

THE HEALTH BENEFITS OF MOLECULAR HYDROGEN



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INTRODUCTION

Many experiments have demonstrated that H₂ has protective effects in different animal models and human diseases after the 2007 discovery that molecular hydrogen (H₂) has particular antioxidant properties. The effects of molecular hydrogen on various diseases have been reported over the 3 years at our Hydrogen Therapy Clinic.

Research on molecular hydrogen has evolved greatly from its modest origins and has continued to improve over the years. Since it has the potential to function at the cellular level, hydrogen is incredibly special. In certain cases, hydrogen can cross the blood-brain barrier, penetrate the mitochondria, and even translocate to the nucleus. Previous experiments have shown that hydrogen exerts antioxidant, anti-apoptotic, anti-inflammatory, and cytoprotective properties favourable to the cell while in these optimal positions of the cell. The most popular use of hydrogen is gas, water, and saline, which can be used in many other mediums. There are very few hydrogen side effects, making

hydrogen a suitable candidate for medicinal gas to convention novel clinical techniques against cardiovascular, cerebrovascular, cancer, metabolic, and respiratory illnesses and disorders. While hydrogen often seems to be faultless, there are still some defects or snares that potential studies need to explore.

I present the formulation, discovery, physical and chemical characteristics of molecular hydrogen in this book. I further discuss the healing impact of molecular hydrogen and its health benefits on multiple diseases.

THE HISTORY OF HYDROGEN

It is impossible to identify who discovered hydrogen in the history of the exploration of chemical elements since many people were interested in the hydrogen preparation experiment. Paracelsus (originally named Theophrastus Bombastus von Hohenheim), a Swiss chemist, discovered a phenomenon in the late sixteenth century that when acid corroded the metal, a combustive gas could be produced. In other terms, by accident, he found hydrogen. Hydrogen was also studied by Robert Boyle, a prominent Irish philosopher, chemist, physicist, and inventor, in 1671, and he described the properties of hydrogen. The concept of scientific discovery itself defines to which the scientific discovery belongs. The hydrogen discoverer was eventually determined to be Henry Cavendish in the history of science because he was the first scientist to gather hydrogen, closely study it, and determine certain essential hydrogen properties, such as density.

In 1766, Cavendish presented to the Royal Society of Great Britain a scientific paper entitled "On the Artificial Air." In addition to the carbonic acid gases, the key definitions of hydrogen were given in this article. By reacting iron and zinc with hydrochloric acid and diluted sulphuric acid, Cavendish prepared the hydrogen and extracted the hydrogen through the mercury tank process. He observed that if a sufficient quantity of each acid was reacted with a fixed quantity of certain metal, the quantity of hydrogen produced is always fixed, irrespective of the form and concentration of the acid used. He also discovered that to initiate an eruption, the combination of hydrogen and air can be ignited. Thus, Cavendish dubbed the gas "flammable air." In comparison, Cavendish found out that this gas is 11 times lighter than regular air and insoluble in solutions of water or alkali.

"In 1781, he found that some liquid appeared after the explosion of "flammable air" and air mixture when Priestley, a British chemist, was doing experiments on "flammable air. Priestley told Cavendish

of his findings. Cavendish replicated the experiment with varying hydrogen and air concentrations, which validated the discovery in Priestley's experiment, and determined that water was the liquid that emerged. Cavendish found out that water would be produced if hydrogen and oxygen were placed into a glass ball and connected to electricity. Cavendish replicated the previous experiment using pure oxygen instead of air following the discovery of oxygen, and the result not only verified that the mixture of hydrogen and oxygen generated vapour but also quantitatively established that roughly two-volume portions of hydrogen and one volume portion of oxygen create water exactly, and the result was published in 1784. Since Cavendish is a devout follower of the phlogiston principle, he claimed that the metal comprises phlogistic elements, the phlogistic elements found in the metal are released to form the "flammable air" as the metal is dissolved in acid. Although Cavendish is the first person to discover hydrogen, the quantitative relationship between the hydrogen and oxygen reaction has since been shown.

Cavendish's experiment was replicated by Lawrence Lavoisier, a prominent French chemist, and he explicitly suggested a correct conclusion, that water is not an element, but a hydrogen and oxygen compound. Lavoisier announced that hydrogen was an element in 1787 and referred to it as hydrogen, meaning "water-generating element."

Lavoisier died by guillotine on 8 May 1794, which was a major, tragedy in modern scientific history. On Earth, even in the Earth's atmosphere, there is very little free hydrogen. There is about 1.5 percent hydrogen in the soil, and there is also hydrogen in oil, gas, animals, and plants. Hydrogen accounts for 0.5 parts per million of the air's gross air content on Earth's surface. There is maybe just helium and hydrogen in the atmosphere at an altitude of 20-25 km above the Earth.

HYDROGEN: AN ELEMENT OF THE UNIVERSE

Hydrogen is a chemical compound, ranked first with the element symbol "H" in the periodic table. It is both the smallest atom in the Universe and the simplest element in existence. It has three isotopes, namely, protium, deuterium, and tritium. Georges Lemaître is considered to be the world's greatest physicist, who has proposed the "big bang model." The theory is that 15 billion years ago, our Universe emerged from a polar eruption of an infinitely large density, an infinitely high temperature, and an infinitely small volume. It is the origin of the cosmos and the origin of space and time as well. The Big Bang model presumes that the Universe begins to evolve according to the Friedman model from the moment of the Big Bang. The so-called Friedman model applies to the universe expansion mechanism in which the drop in temperature will occur to any object in the Universe due to radiation (namely heat dissipation). The overall or macroscopic manifestation of the average velocity of motion of microscopic particles is temperature. The faster the acceleration of particles and vice versa, the higher the macroscopic temperature is. The drop in the temperature of the Universe will have an immense effect on the state of matter within it. The particle acceleration is very rapid at very high temperatures and can also escape the constraint of the nuclear or electromagnetic force (no atom would have been created at this time) that brought them together. As the temperature drops steadily, it can be predicted that the particles attracted by the nuclear or electromagnetic force are entangled. More significantly, the kinds of particles in the Universe depend on the degree of temperature as well.

