight, and proper carbohydrate intake to restore butyrate and GLP-1 signaling — helps correct the root cause of cravings and metabolic dysfunction

If you're battling constant cravings, broken sleep, and the feeling that your body is working against you no matter what you try — the problem isn't willpower. It's disrupted biology. Appetite dysregulation, poor satiety signaling, and sleep disturbances create a self-reinforcing cycle that no amount of discipline can override, because the signals telling you to eat, stay awake, and store fat are coming from inside your own cells.

A clinical trial from the University of Novi Sad in Serbia shows that a single, simple intervention — drinking hydrogen-rich water daily for eight weeks — shifted multiple systems tied to that cycle at once. Cravings dropped. Sleep improved. The appetite hormone GLP-1 increased.

And none of it required strict dieting, exercise programs, or medications. The findings reveal a change in how the body produces energy, manages stress, and communicates hunger signals — which sets the stage for understanding exactly how hydrogen-rich water works inside your body.

Hydrogen Infused Water Shifts Hunger, Sleep, and Metabolism at Once

The study, published in the journal Medicina, followed 36 adults with obesity to determine how hydrogen-rich water affects appetite, sleep, body composition, and key metabolic markers like GLP-1, a gut-derived hormone that signals fullness to your brain and helps regulate blood sugar by slowing digestion and reducing appetite — the same hormone targeted by popular weight loss drugs like Ozempic.

Participants consumed 1 liter per day, split into three doses, delivering a total of 15 milligrams (mg) of molecular hydrogen, while a control group drank identical-looking water with no hydrogen. The design was randomized, placebo-controlled, and double-blind, meaning neither participants nor researchers knew who received the active treatment, which strengthens the reliability of the findings.

- Hydrogen group experienced measurable changes in cravings, sleep, and hormones — The group drinking hydrogen-rich water showed significant reductions in food cravings, improvements in sleep quality, and increases in GLP-1 levels compared to the control group. These weren't vague or subjective shifts alone.

Researchers used structured tools like the Food Cravings Questionnaire and Pittsburgh Sleep Quality Index to quantify changes in hunger and sleep patterns. At the same time, blood tests confirmed biochemical improvements, including cholesterol optimization and hormone changes tied directly to appetite control.

- Cravings dropped in a way you can actually feel day to day — One of the most striking findings involved appetite. The hydrogen group saw a meaningful reduction in total food cravings score, dropping by about 7.4 points compared to just 1.3 points in the control group.

That difference reflects fewer intrusive thoughts about food, less emotional eating, and better control over when and how much you eat. If you often feel like hunger drives your choices instead of the other way around, this is the exact shift that changes your daily experience.

- The strongest appetite changes showed up in physical hunger signals — Hydrogen-rich water had its biggest impact on cravings as a "physiological state," meaning actual bodily hunger rather than habit or emotion.

This includes the internal signals that tell you to eat even when you've already had enough. When those signals calm down, you stop fighting yourself. Instead of relying on willpower, your body starts cooperating.

- Sleep improvements extended beyond just feeling rested — Participants didn't just report better sleep in general terms. Specific areas improved, including how quickly they fell asleep, how often they woke up, and how they functioned during the day. Better sleep latency means you fall asleep faster.

Reduced disturbances mean fewer interruptions overnight. Improved daytime function means more stable energy and focus. When sleep improves across all these areas, your metabolism stabilizes, and your appetite becomes easier to manage.

- GLP-1 increased, directly changing how full you feel — Hydrogen-rich water significantly increased circulating GLP-1 levels compared to the placebo group, with a statistically meaningful effect size. When this hormone rises, you feel satisfied sooner and stay full longer. This is the same pathway targeted by many weight-loss drugs, but here it's influenced through a simple dietary intervention.

Why Hydrogen Works Quickly and Targets the Root Cause of Cravings

All of these changes occurred within just eight weeks, with participants maintaining over 97% adherence to the protocol. That high compliance matters. It shows the intervention was easy to follow and fit into daily routines. You're not looking at an extreme lifestyle overhaul. You're looking at something that integrates into your current habits without friction.

- Women showed even stronger responses in key areas — Subgroup analysis revealed that many of the improvements, especially in cravings and GLP-1 levels, were more pronounced in women.

This suggests a biological sensitivity that could relate to hormonal differences, appetite regulation pathways, or metabolic factors. If you struggle with persistent cravings despite doing everything "right", this finding highlights that your biology isn't working against you permanently. It can shift.

- Hydrogen calms the cellular damage that drives false hunger signals — At a deeper level, hydrogen acts as a signaling molecule in your body, not just a passive substance. It influences pathways related to oxidative stress, which is the buildup of cellular damage from unstable molecules. When oxidative stress drops, the cells responsible for hunger and energy signaling can finally communicate clearly — so your brain gets accurate information about when you actually need food.

- Gut-brain communication plays a central role — Hydrogen influences the gut–brain axis — the communication network between your digestive system and your brain. Much of this signaling travels through the vagus nerve, a physical nerve pathway that runs from your brainstem down to your gut, carrying messages in both directions.

When hydrogen improves the chemical environment in your gut, clearer signals travel up this nerve to your brain, including the hormones and metabolites that tell you whether you're genuinely hungry or already full.

- Neurotransmitters tied to cravings are directly affected — Researchers also identified changes in the glutamate-GABA-glutamine cycle, a brain chemistry loop that balances two opposing signals. Glutamate is the "fire up" signal that makes you alert and reactive; GABA is the "calm down" signal that keeps your responses in check.

When this balance is off, every food cue hits harder — the smell of bread, the sight of a snack — and cravings dominate your thinking. Hydrogen helped stabilize this cycle, meaning food stimuli lose their outsized grip on your attention.

- Cellular energy production improves at the same time — Hydrogen supports mitochondrial function, your cells energy production system, by acting as a selective anti-oxidant inside the mitochondria themselves. Your mitochondria generate energy through a chain of chemical reactions, and oxidative damage jams that chain at multiple points.

Hydrogen specifically neutralizes the most aggressive free radicals that cause that damage, without disrupting the beneficial ones your cells need for normal signaling. When this energy production system runs cleanly, your body stops relying on constant food intake as a backup fuel source.

How to Use Molecular Hydrogen to Fix Cravings and Restore Metabolic Control

Taken together, these mechanisms explain why the study participants didn't just see one number change on a blood test — they felt different day to day. Their hunger quieted. Their sleep deepened. Their energy stabilized. Science points to a body that was finally producing energy efficiently, communicating accurately between gut and brain, and no longer flooding itself with false hunger signals.

Those understanding matters, because it tells you exactly where to intervene. The steps below are designed to support each of these mechanisms directly — starting with hydrogen-rich water and

extending into the dietary and lifestyle factors that determine whether your cells can use it.

1. Use hydrogen-rich water the right way — Drop one hydrogen tablet into a glass of room-temperature water and drink it immediately after it fully dissolves and turns cloudy. That cloudy appearance tells you the hydrogen gas is active and ready to work. Look for tablets that generate 8 to 10 parts per million (ppm) of hydrogen and are independently tested for purity.

Timing matters. Drink it right away, because hydrogen escapes quickly once dissolved. Avoid swallowing the tablet directly and don't drink any remaining undissolved pieces. The reaction that releases hydrogen produces heat and taking dry risks burning tissue in your mouth, throat, or stomach. These tablets are designed to react in water, not inside your body.

2. Build consistency, then cycle your intake to stay responsive — Use hydrogen-rich water daily during periods when cravings, fatigue, or stress are high. Once your appetite and sleep stabilize, take short breaks for a few days or a couple of weeks. This keeps your body responsive instead of adapting and dulling the effect. Think of it the way you'd cycle any training stimulus — you want your metabolism to stay responsive, not adapted.

3. Eliminate the factors that block your cellular energy — If you consume seed oils, you're working against yourself. Soybean oil, corn oil, canola oil, and similar vegetable oils flood your cells with linoleic acid (LA), a polyunsaturated fat that destabilizes mitochondrial membranes and increases oxidative stress. Replace these oils with stable saturated fats such as grass-fed butter, ghee or tallow.

At the same time, remove ultra processed foods and most restaurant meals, since these almost always contain high amounts of seed oils. Your goal is to bring daily LA intake below 5 grams and ideally closer to 2 grams. To track your intake, download the upcoming Mercola Health Coach app, which includes the Seed Oil Sleuth feature that calculates LA exposure with precise accuracy.

