



AquaSciences LLC
MOLECULAR HYDROGEN INSTITUTE

Molecular Hydrogen: Brief Introduction

Hydrogen is the most abundant substance on Earth. It is in every part of the human body. It would seem that a small increase in the amount of hydrogen in the body would not have any significant effect, since it is regarded, in biological terms, as an 'inert' gas.

So why is it that since 2007 there have been 350 scientific studies showing that a miniscule addition of molecular hydrogen (H₂) to the body has major health effects in a huge range of health conditions? Indeed, it is beginning to be viewed as a potential all round health support that may be the biggest natural health breakthrough in over a decade.

Let's take a look.. and to keep it simple we give definitions as we go.

Definition: Molecular Hydrogen (or Hydrogen gas)

Hydrogen gas (H₂) in its molecular form of two 'joined' hydrogen atoms. This is not the same as the H₂ in H₂O. H₂O consists of two separate hydrogen atoms linked to one oxygen atom.

The scientific studies suggest that there are 3 main therapeutic uses:

- Anti Inflammation
- Selective antioxidant
- Support of cell signalling, (the body's own natural detox & repair system).

Many other (over 80) specific disease conditions have also been studied.

Definition: Free radical

An atom or molecule that has either a positive or negative electrical charge, making it either attractive or repellent to other molecules. Free radicals are formed from either oxygen or nitrogen.

Free radicals are unstable and can cause a chain reaction of 'electron swapping'. This can result in damage to our body at a cellular level.

Definition: Antioxidant

Antioxidants are molecules that donate electrons to free

radicals and therefore neutralize them.

Most antioxidants on the market neutralize all free radicals. But many free radicals are perfectly 'good' ones, undertaking many forms of cleanup and detoxification at a cellular level.

Molecular hydrogen specifically neutralizes the 'bad' free radical also known as the Hydroxyl radical. Its nanosize gives it unique penetrative ability, allowing it to reach inside a single cell and to repair mitochondria, the powerhouse inside the cell.

Definition: Oxidative Stress

Oxidative stress is like 'rusting'. It happens when our free radicals and our natural detoxification ability is out of balance.

Definition: Inflammation

Part of the complex biological response of **vascular** tissues to harmful stimuli, such as **pathogens**, damaged cells, or irritants. The classical signs of acute inflammation are pain, heat, redness, swelling, and loss of function. Inflammation is a protective attempt by the organism to remove the injurious stimuli and to initiate the healing process.

Molecular hydrogen is an excellent and side-effect-free agent for reduction of chronic inflammation. It decreases the circulation of the molecules responsible for continued inflammation. Studies indicate that it may even 'turn off' inflammatory genes.

Definition: Cell Signalling

is part of a **complex system** of communication that governs basic cellular activities and coordinates cell actions. The ability of cells to perceive and correctly respond to their microenvironment is the basis of development, tissue repair, and **immunity** as well as normal tissue **homeostasis**. It is how our body 'talks to itself'. It both oversees and carries out every action in the body's daily internal routine.

It was long thought that only minerals like sodium, potassium, calcium and magnesium supported healthy cell signalling. We are now finding that hydrogen gas does the same.

Cell signalling is *extremely* important to ongoing health. Poor cell signalling is identified as a precursor to cancer, autoimmunity and diabetes.

The sum of the studies demonstrate that molecular hydrogen can be viewed as something very different to any specific treatment. Although its 3 major uses (above) are all high level health strategies, studies reveal that hydrogen affects health in so many ways to support the body's natural defences, and to optimize energy usage in the body.

350+ scientific studies show many potential health benefits including:

- Metabolic Syndrome
- Cardiovascular health
- Obesity
- Fatigue
- Cognitive function
- Gastrointestinal Function
- Chronic pain & inflammation
- Abnormal cell division
- Immune function

Definition: Metabolic Syndrome

It is a disease, but is characterised by a group of symptoms including insulin resistance, impaired glucose tolerance, obesity, hypertension and dislipidaemia (an abnormal amount of fats or cholesterol).

There is a strong correlation between oxidative stress, inflammation, reduced cell signalling and the progression of insulin resistance to more serious conditions. All of these

conditions may be beneficially affected by Molecular Hydrogen intake.

Definition: Obesity

Obesity is a **medical condition** in which excess **body fat** has accumulated to the extent that it may have a negative effect on health, leading to reduced **life expectancy** and/or increased health problems. Obesity is always an inflammatory state. One of molecular hydrogen's 3 big effects is reported as anti-inflammatory.