The temperature plummeted steadily from infinitely high to 1 billion degrees, around 100 s after the big bang. No protons and neutrons have ample energy at this temperature to escape the strong nuclear force between the attracting particles, and so the combination and production in the Universe of deuterium (heavy hydrogen) nuclei have been introduced. The deuteron is made up of a proton and a neutron, and the first type of nuclei that formed in the evolution phase of the Universe is deuterium. Later, to create a helium nucleus containing two protons and two neutrons, deuterons were combined with more protons and neutrons, and a limited number of two kinds of heavier elements, namely lithium and beryllium, were also formed. The remainder of the neutrons have decayed into protons and electrons, and no more particles are to be coupled with protons, which are the nuclei of the protium atom itself, the hydrogen ion we are familiar with. In a term, first, the deuterium nuclei form, and then protium nuclei, in the atom forming process; first, the nuclei form, and then the atom emerges.

Four minutes after the great bang, the helium production and other elements in the nucleus effectively ceased. Around 300,000 years old, from a macroscopic point of view, the Universe just started to expand, and nothing changed. Ultimately, as the temperature fell to thousands of degrees, the electron and the nucleus no longer had enough energy to survive the electric attraction between them. They began to merge and form atoms. That is, 300,000 years after the Big Bang, the hydrogen atom, the strongest and most powerful member of the Universe, was born with a mixture of protons and electrons.

Certain theoretical findings show that 90 percent is hydrogen, and 9 percent is helium in the structure of the Universe. However, it does not appear to be such a ratio of the Planet we live on. In descending order, the composition of each part of the crust is oxygen, silicon, aluminum, iron, calcium, sodium, potassium, magnesium, potassium, and the percentages of the elements are: 48.06 %

of oxygen, 26.30 % of silicon, 7.73 % of aluminum, 4.75 % of ferric, 3.45 % of calcium, 2.74 % of sodium, 2.47 % of potassium, 2.00 % of magnesium, 0.76 % of hydrogen, 0.76 % of others. Earth-like planets, however, are not the primary component of the Universe, but the larger-mass Sun-like stars are part of the Universe in a higher percentage and are the main variables deciding the components of the Universe. Three characteristics of hydrogen may be viewed as a common variable. Hydrogen is primarily the primary ingredient of the Universe's structure. Second, of all elements of the Universe, the composition of hydrogen is the simplest. Third, the centre of energy transformation in the Universe is hydrogen. Like Gerhard Richter, a famous German astrophysicist, said, "Hydrogen is the most important component of the universe." Hydrogen legend, published in 2002 by Rigdon, a famous science writer and physics professor at Washington University, was picked as the 20 best science books by the magazine Discover. Rigdon commented on hydrogen as follows, "Our understanding of the physical world, microscopically, regardless of the most basic atom, or macroscopically to the universe itself, in fact, all can be linked by a hydrogen atom." In Hydrogen Mythology, the author showed us a special charm of the hydrogen atom in the history of scientific progress, and the hydrogen atom structure is simplest and simplest.

Coincidentally, hydrogen is the most common element in the composition of organic life, and it is an electron transport medium and, therefore, a primary component of life's energy transformation. Hydrogen is often made of water, the most significant factor of the internal milieu. Therefore, we might assume that hydrogen is not only a part of the Universe but also a part of creation. Although some people believe that natural laws originated in the Universe, others still think that hydrogen originated in the world. However, hydrogen is everywhere and still plays the most important role in the Universe, the Milky Way, the Sun, and the planets, and in the long and thrilling period of origin and evolution of all forms of life.

PROPERTIES OF HYDROGEN

PHYSICAL PROPERTIES OF HYDROGEN

As it consists of only one proton in its nucleus, hydrogen is the smallest chemical element. Its symbol is H, the atomic number of which is 1. It has an average of 1.0079 amu atomic weight, making it the lightest component. Hydrogen mass is tiny and has the lowest molecular weight in existence, and the density of hydrogen is less than oxygen. The density of hydrogen is around $\frac{1}{4}$ compared with the same amount of air. Hydrogen, especially in stars and gas-giant planets, is the most abundant chemical element in the universe. However, because of its ability to form covalent bonds with other elements, monoatomic hydrogen is rare on Earth. With the molecular formula H₂, hydrogen is a non-toxic, non-metallic, odourless, tasteless, colourless, and highly combustible diatomic gas at normal temperature and pressure. In the form of chemical compounds such as hydrocarbons and water, hydrogen is still prevalent on Earth.

Hydrogen has one proton and one electron; there are no neutrons in the most common isotope, protium (1H). The saturation point for hydrogen is -259.14 °C, and the boiling point is -252.87 °C. Hydrogen has a 0.08988 g/L mass, making it less dense than air. It has two distinct oxidation states (+1, -1), allowing it to act as both an oxidizing and a reducing agent. Its covalent radius is 31.5 pm.