4. Use sunlight to recharge your cellular energy daily — Get direct sun exposure every day, especially earlier in the day. Sunlight drives energy production at the cellular level and helps regulate your sleep-wake cycle. If your body is full of LA from years of seed oil consumption, your skin is more prone to burning during midday sun.

Avoid sunlight from 10 a.m. to 4 p.m. until you've reduced seed oils for at least six months, focusing instead on morning and late afternoon light. Once your tissues are free from these unstable fats, you'll tolerate more sun safely. Over time, this strengthens your energy production and supports better appetite control.

5. Rebuild your metabolism by restoring butyrate and GLP-1 signaling — Your gut bacteria convert carbohydrates into short-chain fatty acids like butyrate. Butyrate acts as fuel for your colon cells and plays a direct role in regulating appetite hormones. When your gut produces enough butyrate, natural GLP-1 secretion works properly, which improves satiety, stabilizes blood sugar, and supports healthy weight regulation.

Start with easy-to-digest carbs like whole fruit and white rice, then slowly increase fiber as your gut heals to avoid excess endotoxin production. Pair this with adequate protein, about 0.8 grams per pound of lean body mass (or 1.76 grams per kilogram) and make one-third from collagen-rich sources like slow-cooked meats or bone broth. When this system is working, your hunger signals normalize and your body stops pushing you to overeat.

FAQs About Hydrogen-Rich Water, Cravings, and Metabolism

Q: How does hydrogen-rich water reduce cravings?

A: Hydrogen-rich water works by improving how your body regulates hunger signals at the cellular level. In the study, participants experienced a measurable drop in cravings, especially physical hunger signals, not just emotional eating. This shift happens because hydrogen supports better communication between your gut and brain and helps normalize appetite hormones like GLP-1.

Q: What is GLP-1 and why does it matter for weight control?

A: GLP-1 is a hormone released in your gut that tells your brain you're full and helps regulate blood sugar. When GLP-1 levels increase, you feel satisfied sooner and eat less without forcing it. This is the same hormone targeted by drugs like Ozempic, but in this case, your body increases it naturally.

Q: How quickly do the benefits of hydrogen-rich water show up?

A: The study showed noticeable improvements in just eight weeks. Participants reported better sleep, reduced cravings and improved metabolic markers within that timeframe. Because the approach fits easily into daily routines, adherence stayed above 97%, which means the results came from consistent, realistic use.

Q: Does hydrogen-rich water help with sleep as well as appetite?

A: Yes. Participants fell asleep faster, woke up less often and functioned better during the day. Better sleep directly supports appetite control because poor sleep increases hunger hormones and weakens decision-making around food.

Q: Why does gut health matter for controlling cravings and GLP-1?

A: Your gut bacteria produce compounds like butyrate when they break down carbohydrates and fiber. Butyrate fuels your colon cells and helps regulate GLP-1 production. When this system works properly, your body naturally controls hunger, improves insulin sensitivity and supports healthy weight regulation without relying on willpower.

Hydrogen Water and Eye Health

Posted on December 9, 2019 by Rhona Reid

Whether you're short-sighted, long-sighted or have perfect vision, we all want problem-free, functioning eyes. Did you know that Hydrogen Water helps our eyes to stay healthy? Keep reading below to learn how!

Hydrogen Water helps to keep your eyes healthy.

Antioxidants and Eye Health

As with everything, eating right is a big factor when it comes to our eyes. Antioxidant-rich foods containing vitamin C are particularly good for our eye health.

Were you ever told as a kid that carrots help you to see in the dark? It seems that our grandmothers' saying is rooted in scientific fact!

Drinking freshly ionized Hydrogen Water directly from a special pouch takes things to another level.

It means that you're maximizing your intake of powerful, free radical-busting antioxidants and vital minerals with every pouch.

"Water treated by electrolysis to increase its reduction potential is the best solution to the problem of providing a safe source of free electrons to block the oxidation of normal tissue by free oxygen radicals." – **Dr. Hidemitsu Hayashi, Director of the Water Institute of Japan**

Can My Eyes Get Dehydrated?

Yes, they can!

Underpinning all aspects of robust good health is being properly hydrated, and your eyes need hydration just like every other part of your body.

Dehydration can be detrimental to eye health, which is why ultra-hydrating Hydrogen Water is so important.

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Hydrogen-rich water as a modulator of gut microbiota?

Sergej M. Ostojic *

FSPE Applied Bioenergetics Lab, University of Novi Sad, Novi Sad, Serbia

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ABSTRACT

Hydrogen-rich water (HRW) is an innovative functional drink with many professed benefits for human health, including good intestinal viability and gut microbiota upregulation. A source of molecular hydrogen, HRW might be a convenient medium to deliver this bioactive gas to the gastrointestinal tract, and perhaps modulate the activity of both hydrogen-producing and hydrogen-consuming bacteria, abundant members of the intestinal microbiota community. This paper summarizes the findings from previous studies evaluating a response of gut microbiota to HRW intake and discusses possible mechanisms and medical consequences of this interaction. It appears that only a handful of rodent studies and one human randomized-controlled trial investigated how drinking HRW affects gut microbiota, with all studies published from 2018 onwards. HRW-induced protection of the gut barrier integrity and upregulation of butyrate-producing bacteria were seen in most studies, with HRW ameliorated clinical features of gut microbiota disturbances, including diarrhea rate, weight, and fluid loss. However, no well-powered multicentric trial evaluated the effectiveness of HRW consumption so far in common gastrointestinal diseases with gut flora scenario, including inflammatory bowel disease, irritable bowel syndrome, gastroenteritis and colitis of infectious origin. HRW might be an up-and-coming compound that might tune endogenous H_2 homeostasis and modulate gut microbiota but it should still be perceived as an experimental drink and not widely recommended to the general public.

1. Introduction

Hydrogen-rich water (HRW, or hydrogen-infused water) is an emerging functional drink with purported beneficial effects on human health. Over 150 studies with HRW were published in the past decade or so, with human trials reported in 2019–2020 alone have shown advantageous effects of consuming HRW in patients with non-alcoholic fatty liver disease (Korovljev, Stajer, Ostojic, LeBaron, & Ostojic. 2019), metabolic syndrome (LeBaron et al., 2020), in elite athletes to relieve psychometric fatigue (Mikami et al., 2019) and improve performance (Botek, Krejčí, McKune, and Sládečková, 2020), and healthy adults to reduce inflammatory responses and prevent apoptosis (Sim et al., 2020), to quote but a few recent reports. Although many contentious issues surround its medicinal properties (Ostojic, 2019), HRW is an apparent source of molecular hydrogen (H_2), a bioactive gas that is believed to act as a selective antioxidant, anti-inflammatory, antiapoptotic and signaling agent (for more details see Ohta, 2014). A unique molecular target for H_2 remains unknown yet few studies imply its possible role in the fine-tuning of homeostasis (Ishibashi, 2019; LeBaron, Kura, Kalocayova, Tribulova, & Slezak, 2019), perhaps similar to other naturally-occurring gases such as NO, H_2S and CO. Besides other plausible targets, exogenous H_2 delivered by HRW can have an effect on gut microbiota, a complex community of over 100 trillion microbial cells which influence human physiology, metabolism, nutrition and immune function (Guinane & Cotter, 2013). The fact that intestinal microbiota produces and utilizes endogenous hydrogen gas by itself (approximately 12 L of gaseous hydrogen per day) makes HRW performance in the human gut even more convoluted. To address this, I summarized findings from previous studies that evaluated a response of gut flora to HRW intake and discussed possible mechanisms and medical consequences of the interaction.

2. Research studies on HRW and gut microbiota

A handful of rodent studies and one human trial investigated how drinking HRW affects gut microbiota, with all studies appeared from 2018 onwards (Table 1). Arguably the first study, published in January 2018 by a Chinese research group, evaluated whether HRW administration affects radiation-induced small intestine toxicity in an animal model (Xiao et al., 2018). The authors reported that force-fed mice

E-mail address: sergej.ostojic@chess.edu.rs.
* Address: FSPE Applied Bioenergetics Lab, University of Novi Sad, Lovcenska 16, Novi Sad 21000, Serbia.