Long-term drinking H₂-water has been shown to significantly control fat and body weight, despite no change in the amount of water consumed. Drinking molecular hydrogen infused water decreased levels of plasma glucose, insulin, and triglyceride, the effect similar to diet restriction.

Definition: Fatigue

(Also exhaustion, tiredness, languidness, languor, lassitude, and listlessness) is a subjective feeling of tiredness which is distinct from **weakness**, and has a gradual onset. Though there are many causes of fatigue, the underlying physiological mechanism is almost always a decrease in mitochondrial function. Mitochondria are the part of almost every cell that creates energy, in the form of ATP, so the cell can function.

Poor mitochondrial function can also lead to using anaerobic energy generation which leads to lactic acid build up and acidosis. Molecular Hydrogen studies indicate that it may be an ideal antioxidant molecule for oxidative stress in the mitochondria due to its small size. It is one of the very few, if not only antioxidant molecules that can reach the inside of the mitochondria.

By measuring oxygen consumption and CO₂ production, scientists have been able to conclude that consumption of H₂ enhances our energy metabolism. This may also relate to fat loss through burning energy more efficiently.

Energy Storage

Glycogen is a form of glucose that serves as a form of energy storage for the body. Molecular hydrogen increases glycogen stores in the liver and therefore may improve the functioning of all organs in the body by increasing the stores of available energy.

GI Health

Studies so far on Molecular Hydrogen's effect on the Gastro Intestinal Tract have shown a reduction of symptoms and indicators of damage in serious health conditions. This indicates a potential role in reducing the symptoms of

Inflammatory Bowel Disease, reduced liver function and Pancreatitis.

Studies of rats with acute pancreatitis treated with Molecular Hydrogen indicated that it has a protective effect against pancreatitis, and the effect may be due to its ability to inhibit oxidative stress, reduce cell death, decrease inflammation and to promote proliferation of healthy cells.

Liver function

The liver detoxifies and is therefore an accumulator of oxidative stress. Studies indicate that H₂ significantly reduces oxidative stress – even to normal healthy levels.

When fat accumulates in the liver, it often leads to inflammation and actual liver damage. Studies indicate that H₂ inhibits signalling pathways in acute liver injury and also inhibits fatty acid uptake and lipid accumulation in the liver.

Chronic Pain

Chronic long term pain has been reduced in humans through the ingestion of molecular hydrogen..

Immune Function

As yet studies have not proven H₂'s effectiveness against common cold and influenza. However H₂'s inflammation reduction and oxidative damage indicates there may well be a role in decreasing symptoms/severity.

Allergies

Hydrogen attenuates allergies by its ability to increase cell signalling ability, and decrease inflammatory and oxidant reactions.

Septicemia

Hydrogen treatment ameliorated polymicrobial sepsis and sepsis-associated organ damage in mice.

Lupus (SLE) and Auto Immune Disease

As Molecular Hydrogen has been shown to either directly, or indirectly decrease excessive free radicals it is conceivable that Molecular Hydrogen may be beneficial in reduction of symptoms of SLE.

Cognitive Function/ Neurodegeneration

A decline in cognitive function is often considered a precursor to the development of serious neurodegenerative conditions such as Alzheimer's, senile dementia and Parkinson's disease. Due to its ability to easily cross the blood brain barrier, Molecular Hydrogen is an ideal consideration to assist the health and wellbeing of those with Parkinson's disease. Administration of saturated hydrogen water led to symptomatic improvement in PD patients. This suggests that hydrogen water is likely able to

retard the development and progression of Parkinson's disease.

Alzheimers

Rat studies show Molecular Hydrogen inhibits signalling pathways in animal models of amyloid-beta-induced Alzheimer's disease. In the rat model of Alzheimer's disease, hydrogen-rich saline prevented neuro inflammation, oxidative stress and improved memory.

Stress induced Cognitive Decline

Studies demonstrate that consumption of hydrogen water suppressed the increase in oxidative stress in the brain, and prevented cognitive impairment.

We suggest that Molecular Hydrogen may be considered as part of the treatment plan for conditions associated with or developing from inflammation and oxidative stress.

This includes metabolic syndrome and its associated conditions, chronic pain, decreases in cognitive function and abnormal cell division.

The only reported side effects registered include mild detox symptoms, headache and loose bowel motions. These appear to be the exception rather than normal.

For more information, list of studies and explanations of the molecular hydrogen delivery methods, go to:
www.molecularhydrogeninstitute.com