Hydrogen is found in two separate spin isomers of diatomic molecules of hydrogen that vary according to their nuclei's relative spin. Parallel spins are in the orthohydrogen form; antiparallel spins are in the parahydrogen form. Hydrogen gas consists of 75 percent orthohydrogen and 25 percent parahydrogen at normal temperature and pressure. Hydrogen is found in various types, as well as solid and metallic forms, such as concentrated gaseous hydrogen, liquid hydrogen, and slush hydrogen (composed of solid and liquid).

CHEMICAL PROPERTIES OF HYDROGEN

Hydrogen gas (H₂) is extremely flammable and burns between 4 and 75 percent by volume in the air at a very wide range of concentrations. The combustion enthalpy density for hydrogen is -286 kJ/mol. Hydrogen gas will also combust in a combination of chlorine (from 5 to 95 percent). In response to a spark, fire, or even sunlight, these mixtures will burst. The temperature of hydrogen self-ignition (the temperature at which spontaneous combustion occurs) is 500 °C. Pure flames of hydrogen-oxygen emit ultraviolet light that is unseen to the naked eye. At room temperature, hydrogen is chemically stable and is primarily determined by the tight covalent bond of hydrogen between the hydrogen atoms. Hydrogen gas can react easily with several substances when igniting or heating. It will burn softly, emit a blue flame, give off heat, and create water as pure hydrogen gas ignites. The concentration spectrum of Hydrogen as combustion occurs in an oxygen system is 4-94 percent. Hydrogen has a reductive property. Hydrogen is chemically active, and can react to form water with oxygen, and is vulnerable to combustion and explosion. Hydrogen's flammability is also a manifestation of its reductive property, which is determined by hydrogen's oxygen-reduction property. In the human body's internal environment, the dissolution concentration is just 1.8 percent, except under the state of pure hydrogen gas, because the body temperature is only 37C and it is probably lower than the prerequisite for hydrogen and oxygen reaction, hydrogen does not react with oxygen in the human body. This is precisely an important explanation for the long-term consideration of hydrogen as a physiologically inert gas. Hydrogen flames grow quickly and inflict less harm than hydrocarbon explosions since hydrogen is buoyant in the air. H₂ reacts with oxidizing elements, which react with chlorine and fluorine to form the resulting hydrogen halides spontaneously and violently.

Despite its stability, H₂ does form compounds with most elements. Hydrogen may have a partial positive charge when involved in reactions when reacting with more electronegative elements such as halogens or oxygen, but when reacting with more electropositive elements such as alkali metals, it may have a partial negative charge. It may participate in a type of medium-strength noncovalent (intermolecular) bonding called hydrogen bonding as hydrogen bonds with fluorine, oxygen, or nitrogen, which is essential to the stabilization of many biological molecules. Hydrides are considered compounds that have hydrogen bonding with metals and metalloids.

THE LIFE'S FIRE

Health scientists concentrate on hydrogen's antioxidant consequences, eventually finding a fire engine strong enough to put out the nastiest oxidative flames. Yet, we still see hydrogen as a fuel in our bodies, not only for rockets and vehicles but for mitochondria. It is the fire of creation that is

being stimulated. If one needs healing, the fire is aimed precisely to the spot where it is most desired. It is a perfect fire that is formed when oxygen is administered with hydrogen. Great in that it burns coolly because hydrogen is a flawless antioxidant. By balancing the three gases, we can build a perfect hydrogen flame in order for the mitochondria to start up their ATP production. The mitochondria can flame without oxidative bias with enough hydrogen, and the hydrogen puts out the flames of oxidative stress even though it is the fuel that lights the fire.

Human beings, without hydrogen, do not exist. Although science refers to humans as life forms based on carbon, man is a life form based on hydrogen, too. They store negatively charged hydrogen ions through the photosynthesis process as plants consume sunlight. Your body's cells use certain plants' nutrients for the electric charge of hydrogen ions when you consume unprocessed plants. The energy you need to survive is created as your body burns hydrogen and oxygen.

To support life, all living beings must have hydrogen. To get oxygen, the human body must breathe and feed and drink to get hydrogen. Fresh, uncooked plants, fruits, vegetables, and water are the principal sources of hydrogen ions for the human body. In the shape of molecular hydrogen gas, we will now inhale it directly. It is also easy to dissolve the gas in water, so we can drink it. We can apply it to the skin.

HYDROGEN'S HEALING EFFECTS ON VARIOUS DISEASES

Conventional treatment options are sometimes ineffective for severe diseases. Hydrogen is also not an exception. Although oxidative stress has been proposed to be implicated in the pathogenesis of muscle atrophy disuse, hydrogen has been unsuccessful in this form of the disorder, indicating that oxidative stress may not be the most relevant pathogenesis of muscle atrophy disuse. Hydrogen's beneficial effects on organ Ischemia/Reperfusion damage and inflammation-related diseases are the most significant. The simplest atom in existence, composed of a proton and an extra nuclear electron, is hydrogen. The smallest molecule of nature that is composed of two hydrogen atoms is hydrogen gas. When hydrogen gas and oxygen gas are combined at a concentration ranging from 4 to 75%, combustion or explosion can occur. Hydrogen gas, however, is chemically inactive at room temperature and is unable to react readily with other compounds. Given this, hydrogen gas is a small molecule that can quickly spread through the body and tissues, leading to a high risk of hydrogen-to-other atoms or molecules colliding. Perhaps the high diffusion potential of hydrogen gas makes up for the poor hydrogen gas reaction rate. This makes hydrogen gas, which is the unique benefit of hydrogen gas, not just stable but also a selectively antioxidant.