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Hydrogen: A Novel Treatment Strategy in Kidney Disease

Bo Wang[a] Zhuoshu Li[b, c] Longfei Mao[d] Mingyi Zhao[b] Bingchang Yang[e]
Xiaowu Tao[a] Yuxiang Li[a] Guangming Yin[a]

[a]Department of Urology, The Third Xiangya Hospital, Central South University, Changsha, China; [b]Department of Pediatrics, The Third Xiangya Hospital, Central South University, Changsha, China; [c]Xiangya School of Medicine, Central South University, Changsha, China; [d]Bioinformatics Center, College of Biology, Hunan University, Changsha, China; [e]Department of Critical Care Medicine, Central South University, Changsha, China

Keywords
Hydrogen · Kidney disease · Anti-inflammatory · Antioxidant · Cell death

Abstract
Background: Hydrogen is a chemical substance that has yet to be widely used in medicine. However, recent evidence indicates that hydrogen has multi-faceted pharmacological effects such as antioxidant, anti-inflammatory, and antiapoptotic properties. An increased number of studies are being conducted on the application of hydrogen in various diseases, especially those affecting the renal system. ***Summary:*** Hydrogen can be inhaled, as a gas or liquid, and can be administered orally, intravenously, or locally. Hydrogen can rapidly enter suborganelles such as mitochondria and nucleus by simple diffusion, producing reactive oxygen species (ROS) and triggering DNA damage. Hydrogen can selectively scavenge hydroxyl radical (•OH) and peroxynitrite ($ONOO^-$), but not other reactive oxygen radicals with physiological functions, such as peroxyanion (O_2^-) and hydrogen peroxide (H_2O_2). Although the regulatory effect of hydrogen on the signal transduction pathway has been confirmed, the specific mechanism of its influence on signal molecules remains unknown. Although many studies have investigated the therapeutic and preventive effects of H_2 in cellular and animal experiments, clinical trials are few and still far behind. As a result, more clinical trials are required to investigate the role of hydrogen in kidney disease, as well as the effect of its dose, timing, and form on the overall efficacy. Large-scale randomized controlled clinical trials will be required before hydrogen can be used to treat renal illnesses. ***Key Messages:*** This article reviews the mechanisms of hydrogen in the treatment of renal disease and explores the possibilities of its use in clinical practice.

Introduction

Kidney disease is one of the most common diseases in humans. Common types of kidney disease include acute kidney injury (AKI), renal fibrosis, polycystic kidney disease, and renal cell carcinoma. There are many treatment options available for kidney diseases, including drug therapy, kidney dialysis, and kidney transplantation. In recent years, increasing attention has been paid to research using hydrogen to treat these diseases. Hydrogen exhibits

karger@karger.com
www.karger.com/kdd

Correspondence to:
Guangming Yin, yingm75@126.com

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MEDICAL GAS RESEARCH

SHORT COMMUNICATION Open Access

Effects of drinking hydrogen-rich water on the quality of life of patients treated with radiotherapy for liver tumors

Ki-Mun Kang[1], Young-Nam Kang[1], Ihil-Bong Choi[1,2], Yeunhwa Gu[2,3], Tomohiro Kawamura[4], Yoshiya Toyoda[4] and Atsunori Nakao[4,5*]

Abstract

Background: Cancer patients receiving radiotherapy often experience fatigue and impaired quality of life (QOL). Many side effects of radiotherapy are believed to be associated with increased oxidative stress and inflammation due to the generation of reactive oxygen species during radiotherapy. Hydrogen can be administered as a therapeutic medical gas, has antioxidant properties, and reduces inflammation in tissues. This study examined whether hydrogen treatment, in the form of hydrogen-supplemented water, improved QOL in patients receiving radiotherapy.

Methods: A randomized, placebo-controlled study was performed to evaluate the effects of drinking hydrogen-rich water on 49 patients receiving radiotherapy for malignant liver tumors. Hydrogen-rich water was produced by placing a metallic magnesium stick into drinking water (final hydrogen concentration; 0.55~0.65 mM). The Korean version of the European Organization for Research and Treatment of Cancer's QLQ-C30 instrument was used to evaluate global health status and QOL. The concentration of derivatives of reactive oxidative metabolites and biological antioxidant power in the peripheral blood were assessed.

Results: The consumption of hydrogen-rich water for 6 weeks reduced reactive oxygen metabolites in the blood and maintained blood oxidation potential. QOL scores during radiotherapy were significantly improved in patients treated with hydrogen-rich water compared to patients receiving placebo water. There was no difference in tumor response to radiotherapy between the two groups.

Conclusions: Daily consumption of hydrogen-rich water is a potentially novel, therapeutic strategy for improving QOL after radiation exposure. Consumption of hydrogen-rich water reduces the biological reaction to radiation-induced oxidative stress without compromising anti-tumor effects.

Background

Radiotherapy is one of the major treatment options for malignant neoplasms. Nearly half of all newly diagnosed cancer patients will receive radiotherapy at some point during treatment and up to 25% may receive radiotherapy a second time [1]. While radiotherapy destroys malignant cells, it adversely affects the surrounding normal cells [2]. Acute radiation-associated side effects include fatigue, nausea, diarrhea, dry mouth, loss of appetite, hair loss, sore skin, and depression. Radiation increases the long-term risk of cancer, central nervous system disorders, cardiovascular disease, and cataracts. The likelihood of radiation-induced complications is related to the volume of the irradiated organ, the radiation dose delivered, the fractionation of the delivered dose, the delivery of radiation modifiers, and individual radiosensitivity [3]. Most radiation-induced symptoms are believed to be associated with increased oxidative stress and inflammation, due to the generation of reactive oxygen species (ROS) during radiotherapy, and may significantly affect the patient's quality of life (QOL) [2].

* Correspondence: anakao@imap.pitt.edu
[4]Department of Cardiothoracic Surgery, University of Pittsburgh, Pittsburgh, Pennsylvania, USA
Full list of author information is available at the end of the article

Molecular Hydrogen for Macular Degeneration, Cataracts, and Diabetic Retinopathy

Molecular Hydrogen is gaining popularity as a therapy for everything from skin problems to eye disease to arthritis to cancer. Is molecular hydrogen the latest supplement craze? Or is there merit to using this therapy? Find out how it works and look at the research.

The Smallest Molecule has Advantages

Hydrogen is the very first molecule on the Periodic Table of Elements. As the smallest molecule, hydrogen can reach places that other molecules cannot. For example, hydrogen easily crosses the blood-brain barrier and reaches the interior of the eyes. It can also get into the smallest parts of the cells, which many other anti-oxidants cannot. Modular hydrogen is two molecules of hydrogen bonded to each other. Water is H_2O — two molecules of hydrogen plus a molecule of oxygen. Molecular hydrogen is written as H_2.

Molecular hydrogen has been studied as a therapy for over 50 years. H_2 is available as tablets that you drop into water and drink. H_2 can also be breathed in as a gas. A doctor can inject molecular hydrogen or provide it intravenously.

Molecular Hydrogen is a Super Anti-oxidant

Due to its stability and neutral charge, molecular hydrogen is a very potent anti-oxidant. Anti-oxidants are the antidote to free radicals. Free radicals are unstable atoms that cause damage to cells. Too many free radicals in the body cause a state of oxidative stress, contributing to the development of many common diseases.

An anti-oxidant stabilizes a free radical by donating an electron. This reduces the free radical's ability to do harm. For example, vitamin C in citrus fruit is a powerful anti-oxidant. However, eating more of a specific food will not harness hydrogen's anti-oxidant powers. Hydrogen is already in everything you eat.

Therapeutic H_2

The easiest way to add molecular hydrogen to the body is by drinking hydrogen infused water. You can make it at home by dissolving a small tablet into ordinary drinking water. Or purchase a hydrogen water generator. Water already contains two molecules of hydrogen attached to one molecule of oxygen. Adding molecular hydrogen turns the water into "hydrogen infused water."

Follow the directions on the package and consult with your doctor before taking any supplement.

Another way to get molecular hydrogen into the body is inhalation. Breathed straight into the lungs, this delivery method is preferred for lung problems, and heart and circulation issues. Hydrogen gas is so small that it enters the bloodstream quickly. You might use a special inhaler or molecular hydrogen generator device. This therapy can be useful for lung infections, acute COVID, "long-COVID", allergies, heart disease, hardening of the arteries, asthma, and COPD.

In medical offices, molecular hydrogen can be given intravenously or by injection.

What the Research on Molecular Hydrogen Shows

A large body of research into H_2's benefits covers a wide range of diseases. This includes inflammatory diseases, cognitive issues, Parkinson's disease, and metabolic syndromes. H_2 has also been studied in ischemia – reperfusion (I/R) injuries (damage due to stopped blood flow) in the brain, liver, myocardium, intestines, and kidneys.

Molecular hydrogen therapy is well-studied for its effects on the eyes. Diabetic retinopathy, cataracts, glaucoma, age-related macular degeneration, retinitis pigmentosa, dry eye disease, corneal diseases and retinal issues are just a few.

H_2 is so tiny that it easily permeates the eyes. The eyes are especially sensitive to oxidative damage. This is why seniors often develop one or more eye diseases as they age. Preventing eye disease, and slowing its progress, are two crucial goals for seniors.

Macular Degeneration

Age-related macular degeneration (AMD) is a serious eye disease that can result in vision loss. Treatment options include uncomfortable eye injections. In its advanced stages, extra blood vessels form on the retina, obscuring vision. Hydrogen gas is both an anti-oxidant and anti-inflammatory. Research is underway on how H_2 might suppress the growth of unwanted blood vessels in the eyes of AMD patients. The gas might also decrease the damaging blood vessel leakage. H_2 appears to help reduce drusen build-up found in dry AMD.

Retinitis Pigmentosa and Molecular Hydrogen

Retinitis pigmentosa causes vision loss because the photoreceptor cells gradually die. A type of free radical plays a role in the process. Hydrogen neutralizes this specific type of free radicals, which helps protect the photoreceptors from harm.

H_2 and Glaucoma

The main risk factor in glaucoma is elevated eye pressure. Therefore, the management of glaucoma is primarily focused on controlling intraocular pressure using eye drops. However, this treatment does not usually stop glaucoma's progression and damage to the optic nerve.4 Glaucoma is a complex family of diseases. Other factors in its progression include inflammation, oxidative stress, and the accumulation of protein mutations. Oxidative stress markers are often higher in glaucoma patients.

Traumatic Optic Neuropathy

A traumatic injury to the eye can cause damage to the retinal ganglion cells. Also, cells can die in the retina. Scientists are studying whether cell death after an injury could be made worse by oxidative stress. An important study looked at rats with traumatic eye injuries. The researchers found that hydrogen helped the retinal cells survive. It also enhanced visual function recovery.

Cataracts

The usual treatment for cataracts is surgery. The eye doctor replaces the cloudy lens with an artificial one. However, a study indicates that hydrogen could be an alternative therapy for cataracts. In animal testing, hydrogen slowed cataract formation. Classic theories suggest that free radical damage plays a vital role in starting cataract formation.

Diabetic Retinopathy

Given that diabetes rates are on the rise, the rate of diabetic retinopathy is also increasing. Patients with diabetes have a 1 in 4 chance of getting this eye disease. Oxidative stress is an important factor in diabetic retinopathy because it starts breaking down the blood-retinal barrier. This barrier damage starves the retina of nutrients. It also stops filtering out toxins efficiently.

Corneal Injury and Dry Eye Disease

Doctors have started testing molecular hydrogen on patients with dry eye disease. They are also looking into H_2 for corneal endothelial injuries. So far, the treatment looks beneficial. For example, alkaline chemicals, such as sparklers, dishwasher powders, and fertilizers, can do significant damage when they get into the eyes. Scientists are researching a molecular hydrogen-enriched irrigation solution to minimize the damage to the eyes from alkaline burns.

Conclusion

After half a century of interest in molecular hydrogen as a therapy, the research is promising. Hydrogen's small size and strong anti-oxidant properties mean that molecular hydrogen is much more than a fad. You can make hydrogen water on demand using an over-the-counter additive or machine. Hydrogen infused water can replace the water you drink throughout the day. Or, breathe in molecular hydrogen using a special inhaler or molecular hydrogen generator device. The anti-oxidants will help your body fight free radicals and reduce the effects of aging.

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http://www.medicalgasresearch.com/content/1/1/24

MEDICAL GAS RESEARCH

RESEARCH Open Access

Open-label trial and randomized, double-blind, placebo-controlled, crossover trial of hydrogen-enriched water for mitochondrial and inflammatory myopathies

Mikako Ito[1†], Tohru Ibi[2†], Ko Sahashi[3], Masashi Ichihara[4], Masafumi Ito[5] and Kinji Ohno[1*]

Abstract

Background: Molecular hydrogen has prominent effects on more than 30 animal models especially of oxidative stress-mediated diseases and inflammatory diseases. In addition, hydrogen effects on humans have been reported in diabetes mellitus type 2, hemodialysis, metabolic syndrome, radiotherapy for liver cancer, and brain stem infarction. Hydrogen effects are ascribed to specific radical-scavenging activities that eliminate hydroxyl radical and peroxynitrite, and also to signal-modulating activities, but the detailed molecular mechanisms still remain elusive. Hydrogen is a safe molecule that is largely produced by intestinal bacteria in rodents and humans, and no adverse effects have been documented.

Methods: We performed open-label trial of drinking 1.0 liter per day of hydrogen-enriched water for 12 weeks in five patients with progressive muscular dystrophy (PMD), four patients with polymyositis/dermatomyositis (PM/DM), and five patients with mitochondrial myopathies (MM), and measured 18 serum parameters as well as urinary 8-isoprostane every 4 weeks. We next conducted randomized, double-blind, placebo-controlled, crossover trial of 0.5 liter per day of hydrogen-enriched water or placebo water for 8 weeks in 10 patients with DM and 12 patients with MM, and measured 18 serum parameters every 4 weeks.

Results: In the open-label trial, no objective improvement or worsening of clinical symptoms was observed. We, however, observed significant effects in lactate-to-pyruvate ratios in PMD and MM, fasting blood glucose in PMD, serum matrix metalloproteinase-3 (MMP3) in PM/DM, and serum triglycerides in PM/DM. In the double-blind trial, no objective clinical effects were observed, but a significant improvement was detected in lactate in MM. Lactate-to-pyruvate ratios in MM and MMP3 in DM also exhibited favorable responses but without statistical significance. No adverse effect was observed in either trial except for hypoglycemic episodes in an insulin-treated MELAS patient, which subsided by reducing the insulin dose.

Conclusions: Hydrogen-enriched water improves mitochondrial dysfunction in MM and inflammatory processes in PM/DM. Less prominent effects with the double-blind trial compared to the open-label trial were likely due to a lower amount of administered hydrogen and a shorter observation period, which implies a threshold effect or a dose-response effect of hydrogen.

* Correspondence: ohnok@med.nagoya-u.ac.jp
† Contributed equally
[1]Division of Neurogenetics, Center for Neurological Diseases and Cancer, Nagoya University Graduate School of Medicine, 65 Tsurumai, Showa-ku, Nagoya 466-8550, Japan
Full list of author information is available at the end of the article

Hydrogen Infused Water Alleviates Obliterative Airway Disease

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Objective:

Bronchiolitis obliterans syndrome arising from chronic airway inflammation is a leading cause of death following lung transplantation. Several studies have suggested that inhaled hydrogen can protect lung grafts from ischemia-reperfusion injury via anti-inflammatory and -oxidative mechanisms. We investigated whether molecular hydrogen-saturated water can preserve lung allograft function in a heterotopic tracheal allograft model of obliterative airway disease and were subsequently administered hydrogen infused water (10 ppm) or tap water (control group) (n = 6 each) daily without any immuno suppressive treatment. Histological and immuno histochemical analyses were performed on days 7, 14, and 21.

Results

Hydrogen infused water decreased airway occlusion on day 14. No significant histological differences were observed on days 7 or 21. The cluster of differentiation 4/cluster of differentiation 3 ratio in tracheal allografts on day 14 was higher in the hydrogen water group than in control. Enzyme-linked immuno sorbent assay performed on day 7 revealed that hydrogen water reduced the level of the pro-inflammatory cytokine interleukin-6 and increased that of fork head box P3 transcription factor, suggesting an enhancement of regulatory T cell activity.

Conclusions

Hydrogen infused water suppressed the development of mid-term obliterative airway disease in a tracheal allograft model via anti-oxidant and -inflammatory mechanisms and through the activation of Tregs. Thus, hydrogen infused water is a potential treatment strategy for BOS that can improve the outcome of lung transplant patients.

These results indicate that molecular hydrogen may be a novel preventive and therapeutic approach for COPD. In a pilot study, hydrogen gas inhalation ameliorates airway inflammation in bronchial asthma.

Is Hydrogen Infused Water Good for Lungs?

Indeed, hydrogen infused water has been reported to improve various diseases and tissue injuries through anti-oxidative and anti-inflammatory activities including Pulmonary Inflammation and Asthma, Cerebral Infarction (stroke), Alzheimer's Disease, Parkinson's Disease, Rheumatoid Arthritis (RA), Diabetes and COPD patients.