The reactive oxygen species (ROS) play an essential part in the pathophysiology of different forms of cardiovascular and cerebrovascular disorders, such as stroke and myocardial infarction, and metabolic diseases such as diabetes and atherosclerosis and other severe acute and chronic human diseases. There are two types of oxygen-free and non-oxygen-free radicals. The hydroxyl radical, superoxide anion, nitric oxide, nitrite anion, and other compounds are oxygen-free radicals. ROS is continuously produced in the body under physiological conditions and is also continuously washed, which is in dynamic equilibrium. However, a significant amount of ROS may be produced in

pathological conditions such as ischemia and inflammation. The principal compounds that cause oxidative damage to cells are hydroxyl radicals and peroxynitrite. Nitric oxide, superoxide anion, hydrogen peroxide, and other compounds are low in their toxicity but play an important role in signal transduction. Reductive drugs can lead to a new imbalance in oxidative-redox status in the previous treatment of oxidative damage, which is the key explanation for antioxidant treatments' current bad results. In 2007, George Ohsawa found that hydrogen could selectively reduce toxic hydroxyl radicals and peroxynitrite anion, with no impact on ROS, which has low toxicity and major biological functions. This is the hydrogen gas selective antioxidant effect that offers a novel concept for antioxidant therapy.

In 2008, hydrogen was found to decrease tissue damage in rats with the hypoxia-ischemia model. Low concentrations of hydrogen inhalation can decrease the activity of the enzymes caspase-3 and caspase-12, suggesting that they have antiapoptotic effects. The studies of Ischemia/Reperfusion damage, inflammation, and other diseases are gaining more and more interest because of their antiapoptotic effects. But the precise mechanism of the antiapoptotic impact of hydrogen, which requires further research, is not fully clear. ROS plays an essential part in the development of angiogenesis. Studies have shown that ROS can cause vascular smooth muscle hyperplasia. Prof. Masanobu Kubota also documented the anticorneal angiogenesis results of hydrogen-rich water eye drops. The mechanism may be linked to its ability to scavenge ROS produced after corneal injury, to decrease gene transcription of the nuclear transcription factor (NF- κ B), and to decrease the level of vascular endothelial growth factor expression. In addition, to be significant in many vascular diseases' pathophysiology, angiogenesis also plays an important role in tumour incidence. Hydrogen's role in angiogenesis is worthy of further debate.

HEALING EFFECTS OF HYDROGEN ON CENTRAL NERVOUS SYSTEM DISEASES

One of the most important structures of the body is the central nervous system. Central nervous system diseases include disorders of the central nervous system that are acute and chronic. Trauma and cerebrovascular conditions include acute disorders of the central nervous system. Different kinds of neurodegenerative conditions include chronic central nervous system diseases. It has been proven to have important beneficial effects on central nervous system dysfunction, including cerebral vascular disease, Parkinson's disease, and Alzheimer's disease, as the biological effects of hydrogen have been found. In cerebral ischemia and Parkinson's disease, preliminary clinical trials have been performed, suggesting that the clinical use of hydrogen in neurological disorders has received substantial interest.

HEALING EFFECTS OF HYDROGEN ON CEREBRAL VASCULAR DISEASE

A cerebrovascular disease contributes to intracranial blood circulation abnormalities and injury to brain tissue affecting the brain artery or carotid artery. Cerebrovascular disorder, including cerebral infarction and cerebral embolism, can be classified into ischemic cerebrovascular disease and haemorrhagic cerebrovascular disease. There are quite a few successful therapies, independent of

cerebral ischemia or cerebral haemorrhage. While cerebrovascular disease pathophysiology is complex, in most cases of acute brain injury, such as hypoxia-ischemia, reperfusion injury, calcium overload, free radicals, and inflammatory injury, and so on, there is a similar pathophysiological method. At the heart of the above-described pathophysiology, mechanisms are free radicals and inflammation destruction, which is the key reason why hydrogen has been studied in different forms of cerebrovascular disease. In 2007, inhalation of hydrogen gas exerted therapeutic effects in a rat model with left middle cerebral artery occlusion, George Ohsawa reported. After the study, Prof. Cai found that hydrogen gas inhalation has desired therapeutic effects on asphyxia-induced hypoxic-ischemic brain injury. Although several experts have indicated that hydrogen's therapeutic results on serious hypoxic-ischemic brain injury are not optimal, further studies have found that hydrogen has protective effects on brain injury caused by cardiac arrest, further supporting hydrogen's protective effects on hypoxic-ischemic brain injury.

Edaravone is the only licensed stroke treatment at present. Kinji Ohno performed clinical trials and investigated the beneficial efficacy of combination saline saturated hydrogen and edaravone on patients with brain stem infarction relative to patients treated with edaravone alone. Indicators of magnetic resonance imaging (MRI) of patients treated with hydrogen and edaravone have been shown to be better than those treated with edaravone alone. Antioxidation is the principal mechanism in edaravone, which is very similar to hydrogen gas. Hydrogen has the intended beneficial effects indicated by the findings. This is the only scientific study actually published on the treatment of hydrogen cerebral ischemia.

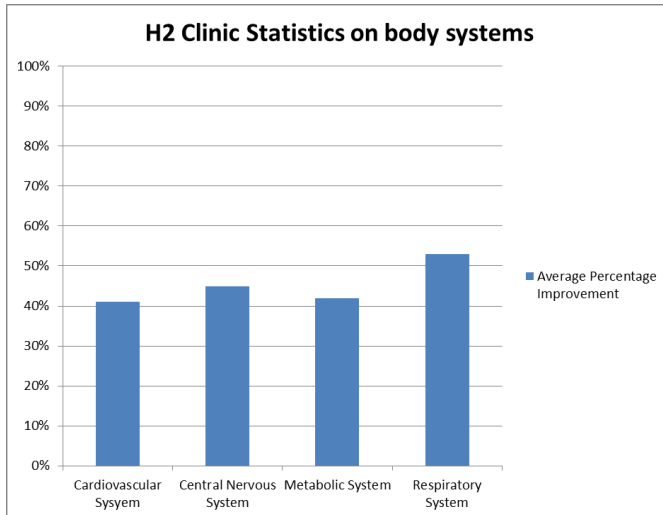
Intracranial haemorrhage is a type of cerebrovascular disease, including cerebral haemorrhage and subarachnoid haemorrhage that very easily leads to death. Hydrogen has been found to have ideal preventive effects on early brain damage, necrosis of nerve cells, edema, and vascular spasm triggered by cerebral haemorrhage and haemorrhage of subarachnoid. In all types of cerebral vascular disorders, this indicates that hydrogen has a possible therapeutic benefit. Hydrogen has recently been discovered to have beneficial implications that need to be paid greater attention to platelet aggregation since delayed haemorrhage is a dangerous, lethal complication of cerebral vascular disease. But interestingly, some researchers have shown that hydrogen could minimize cerebral ischemia-induced haemorrhage. These conflicting questions, evidently, require further research.

HEALING EFFECTS OF HYDROGEN ON METABOLIC DISEASES

DIABETES

A randomized, double-blind, placebo-controlled study was conducted by Sizou Kajiyama. in 2008 in 30 patients with type II diabetes mellitus and 6 patients with reduced glucose tolerance. For 8 weeks, with a 12-week washout duration, the patients drank either hydrogen-rich water or placebo water. To approximate lipid and glucose metabolisms, they tested 13 biomarkers. Both biomarkers were favourably altered with hydrogen, however only electronegative charge-modified low-density lipoprotein (LDL) cholesterol, small dense LDL, and urinary 8-isoprostanes were found to enhance statistical significance. Hydrogen normalized the oral test for glucose tolerance in four out of six patients with compromised glucose tolerance. In their research, the lack of statistical significance was possibly attributed to the limited number of patients and the brief time of observation. However, the

lack of statistical significance may also indicate that human diabetes mellitus has a less prevalent impact than rat models.



Research carried out by H2 Clinic on a number of subjects over a two year period shows the therapeutic benefits of molecular hydrogen. The study was carried out on 150 people. The ages of these people ranged from 12 to 89. The average improvement in symptoms from clients overall was 44%. The study was carried out on people with many different ailments. Including: General Pain, Arthritis, Chest and breathing issues, High Blood pressure, Cholesterol, Diabetes Type 1&2, Sinusitis, MS, Lymphedema, IBS, Hormonal Acne, Fibromyalgia. This study showed that the more treatments administered initially over a four to six week period the more favorable results post treatment with a 67% symptom free alleviation rate six months on and a 47% rate symptom free rate one year on.

THE ADVANTAGES OF MOLECULAR HYDROGEN

Molecular hydrogen has a wide variety of advantages that can increase the overall lifestyle and health, including:

- Diminishes inflammation
- Antioxidant
- Lowers joint pain.
- Reduces muscle tiredness.
- Reduces Neuropathic Pain
- Lowers degeneration of muscles.

- Improves the consistency of the skin
- Promotes excellent bacteria in the stomach.

The molecules of hydrogen are not only healthy but effective. It's still only one atom away from being water, which is one of the reasons it's so powerful. Hydrogen water, for instance, is literally water that contains hydrogen gas dissolved into it. It is somewhat close to how dissolved carbon dioxide gas is present in carbonated drinks (CO₂). Many experiments are continuously showing that H₂ has advantages in preventing many diseases as an antioxidant. Hydrogen molecules are healthy, effective, and natural.

OXIDATIVE STRESS

An imbalance between the development of free radicals, known as reactive oxygen species (ROS), and antioxidant defences that mitigate the harmful influence of free radicals is represented by oxidative stress. Essentially free radicals are any kind of molecule that contains oxygen. By destroying attacking bacteria and microbes, various free radicals help the body. There are one or two unpaired electrons in Free Radicals. This means that, unlike most chemicals, free radicals are extremely reactive.

Free radicals can attempt to stabilize in some circumstances by stealing electrons from cell components such as DNA, lipids, and proteins. An incident like this would trigger a chain reaction to stabilize molecules that capture an electron from other molecules. This is generally known as oxidative stress.

It is believed that oxidative stress is influential in the creation of diseases such as:

Lou Gehrig's disease

Parkinson's disease

Alzheimer's

Huntington's

Antioxidants' key aim is to lend an additional hand (or an electron) to keep electrons from being taken from other molecules by free radicals. By actively neutralizing the most poisonous radicals in your body by converting them into liquids, H₂ functions as an antioxidant molecule. This is achieved because H₂ is the universe's smallest molecule, enabling it to penetrate the mitochondria and scavenge harmful radicals quickly.

INFLAMMATORY DISEASE

A widespread ailment that affects several individuals is inflammation of the joints or arthritis. The proteins involved in inflammation are suppressed by H₂ while also activating the pathways that guard against cell death. Numerous studies have demonstrated that H₂ has advantages for people with tissue injury and inflammation. Since taking hydrogen gas, several clinical trials examined people with rheumatoid arthritis. The findings revealed a decline in DNA damage as well as an improvement in the effects of the patients. Actually, 45% of people taking hydrogen had a complete remission of their symptoms.

In addition, it has been observed that after times of vigorous activity, consuming a hydrogen product decreases lactic acid build-up.