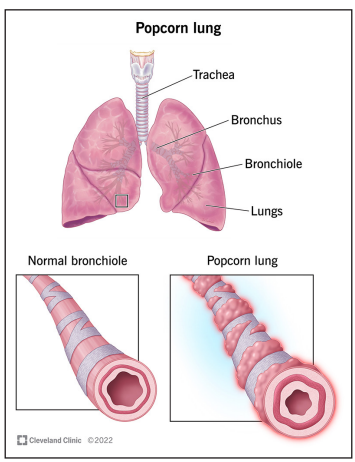
What does hydrogen do in the respiratory system?

An increasing number of studies have revealed that hydrogen may protect the lungs from diverse diseases, including acute lung injury, chronic obstructive pulmonary disease, asthma, lung cancer, pulmonary arterial hypertension, and pulmonary fibrosis. Molecular hydrogen is a promising therapeutic agent for pulmonary disease

Abstract:

Molecular hydrogen exerts biological effects on nearly all organs. It has anti-oxidative, anti-inflammatory, and anti-aging effects and contributes to the regulation of autophagy and cell death. As the primary organ for gas exchange, the lungs are constantly exposed to various harmful environmental irritants. Short- or long-term exposure to these harmful substances often results in lung injury, causing respiratory and lung diseases. Acute and chronic respiratory diseases have high rates of morbidity and mortality and have become a major public health concern worldwide.

For example, Coronavirus Disease 2019 (COVID-19) caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) has become a global pandemic. An increasing number of studies have revealed that hydrogen may protect the lungs from diverse diseases, including acute lung injury, chronic obstructive pulmonary disease, asthma, lung cancer, pulmonary arterial hypertension, and pulmonary fibrosis. In this review, we highlight the multiple functions of hydrogen and the mechanisms underlying its protective effects in various lung diseases, with a focus on its roles in disease pathogenesis and clinical significance.



Clinical Trial/Experimental Study

Medicine

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Effects of concomitant use of hydrogen water and photobiomodulation on Parkinson disease

A pilot study

Chien-Tai Hong, MD, PhD[a,b], Chaur-Jong Hu, MD[a,b], Hung-Yu Lin, PhD[c], Dean Wu, MD, PhD[a,b,*]

Abstract

Background: Parkinson disease (PD), the second most common neurodegenerative disease, has no cure or applicable disease-modifying approach, only symptomatic therapy. Oxidative stress and mitochondrial dysfunction play key roles in PD pathophysiology. Animal studies have demonstrated that photobiomodulation (PBM) may enhance mitochondrial function and boost adenosine triphosphate production, thus alleviating PD symptoms; however, this process can cause increased reactive oxygen species (ROS) production. Molecular hydrogen (H_2) is a potent and possibly therapeutic antioxidant that can mitigate the effect of ROS. PBM targeting the brainstem may facilitate neuronal activity, and the concomitant H_2 may clear additional ROS produced by PBM. Therefore, this study aimed to determine the safety and effectiveness of PBM + H_2 in patients with PD.

Methods: We included 18 patients with PD (age 30–80 years) who were at Hoehn and Yahr stages II-III. All the participants received daily PBM + H_2 therapy for 2 weeks. The adverse event and the Unified Parkinson Disease Rating Scale (UPDRS) scores were recorded.

Results: We noted that the UPDRS scores began significantly decreasing from the first week, and this improvement persisted until the end of therapy. Moreover, no adverse event was recorded. After 1 week of therapy cessation, UPDRS scores slightly increased but the improvement remained significant compared with the baseline.

Conclusion: This novel, proof-of-concept study demonstrated that PBM+H_2 therapy is safe and reduces disease severity. A larger-scaled clinical trial is warranted to completely investigate the effects of PBM + H_2 therapy on PD.

Abbreviations: ANOVA = analysis of variance, ATP = adenosine triphosphate, H_2 = molecular hydrogen, LED = light-emitting diode, PBM = photobiomodulation, PD = Parkinson disease, ROS = reactive oxygen species, UPDRS = Unified Parkinson Disease Rating Scale.

Keywords: hydrogen water, Parkinson disease, photobiomodulation

Editor: Yi Zhu.

HYL is the original idea initiator.

This study was approved by the Ministry of Health and Welfare of Taiwan (Case No.: 1070003422) and the JIRB of Taipei Medical University (Case No.: N201803065). Informed consent was obtained from all study participants.

All authors had agreed to release the copyright once the manuscript be acceptable for publication.

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

The authors have no conflicts of interest to disclose.

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[a] Department of Neurology, Taipei Medical University Shuang Ho Hospital, New Taipei City, [b] Department of Neurology, School of Medicine, College of Medicine, Taipei Medical University, [c] National Taipei University of Technology, Taipei, Taiwan.

[*] Correspondence: Dean Wu, Department of Neurology, Shuang Ho Hospital, Taipei Medical University, No. 291, Zhongzheng Rd, Zhonghe District, New Taipei City 23561, Taiwan (e-mail: tingyu02139@gmail.com).

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1. Introduction

Parkinson disease (PD), the second most common neurodegenerative disease, affects approximately 1% of people aged >60 years.[1] Currently, the only available modality for PD management is symptomatic and is mainly based on exogenous dopaminergic supplement. No cure or disease-modifying approach to halt PD progression is available. In most people, PD progression leads to the impairment of the quality of life and a large economic burden on the patients themselves, their families, and the whole society.[2,3]

Since the discovery of laser in the 1960s, laser therapy has been reported to have the potential to improve wound healing and reduce pain, inflammation, and swelling (review by Lemes et al).[4] Some animal studies have determined that red to infrared light or photobiomodulation (PBM) is neuroprotective in patients with PD.[5–7] Low-level PBM, involving the application of red to near-infrared light (600–1000 nm) at a power density of 1 to 5 W/cm^2, has been clinically applied globally for many disorders that require tissue healing and regeneration and tissue death prevention.[8] Although the basic mechanisms underlying the beneficial effect of PBM is unclear, the mechanisms possibly involve the improvement of mitochondrial function and cellular metabolism,[9,10] which is in contrast to the main PD pathogeneses involving mitochondrial dysfunction.[11] The other major PD pathogenesis mechanism is the excessive net production of reactive oxygen species (ROS) and oxidative damage. Dysfunctional mitochondria generate overwhelming levels of ROS

A Randomized, Double-blind, Multi-center Trial of Hydrogen Water for Parkinson's Disease: Protocol and Baseline Characteristics

Asako Yoritaka, Takashi Abe, Chigumi Ohtsuka, Tetsuya Maeda, Masaaki Hirayama, Hirohisa Watanabe, Hidemoto Saiki, Genko Oyama, Jiro Fukae, Yasushi Shimo, Taku Hatano, Sumihiro Kawajiri, Yasuyuki Okuma, Yutaka Machida, Hideto Miwa, Chikako Suzuki, Asuka Kazama, Masahiko Tomiyama, Takeshi Kihara, Motoyuki Hirasawa, Hideki Shimura, and Nobutaka Hattori

Abstract:

Background: In patients with Parkinson's Disease (PD), the pharmacological replacement of dopamine and other anti-parkinsonian drugs has been used for symptomatic therapy. However, none of these drugs stop or lessen the dopaminergic neuronal degeneration or the progression of the disease. Findings of increased iron and lipid peroxidation and decreased levels of reduced glutathione in the substantia nigra strongly suggest that enhanced oxidative stress is involved in the pathogenesis of PD. Thus, anti-oxidant therapies might slow the progression of PD. Molecular hydrogen (H_2) has recently been highlighted as a therapeutic and preventive antioxidant. Since the first publication, more than 150 papers have confirmed the efficacy of H_2 in various animal models. H_2-water reduced dopaminergic neuronal cell loss in a 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) mouse model as well as 6-hydroxydopamine did. Our previous randomized double-blind study has shown that drinking 1,000 ml of H_2-water for 48 weeks significantly improved ($p < 0.05$) the total Unified Parkinson's Disease Rating Scale (UPDRS) scores of patients with PD who were being treated with levodopa. In the present study, we aimed to confirm these results by conducting a longer and more large-scale trial that also included patients who were not being treated with levodopa. Here, we present the design and the baseline characteristics of participants already enrolled in this study.

Our previous randomized double-blind study showed that drinking hydrogen (H_2) water for 48 weeks significantly improved the total Unified Parkinson's Disease Rating Scale (UPDRS) score of Parkinson's Disease (PD) patients treated with levodopa. We aim to confirm this result using a randomized double-blind placebo-controlled multi-center trial.