ANTI-AGING

Hydrogen compounds provide the human body with an array of advantages. The appearance and the average age of your body could be enhanced by many of these advantages. Like:

Improving the skin's elasticity. The cells in the skin accumulate free radical damage as you age and become less elastic. Any of the free radical harm is removed by H₂, slowing the decay down.

Promoting a balanced stomach for survival. Several studies have shown that survival can be supported by preserving a balanced gut microbiota. A lack of healthy microbes in the gut can be related to anything from stress to cancer and diabetes. In order to attract healthy bacteria, H₂ may penetrate deep into the cells to reduce oxidative stress.

Molecular hydrogen can protect DNA from degradation and oxidative stress. For the aging process, this could be helpful.

BRAIN WELLNESS AND HYDROGEN

Do the advantages of hydrogen in the brain go beyond its neuroprotective effects? Interestingly, hydrogen's adaptogenic properties illustrate the role it plays in the body's support for homeostasis. Two interesting experiments have demonstrated the beneficial effects on the HPA axis in hydrogen therapy. In a double-blind, placebo-controlled study containing 4 weeks of hydrogen, researchers felt a reduction in anxious feelings and improved mood. Secondly, under moderate stress, the study found hydrogen promoting the HPA axis, and most noteworthy, the results were long-lasting as stress resilience improved past the time of administration. During episodes of nervousness, molecular hydrogen was found to facilitate proper digestive function as a single action. Hydrogen (which **is** neutrally charged defensive's properties) can be due to its unusual capacity to diffuse directly into cells and organelles through membranes.

MOLECULAR HYDROGEN AND SKIN

Going back to primeval days, the need to have safe, elastic, wrinkle-free, and young-looking skin. The ancient ritual of swimming in springs and mineral waters is one method (which is still used today) to try to do this. However, unlike most traditional lotions, creams, oils, powders, and other cosmetics that do not benefit and/or even have harmful side effects, bathing seems to have great medicinal use in specific waters with reductive characteristics. One research-tested mineral water (most likely due to dissolved molecular hydrogen) and prepared water containing molecular hydrogen with reductive characteristics. The findings showed that bathing lowered the oxidation-reduction potential (ORP) of human skin in both of these waters. This is an essential finding since healthy skin has diminishing properties. The skin's ORP increases through oxidative damage (from sun exposure) and aging (as measured by lipid-peroxide levels). This association between the skin and aging's redox potential has been explored in more detail and shows that the skin's oxidation is decreased by reductive water.

At H2 Clinic we treated a 27 year old Nurse with Hormonal Acne. She had been suffering from this for 10 years and had explored all other avenues with little to no results. She initially received a course of 10 treatments within a 4 week period. 6 weeks post treatment examination revealed approx. 80% improvement in physical appearance.

CASE HISTORIES

Case History is information on the following: Sex, Age, Occupation, Complaint, Onset, Intensity, Treatment Plan, Duration, H2 Volume, Administration, Treatment Duration, Results.

- Male, 56, Bar manager, **Osteoarthritis** of the left knee, 4 years onset, Pain 7/10, 5 treatments X 45mins X 600ml per min, Administered Locally X 2 weeks
Results: 1 week post treatment symptoms improved 90%
3 months post treatment symptoms improved 100%
1 year post treatment symptoms improved 100%
2 years post treatment symptoms improved 100%

Hugh Q ø E

- Male, 63, Estate Agent, **Osteoarthritis** of the knee, 7 years onset, Pain 8/10, 6 treatments X 45mins X 600ml per min, Administered Locally X 2 weeks.
Results: 1 week post treatment symptoms improved 95%
6 months post treatment symptoms improved 100%
1 year post treatment symptoms improved 100%

Frank W

- Male, 73, Retired Pilot, **Peripheral Neuropathy**, 20 years onset, Pain 8/10, 5 treatments X 45 mins X 1500 ml per min, Administered through inhalation X 2 weeks
Results: 1 week post treatment symptoms improved 50%
6 weeks post treatment symptoms improved 100%

John F

- Female, 57, Seceretary, **Mast Cell**, 6 years onset, Pain 10/10, 10 treatments X 2hrs X 1500ml per min, Administered through inhalation X 2 months
Results: Treatment ongoing symptoms improved 70%

Paula C

-

- Female, 70, retired, **Rheumatoid Arthritis**, 10 years onset,

Pain 8/10, 5 treatments X 30 mins X 600ml per min,
Administered through inhalation X 2 weeks

Results: 1 week post treatment symptoms improved 40%
6 weeks post treatment symptoms improved 40%
1 year post treatment symptoms improved 40%
2 years post treatment symptoms improved 30%

Mary L

- Male, 65, retired, **Arthritis**, 4 years onset,
Pain 6/10, 5 treatments X 30 mins X 600ml per min,
Administered through inhalation X 2 weeks

Results: 1 week post treatment symptoms improved 100%
6 weeks post treatment symptoms improved 100%
6 months post treatment symptoms improved 100%

N k c o " Q ø F

- Female, 56, housewife, **Rheumatoid Arthritis**, 6 years onset, Pain 7/10, 6 treatments X 30 mins X 600ml per min,
Administered through inhalation X 2 weeks

Results: 1 week post treatment symptoms improved by 90%
6 months post treatment symptoms improved by 95%
1 year post treatment symptoms improved by 95%
2 year post treatment symptoms improved by 95%

Grace G

- Male, 40, Psychiatric Nurse, **Fatigue**, 2 years onset,
Pain 5/10, 4 treatments X 30 mins X 300ml per min ,
Administered through inhalation X 2 weeks

Results: 1 week post treatment symptoms improved by 0%
6 months post treatment symptoms improved by 0%
1 year post treatment symptoms improved by 0%
2 years post treatment symptoms improved by 0%

Michael C

- Female, 27, Nurse, Hormonal Acne, 10 years onset,
Pain N/A, 10 treatments X 45 mins X 4 weeks,
Administered through Inhalation X 4 weeks

Results: 1 week post treatment symptoms improved by 70%
3 months post treatment symptoms improved by 95%

Ellen R

- Male, 50, Doctor, Chronic Fatigue, 7 years onset,
Pain N/A, 5 treatments X 45 mins X 2 weeks
Administered through inhalation X 2 weeks

Results: 1 week post treatment symptoms improved by 30%

6 weeks post treatment symptoms improved by 30%
1 year post5 treatment symptoms improved by 30%
2 year post treatment symptoms improved by 30%

Dr. B

METHODS OF HYDROGEN APPLICATION

Recent clinical studies have shown that hydrogen gas, with antioxidant, anti-inflammatory, and antiapoptotic defensive effects on cells and organs, is a significant physiological regulating element. Since hydrogen gas is explosive, researchers see the methods of adding hydrogen as an important question.

Today, hydrogen application strategies are quickly evolving, including hydrogen gas inhalation, oral hydrogen water, eye drops, skin smear and washing, injection of hydrogen gas, etc. In this chapter, with special attention to laboratory models and human beings, different hydrogen applications are discussed. If hydrogen potentially heals illnesses, more researchers are likely thinking about making it easy to use. To date, hydrogen gas inhalation, hydrogen water, hydrogen-rich water transdermal diffusion, and the induction of colonic bacteria to produce hydrogen by food or medicines, etc., are methods of adding hydrogen for various diseases. As a kind of usable water, water electrolysis has been used in the world for many years. As a novel commodity of functional water, Hydrogen-rich water is developing rapidly in Japan, Korea, Southeast Asia, and other areas. One of the most excellent contributions in this area with apparent advantages is hydrogen-rich saline injection. In basic and clinical trials, hydrogen-rich saline injection also requires further research as a kind of clinical procedure. But hydrogen-rich saline injection, as a form of very promising therapy, is bound to become the most promising method of clinically adding hydrogen. There is great benefit in the diffusion of hydrogen across the skin, local hydrogen gas infusion, drug-induced, and food-induced hydrogen through colon bacteria, which are also worthy of study.

INHALATION

At H₂ Clinic we use Inhalation as our primary method of administration. We provide nasal cannulas for patients and they can inhale the Molecular Hydrogen through this at very safe levels. This method is totally non-invasive.

HYDROGEN WATER

Drinking hydrogen water is an ideal way for you to get your H₂. Hydrogen-rich water is natural water that contains dissolved hydrogen gas, similar to how carbonated beverages and water contain dissolved CO₂ gas. Hydrogen water can be obtained through water ionizers. A water ionizer uses electrolysis to produce hydrogen gas from the water itself, unlike dissolving hydrogen tablets in water.

There are 2 types of hydrogen water generators: hydrogen generators of neutral pH and alkaline water ionizers. You will generate hydrogen gas in your water with a Neutral-pH hydrogen generator without impacting pH levels. This method is particularly efficient and has since been adopted as the industry standard for hydrogen water mass processing.

On the other hand, by absorbing one of the hydrogen ions in water, alkaline water ionizers create hydrogen gas. In two separate chambers, this process would produce both hydrogen-infused alkaline water and acidic water. The alkaline water is also not very tasty without a little lemon to even out the pH levels. Although this can sound like a nuisance, many people really love the extra acidic water with its many applications.

ELECTROLYTIC WATER

Hydrogen-rich water was first used for healthcare in Japan as electrolytic water. A new generation of medical devices for electrolytic water called electrolyzers was accepted by the Japanese Government's Ministry of Health Labour after decades of implementation. Electrodes and ionic membranes are the key internal components of the system. Electrolytic water manufacturing systems that are widely available are called water ionizers or generators of electrolytic water. Electrolytic water by electrolysis is the result of salt-containing water (such as sodium chloride). Electrolytic water is neutral in itself, but by adding other ions or adding a semi-permeable membrane, two kinds of water can be generated: alkaline water and acidic water. Electrolyzing water containing sodium chloride will produce sodium hydroxide, hypochlorous acid, and sodium hypochlorite. By electrolyzing pure water, however, only hydroxide ions, hydrogen gas, oxygen gas, and hydrogen ions were formed. Acidic electrolytic water has had bactericidal effects under some conditions. Some ads say that alkaline electrolytic water will "neutralize the acidic physique" of the human body, but it would be with a heavy acidic gastric acid when alkaline water enters the stomach and becomes acidic. Therefore there is no theoretical justification for changing the pH of the body with alkaline water.

In Japan in 1931, the first water ionizer in the world was invented. The Japanese started researching the influence of electrolytic water on flora and fauna in 1932. Civil electrolytic devices were successfully patented in 1954, and farm electrolytic devices were on the market. In 1960, the Japanese used electrolytic systems for drinking water to become a medicinal aid. The Japanese No.1 certification of medical devices (medical devices for the development of electrolytic water) for drinking water was issued in 1966. Japanese certification was passed in 1979 for a new range of equipment capable of consistently supplying drinking water. The Japanese Ministry of Health formed a study committee for electrolytic water in 1994. The Japanese Cancer Prevention Centre published a paper in 1994, "Free radicals are carcinogenic incentives," which also stated that free radicals in the human body could really be scavenged by electrolytic water. Although there is a very long tradition of electrolytic water science, the hypothesis of its medicinal effects on diseases is not very compelling.