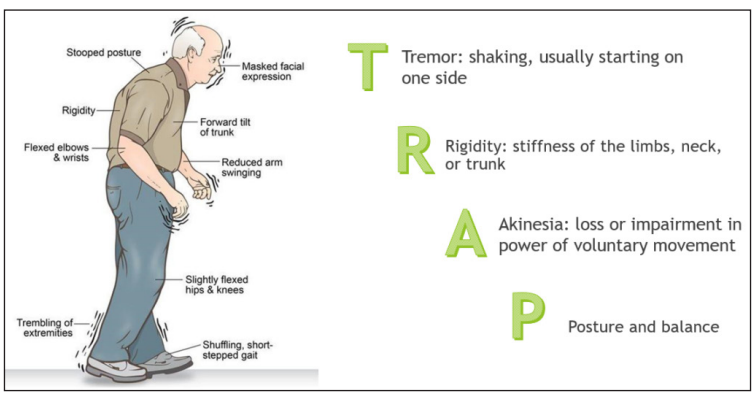
Methods: Changes in the total UPDRS scores from baseline to the 8th, 24th, 48th, and 72nd weeks, and after the 8th week, will be evaluated. The primary endpoint of the efficacy of this treatment in PD is the change in the total UP DRS score from baseline to the 72nd week. The changes in UPDRS part II, UPDRS part III, each UPDRS score, PD Questionnaire-39 (PDQ-39), and the modified Hoehn and Yahr stage at these same time-points, as well as the duration until the protocol is finished because additional levodopa is required or until the disease progresses, will also be analyzed. Adverse events

and screening laboratory studies will also be examined. Participants in the hydrogen water group will drink 1,000 ml/day of H_2 water, and those in the placebo water group will drink normal water. One-hundred-and-seventy-eight (178) participants with PD (89 women, 89 men; mean age: 64.2 [SD 9.2] years, total UPDRS: 23.7 [11.8], with levodopa medication: 154 participants, without levodopa medication: 24 participants; daily levodopa dose: 344.1 [202.8] mg, total levodopa equivalent dose: 592.0 [317.6] mg) were enrolled in 14 hospitals and were randomized.

Discussion: This study will confirm whether H_2 water can improve PD symptoms.

Trial registration: UMIN000010014 (February, 13, 2013)

Keywords: Hydrogen, oxidative stress, Parkinson's Disease, randomized double-blind placebo-controlled multicenter trial



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Pilot Study of H_2 Therapy in Parkinson's Disease: A Randomized Double-Blind Placebo-Controlled Trial

Asako Yoritaka, MD, PhD,[1,2] Masashi Takanashi, MD, PhD,[1] Masaaki Hirayama, MD, PhD,[3] Toshiki Nakahara, MD, PhD,[1] Shigeo Ohta, PhD,[4] and Nobutaka Hattori, MD, PhD[1]*

[1]Department of Neurology, Juntendo University School of Medicine, Tokyo, Japan; [2]Department of Neurology, Juntendo Koshigaya Hospital, Tokyo, Japan; [3]Department of Pathophysiological Laboratory Science, Nagoya University Graduate School of Medicine, Tokyo, Japan; [4]Department of Biochemistry and Cell Biology, Institute of Development and Aging Sciences, Nippon Medical School, Tokyo, Japan

ABSTRACT

Background: Oxidative stress is involved in the progression of Parkinson's disease (PD). Recent studies have confirmed that molecular hydrogen (H_2) functions as a highly effective antioxidant in cultured cells and animal models. Drinking H_2-dissolved water (H_2-water) reduced oxidative stress and improved Parkinson's features in model animals.

Methods: In this a placebo-controlled, randomized, double-blind, parallel-group clinical pilot study, the authors assessed the efficacy of H_2-water in Japanese patients with levodopa-medicated PD. Participants drank 1,000 mL/day of H_2-water or pseudo water for 48 weeks.

Results: Total Unified Parkinson's Disease Rating Scale (UPDRS) scores in the H_2-water group (n=9) improved (median, −1.0; mean±standard deviation, −5.7±8.4), whereas UPDRS scores in the placebo group (n=8) worsened (median, 4.5; mean±standard deviation, 4.1±9.2). Despite the minimal number of patients and the short duration of the trial, the difference was significant ($P<0.05$).

Conclusions: The results indicated that drinking H_2-water was safe and well tolerated, and a significant improvement in total UPDRS scores for patients in the H_2-water group was demonstrated. © 2013 *Movement* Disorder Society

Key Words: hydrogen; Parkinson's disease; randomized double-blind placebo-controlled trial; oxidative stress

Correspondence to: Dr. Hattori, Department of Neurology, Juntendo University School of Medicine, Hongo 3-1-3, Bunkyo-ku, Tokyo, Japan; nhattori@juntendo.ac.jp

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What is Parkinson's Disease?

When the first symptoms of Parkinson's Disease (PD) appear, it surprises those who suffer from it and those who love them. It is painful and frustrating to struggle to lift objects and not move as easily as you once did.

Parkinson's Disease runs rampant in the United States. One study predicted that by the year 2030, 1,2 million people in the United States will have Parkinson's Disease.

With this staggering number, people continue to look for a cure.

Hydrogen infused water is one product which scientists are investigating. **10acity®** Hydrogen Infused 5.5 ppm Natural Spring Water will not cure Parkinson's Disease, but it can alleviate some of the symptoms and slow down the spread of Parkinson's Disease in the body.

Parkinson's Disease is a degenerative brain disorder. Cells in the area of the brain which control movement and produce dopamine die rapidly. The disease begins gradually but develops and worsens over time. The disease statistically begins affecting people at age 60, but it can begin earlier than that.

Parkinson's Disease can cause:

- Shaking
- Stiffness
- Slowed body movements
- Difficulty walking without support
- Balance issues
- Worsened coordination
- Speech changes
- Trouble eating

As a consequence of these changes, Parkinson's Disease can also lead to:

- Depression
- Anxiety
- Fatigue
- Behavioral changes
- Trouble sleeping
- Trouble remembering things

What Causes Parkinson's Disease?

Though the disease appears random, there are certain factors which increase a person's risk of developing Parkinson's Disease. Genetics, age, and gender (more men are affected than women) - all can increase the risk.

Many scientists also believe exposure to environmental factors such as chemicals, pollution, and high levels of oxidation in the cells of the body could contribute to increased risk of developing Parkinson's Disease.

How Hydrogen Water can Fight Parkinson's Disease

10acity® Hydrogen Infused 5.5 ppm Natural Spring Water contains added molecular hydrogen infused into natural spring water together with a magnesium tablet.

Hydrogen has been proven to act as an anti-oxidant and reduce inflammation on the cellular level.

Oxidative stress can further the progression of dying cells in the brain and cause the common symptoms of Parkinson's Disease to increase in intensity. Because hydrogen water can slow down and even stop oxidation, we can conclude it can also slow down the spread of Parkinson's Disease in the body.

One study supported this idea and found that hydrogen water could suppress brain injury by fighting off the effects of oxidative stress. The study discovered that hydrogen water can significantly decrease the amount of dopamine cells destroyed in the area of the brain affected by Parkinson's Disease.

Other studies have found evidence supporting the use of hydrogen to help those with Parkinson's disease. The Unified Parkinson's Disease Rating Scale (UPDRS) rates how serious a person's Parkinson's levels are by how they perform common tasks.

One study found that inhaling extra hydrogen lowered Parkinson's UPDRS scores.

Another study found that drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water can improve anxiety and mood levels. An improved mood would help people combat the depression often associated with the onset of Parkinson's Disease.

More studies are being conducted with the hopes that they will also conclude that hydrogen water can improve Parkinson's Disease scores.

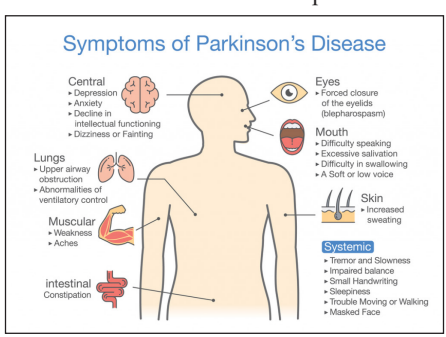
Though **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water may fight off oxidation in the cells throughout the brain and body, no studies prove the water cures the disease. Hydrogen water can slow things down, but more studies are needed to prove whether or not it will completely eradicate the cause or the effects of Parkinson's Disease.