HYDROGEN-RICH WATER PRODUCED BY METALLIC MAGNESIUM

The reaction between magnesium and water at room temperature, which is comfortable for use, will slowly produce hydrogen gas and magnesium hydrate. Metals such as iron, aluminum, and magnesium can react with acidic water and water to create hydrogen gas. However, because of flavour, reaction rate, toxicity, and other factors, they are not ideal for producing oral water rich in hydrogen. Some products, such as tourmaline and nano platinum, are applied to magnesium

for ease and disinfection. Yet magnesium is the central ingredient, and in its healing effects, hydrogen gas plays a vital role. The key issue is the hydrogen gas stability produced in the water. Its results can be desirable at the outset. But after a period of time, the concentration of the produced hydrogen gas will eventually decrease. Thus, the scheduled substitution of the substance is important in clinical and

animal tests. In the human body, a magnesium ion is an integral metal element that is harmless to the human body. Patients of kidney disease that use it, though, must be under medical guidance.

HYDROGEN SATURATED WATER

Hydrogen saturated water absorption of hydrogen gas is generally accepted as the safest method, largely because hydrogen saturated water provides the most experimental results. There have been over 100 research studies published since 2008. Therefore the biological effects of saturated water with hydrogen are most definitely real. Hydrogen saturated water preparation requires four methods: aeration, high pressure, isolation of the membrane, and electrolytic water. The most important technology during the process of generating and storing hydrogen saturated water is not how to dissolve hydrogen gas but how to prevent leaking hydrogen gas from a bottle. Since the hydrogen molecule is so thin, many packing strategies that prevent leakage of other gases do not prevent hydrogen gas leakage. For example, packaging techniques prohibit the release of carbon dioxide from a box of carbonated drinks and cannot limit the release of hydrogen gas. The key technology in the industry, which is often the most challenging technological challenge to solve during product creation, is the packaging process. Most Japanese hydrogen saturated water manufacturers, including plastic packaging aluminum bags or aluminum containers, make the package metal lightweight, which keeps hydrogen gas safe for more than 6 months. Han Hydrogen Technology Co. Ltd. of Taiwan picked a glass kit and received favourable results. While studies have been carried out on the biological effects of hydrogen gas for several years, the production of hydrogen saturated water products is very slow due to restricted packaging materials and methods of packaging.

The most conventional method that was considered could not be an efficient way to prepare the desired hydrogen gas concentration is to fill hydrogen gas into the water to create hydrogen saturated water. Nevertheless, recent studies have shown that hydrogen saturated water with therapeutic effects can also be created by merely blowing hydrogen gas into the water for 10 minutes, even with such a simple process. By this simple process, we can create a bottle of healthy water that is good for health.

OTHER HYDROGEN APPLICATION APPROACHES

Such special methods are still used in addition to the three methods used above, but these methods are rarely used.

EYEDROPS

Hydrogen eye drops have been found to be effective in injuring retinal ischemia-reperfusion. The research revealed future opportunities for hydrogen eye drops and wide application prospects.

SKIN SMEAR AND BATHING

The skin can absorb it due to the high diffusion potential of hydrogen gas. Some researchers have treated inflammation-induced skin injuries by mixing drinking water rich in hydrogen with local hydrogen-rich water. Within 1 to 2 weeks, it had important beneficial effects on most patients. By placing part of the body in a closed hydrogen gas atmosphere, hydrogen gas may also be used, but this kind of procedure has not been published.

HYDROGEN GAS PRODUCED BY INTESTINAL BACTERIA

Those medications and foods that are unable to be consumed by the small intestine are taken to the colon, where the bacteria can create hydrogen gas. Some researchers have shown that hydrogen gas produced in the human body may be encouraged by oral acarbose, modified starch, milk, curcumin, and lactulose. Cottonseed sugar, lactose, sorbitol, mannitol, chitosan, soluble fibre, etc., are other food components that can facilitate bacteria-generating hydrogen gas in the colon. A huge amount of hydrogen gas may induce intestinal bacteria. While some of it may be utilized for many other microbes, such as methane bacteria, most of it can be ingested via the intestinal mucosa into the bloodstream and transferred to other organs to play a part in disease care. This concept has been researched for some time, but the result is still unclear.

HYDROGEN GAS PRODUCED BY ORAL DRUGS

Magnesium has been used as a type of gastritis medicine. When reacted with gastric acid, hydrogen gas may be produced by metal magnesium. There is also no scientific proof that diseases can be treated using this approach. Statins can suppress methane bacteria, which produce methane by consuming hydrogen gas. Statins, thus, indirectly increase the content of intestinal hydrogen gas. We also hypothesized that one of the reasons why statins can protect the heart is the rise in hydrogen gas content in the intestinal tract.

CONCLUSION

Unlike every other health supplement, Molecular Hydrogen is completely new. Hydrogen can be small, but it plays an important role in energy production and life for essentially every living organism. Although researchers continue to do further studies on the long-term health impacts of molecular hydrogen, critical research on H₂ that has already been done shows how good it can be for our health and lifespan. There is NO Molecular Hydrogen latent build-up. Molecular Hydrogen supports the natural functions of the body. It is not a disruptor. Molecular Hydrogen does not have any known side effects. H₂ doesn't have established contra-indications. An excess of H₂ is unlikely. H₂ is a gas. It is not a flower, a root, or a series of numerous chemicals. Molecular Hydrogen is 100% pure and 100% natural. H₂ is approved by the FDA for human consumption.