Choose Hydrogen Infused Water

We work hard to protect ourselves and those we love and make sure the elder members of our families receive the best care possible for their health needs. Parkinson's disease challenges these desires.

A person with Parkinson's Disease has to completely alter their lifestyle to accommodate the symptoms. This is not only frustrating but also discouraging. Drinking **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water on a daily basis will not cure Parkinson's Disease, but it will help fight off oxidative stress in the cells and allow the person affected to lead an easier and more comfortable life.

Choose **10acity®** Hydrogen Infused 3.0 - 4.0 ppm Natural Spring Water for yourself or for your loved ones and see for yourself how it can slow down the spread of Parkinson's Disease.



Hydrogen Infused Water: Effective Treatment for Parkinson's Disease (PD)

January 27, 2021 Sagar Gola

Parkinson's Disease is a progressive nervous system disorder that affects movement. Symptoms start gradually, sometimes starting with a barely noticeable tremor in just one hand. Tremors are common, but the disorder also commonly causes stiffness or slowing of movement. In the early stages of Parkinson's Disease, your face may show little or no expression. Your arms may not swing when you walk. Your speech may become soft or slurred.

How Hydrogen Works on PD?

PD is a disorder that presents with extrapyramidal symptoms caused by the degeneration and loss of dopamine-producing cells in the substantia nigra. In PD, mitochondrial dysfunction and the associated oxidative stress are major causes of dopaminergic cell loss in the substantia nigra. Molecular hydrogen serves as an anti-oxidant that reduces hydroxyl radicals, but not the other reactive oxygen and nitrogen species. Moreover, the involvement of mitochondrial dysfunction in PD has been reported. H_2-rich water inhibits oxidative stress on the nigrostriatal pathway and prevents the loss of dopamine cells in PD. With the consumption of H_2-rich-water-drinking, oxidative stress in the nigrostriatal pathway was inhibited and loss of dopamine cells was decreased. These results suggest that consuming H_2-rich water could affect the onset of PD. It has been observed through a double-blind clinical trial that H_2-rich water (1,000 ml/day) for 48 weeks significantly improved the total Unified Parkinson's Disease Rating Scale (UPDRS) score of PD patients treated with levodopa.

Website: www.kykindia.com
Source: https://www.ncbi.nlm.nih.gov/pubmed/19356598

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RESEARCH Open Access

The effect of hydrogen-rich water consumption on premenstrual symptoms and quality of life: a randomized controlled trial

Menekşe Nazlı Aker[1], Ilknur M. Gönenç[1], Dilan Çalişici[1], Menekşe Bulut[2,3,4], Duried Alwazeer[3,4,5*] and Tyler W. LeBaron[6,7*]

Abstract

Background Premenstrual syndrome (PMS) consists of psychiatric or somatic symptoms negatively affecting the daily life. PMS treatment can involve the use of complementary-alternative approaches. Hydrogen-rich water (HRW) has antioxidant and anti-inflammatory properties that may treat PMS. This study aimed to investigate the effect of drinking HRW on the severity of premenstrual symptoms and the quality of life of women who suffer from PMS.

Methods This study is a randomized controlled trial. Participants were randomized into two groups (intervention group=33, control group=32) using the block randomization method. Participants were requested to consume 1500-2000 mL of HRW daily in the intervention group and drink water in the placebo group. Participants began drinking either HRW or placebo water from day 16 of their menstrual cycle until day 2 of the following cycle for three menstrual cycles. The research data were collected using a Demographic Information Form, Premenstrual Syndrome Scale (PMSS), and Short form of the World Health Organization Quality of Life Questionnaire (WHOQOL- BREF).

Results The intervention group had significantly lower mean scores than the control group in both the first and second follow-ups on the PMSS ($P<0.05$). In the first follow-up, the intervention group had significantly higher mean scores in the Physical Health and Psychological domains of the WHOQOL-BREF compared to the control group ($P<0.05$). Group × time interaction was significant for PMSS ($F = 10.54$, $P<0.001$). Group × time interaction was insignificant for WHOQOL- BREF ($P>0.05$).

Conclusions The consumption of HRW reduces the severity of premenstrual symptoms and improves individuals' quality of life in physical and psychological domains.

Keywords Premenstrual syndrome, Quality of life, Molecular hydrogen, Hydrogen-rich water, Questionnaires

*Correspondence:
Duried Alwazeer
alwazeerd@gmail.com
Tyler W. LeBaron
tylerlebaron@suu.edu
[1] Nursing Faculty, Ankara University, Ankara, Turkey
[2] Department of Food Engineering, Iğdır University, 76000 Iğdır, Turkey
[3] Department of Nutrition and Dietetics, Faculty of Health Sciences, Iğdır University, 76000 Iğdır, Turkey
[4] Research Center for Redox Applications in Foods (RCRAF), Igdir University, 76000 Igdir, Turkey
[5] Application, and Research Center, Innovative Food Technologies Development, Igdir University, 76000 Igdir, Turkey
[6] Department of Kinesiology and Outdoor Recreation, Southern Utah University, Cedar City, UT 84720, USA
[7] Molecular Hydrogen Institute, Enoch, UT 84721, USA

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MEDICAL GAS RESEARCH

RESEARCH Open Access

Hydrogen water intake via tube-feeding for patients with pressure ulcer and its reconstructive effects on normal human skin cells *in vitro*

Qiang Li[1], Shinya Kato[2], Daigo Matsuoka[3], Hiroshi Tanaka[1] and Nobuhiko Miwa[1*]

Abstract

Background: Pressure ulcer (PU) is common in immobile elderly patients, and there are some research works to investigate a preventive and curative method, but not to find sufficient effectiveness. The aim of this study is to clarify the clinical effectiveness on wound healing in patients with PU by hydrogen-dissolved water (HW) intake via tube-feeding (TF). Furthermore, normal human dermal fibroblasts OUMS-36 and normal human epidermis-derived cell line HaCaT keratinocytes were examined *in vitro* to explore the mechanisms relating to whether hydrogen plays a role in wound-healing at the cellular level.

Methods: Twenty-two severely hospitalized elderly Japanese patients with PU were recruited in the present study, and their ages ranged from 71.0 to 101.0 (86.7 ± 8.2) years old, 12 male and 10 female patients, all suffering from eating disorder and bedridden syndrome as the secondary results of various underlying diseases. All patients received routine care treatments for PU in combination with HW intake via TF for 600 mL per day, in place of partial moisture replenishment. On the other hand, HW was prepared with a hydrogen-bubbling apparatus which produces HW with 0.8-1.3 ppm of dissolved hydrogen concentration (DH) and −602 mV to −583 mV of oxidation-reduction potential (ORP), in contrast to reversed osmotic ultra-pure water (RW), as the reference, with DH of < 0.018 ppm and ORP of +184 mV for use in the *in vitro* experimental research. In *in vitro* experiments, OUMS-36 fibroblasts and HaCaT keratinocytes were respectively cultured in medium prepared with HW and/or RW. Immunostain was used for detecting type-I collagen reconstruction in OUMS-36 cells. And intracellular reactive oxygen species (ROS) were quantified by NBT assay, and cell viability of HaCaT cells was examined by WST-1 assay, respectively.

Results: Twenty-two patients were retrospectively divided into an effective group (EG, n = 12) and a less effective group (LG, n = 10) according to the outcomes of endpoint evaluation and the healing criteria. PU hospitalized days in EG were significantly shorter than in LG (113.3 days vs. 155.4 days, $p < 0.05$), and the shortening rate was approximately 28.1%. Either in EG or in LG, the reducing changes (EG: 91.4%; LG: 48.6%) of wound size represented statistically significant difference versus before HW intake ($p < 0.05$, $p < 0.001$). The *in vitro* data demonstrate that intracellular ROS as quantified by NBT assay was diminished by HW, but not by RW, in ultraviolet-A (UVA)-irradiated HaCaT cells. Nuclear condensation and fragmentation had occurred for UVA-irradiated HaCaT cells in RW, but scarcely occurred in HW as demonstrated by Hoechst 33342 staining. Besides, under UVA-irradiation, either the mitochondrial reducing ability of HaCaT cells or the type-I collagen construction in OUMS-36 cells deteriorated in RW-prepared culture medium, but was retained in HW-prepared culture medium as shown by WST-1 assay or immunostain, respectively.

(Continued on next page)

* Correspondence: miwa@butsuryo.ac.jp
[1]Department of Radiological Technology, Faculty of Health Sciences, Butsuryo College of Osaka, Otorikitamachi 3-33, Nishi-ku, Sakai, Osaka 593-8328, Japan
Full list of author information is available at the end of the article

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MEDICAL GAS RESEARCH

RESEARCH Open Access

Consumption of water containing a high concentration of molecular hydrogen reduces oxidative stress and disease activity in patients with rheumatoid arthritis: an open-label pilot study

Toru Ishibashi[1*], Bunpei Sato[2], Mariko Rikitake[1], Tomoki Seo[2], Ryosuke Kurokawa[2], Yuichi Hara[1], Yuji Naritomi[1], Hiroshi Hara[1] and Tetsuhiko Nagao[3]

Abstract

Background: Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by the destruction of bone and cartilage. Although its etiology is unknown, the hydroxyl radical has been suggested to be involved in the pathogenesis of RA. Recently, molecular hydrogen (H_2) was demonstrated to be a selective scavenger for the hydroxyl radical. Also, the method to prepare water containing extremely high concentration of H_2 has been developed. We hypothesized that H_2 in the water could complement conventional therapy by reducing the oxidative stress in RA.

Methods: Twenty patients with rheumatoid arthritis (RA) drank 530 ml of water containing 4 to 5 ppm molecular hydrogen (high H_2 water) every day for 4 weeks. After a 4-week wash-out period, the patients drank the high H_2 water for another 4 weeks. Urinary 8-hydroxydeoxyguanine (8-OHdG) and disease activity (DAS28, using C-reactive protein [CRP] levels) was estimated at the end of each 4-week period.

Results: Drinking high H_2 water seems to raise the concentration of H_2 more than the H_2 saturated (1.6 ppm) water in vivo. Urinary 8-OHdG was significantly reduced by 14.3% ($p < 0.01$) on average. DAS28 also decreased from 3.83 to 3.02 ($p < 0.01$) during the same period. After the wash-out period, both the urinary 8-OHdG and the mean DAS28 decreased, compared to the end of the drinking period. During the second drinking period, the mean DAS28 was reduced from 2.83 to 2.26 ($p < 0.01$). Urinary 8-OHdG was not further reduced but remained below the baseline value. All the 5 patients with early RA (duration < 12 months) who did not show antibodies against cyclic citrullinated peptides (ACPAs) achieved remission, and 4 of them became symptom-free at the end of the study.

Conclusions: The results suggest that the hydroxyl radical scavenger H_2 effectively reduces oxidative stress in patients with this condition. The symptoms of RA were significantly improved with high H_2 water.

Keywords: Arthritis, Rheumatoid, Oxidative stress, Reactive oxygen species, Molecular hydrogen, 8-hydroxylguanine, Hydroxyl radical: DNA repair, Error protein

* Correspondence: toruishi@haradoi-hospital.com
[1]Haradoi Hospital, Department of Rheumatology and Orthopaedic Surgery, 6-40-8 Aoba, Higashi-ku, Fukuoka 813-8588, Japan
Full list of author information is available at the end of the article

Supplementation of Hydrogen - Rich Water Improves Lipid and Glucose Metabolism in Patients with Type 2 Diabetes or Impaired Glucose Tolerance

Sizuo Kajiyama, Goji Hasegawa, Mai Asano, Hiroko Hosoda, Michiaki Fukui, Naoto Nakamura, Jo Kitawaki, Saeko Imai, Koji Nakano, Mitsuhiro Ohta, Tetsuo Adachi, Hiroshi Obayashi, Toshikazu Yoshikawa

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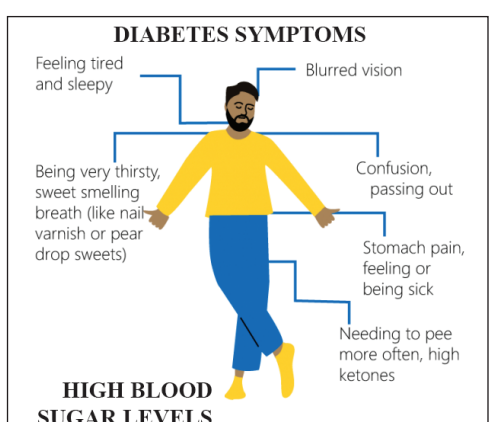
Abstract

Oxidative stress is recognized widely as being associated with various disorders including diabetes, hypertension, and atherosclerosis. It is well established that hydrogen has a reducing action. We therefore investigated the effects of hydrogen-rich water intake on lipid and glucose metabolism in patients with either Type 2 diabetes mellitus (T2DM) or impaired glucose tolerance (IGT). We performed a randomized, double-blind, placebo-controlled, crossover study in 30 patients with T2DM controlled by diet and exercise therapy and 6 patients with IGT. The patients consumed either 900 ml/d of hydrogen-rich pure water or 900 ml of placebo pure water for 8 weeks, with a 12-week washout period.

Several bio-markers of oxidative stress, insulin resistance, and glucose metabolism, assessed by an oral glucose tolerance test, were evaluated at baseline and at 8 weeks. Intake of hydrogen-rich water was associated with significant decreases in the levels of modified low-density lipoprotein (LDL) cholesterol (i.e. modifications that increase the net negative charge of LDL), small dense LDL, and urinary 8-isoprostanes by 15.5% ($P < .01$), 5.7% ($P < .05$), and 6.6% ($P < .05$), respectively. Hydrogen-rich water intake was also associated with a trend of decreased serum concentrations of oxidized LDL and free fatty acids, and increased plasma levels of adiponectin and extracellular-superoxide dismutase. In 4 of 6 patients with IGT, intake of hydrogen-rich water normalized the oral glucose tolerance test. In conclusion, these results suggest that supplementation with hydrogen-rich water may have a beneficial role in prevention of T2DM and insulin resistance.



List of Abbreviations

- 4-HNE: 4-hydroxynonenal
- 6-OHDA: 6-hydroxydopamine
- 8-OHdG: 8-hydroxy-2′-deoxyguanosine
- AD: Alzheimer's disease
- ADAS-cog: Alzheimer's Disease Assessment Scale-cognitive subscale
- AECOPD: Acute exacerbation of COPD
- AMPK: AMP-activated protein kinase
- Atg: Autophagy-related genes
- ATP: Adenosine triphosphate
- BALF: The bronchoalveolar lavage fluid
- CAT: Catalase
- CD: Cluster of differentiation
- COPD: Chronic obstructive pulmonary disease
- CS: Cigarette smoke
- CHF: Congestive heart failure
- CVD: Cardiovascular disease
- DM: Diabetes mellitus
- ETC: Electron transport chain
- EMT: Epithelial-to-mesenchymal transition
- FoxO3a: Forkhead box protein O3a
- GPX1: Glutathione 1
- HDL: High-density lipoprotein
- HFGF2: Human fibroblast growth factor 2
- HO-1: Heme oxygenase-1
- HRS: Hydrogen-rich saline
- HRW: Drinking hydrogen-rich water
- HS: Hydrogen saline
- HW: Hydrogen water
- I/R: Ischemia-reperfusion
- IL: Interleukin
- JNK: c-Jun NH_2-terminal kinase
- LDL: Low-density lipoprotein
- MPO: Myeloperoxidase
- MPTP: Methyl-4-phenyl-1,2,3,6-tetrahydropyrine
- mtDNA: Mitochondrial DNA
- NADPH: Nicotinamide adenine dinucleotide phosphate
- NF-κB: Nuclear factor kappa B
- Nrf2: NRF-E2-related factor2
- PBM: Photobiomodulation
- PD: Parkinson's disease
- RA: Rheumatoid arthritis
- RNS: Reactive nitrogen species
- ROS: Reactive oxygen species
- SOD: Superoxide dismutase
- T2DM: Type 2 diabetes mellitus
- TGF: Transforming growth factor
- TLR: Toll-like receptors
- TNF-α: Tumor necrosis factor-α
- UPDRS: Unified Parkinson's Disease Rating Scale
- VSMCs: Vascular smooth muscle cells.

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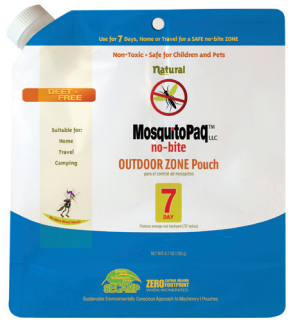

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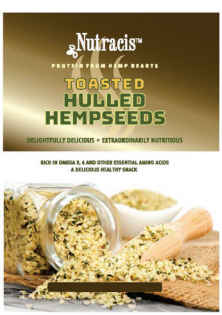

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