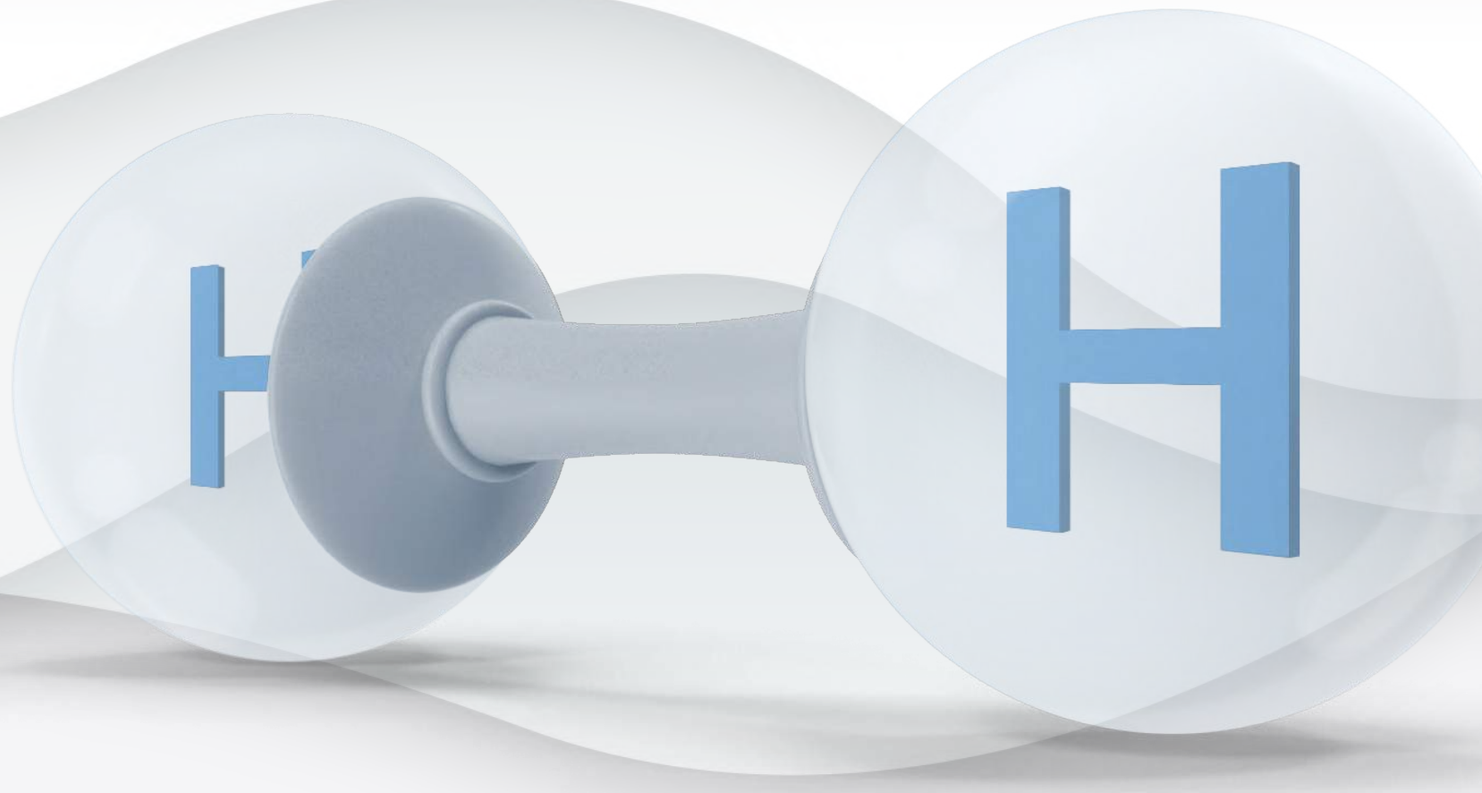
CELLPOWER

THE ULTIMATE HYDROGEN EXPERIENCE



Molecular Hydrogen (H_2)

Molecular hydrogen, often represented as H_2, is the diatomic molecule composed of two hydrogen atoms bonded together. It is the simplest and most abundant molecule in the universe. In its molecular form, hydrogen exists as a colourless, odourless, and tasteless gas at standard temperature and pressure.

Molecular hydrogen consists of two hydrogen atoms, each with a single proton and a single electron, joined together by a covalent bond. The chemical formula for molecular hydrogen is H_2. It is a lightweight gas and highly abundant in the universe. It is a fundamental component of stars, including our sun, and is prevalent in interstellar space. On Earth, hydrogen is less common in its molecular form but is found as a component of water and various organic compounds. While molecular hydrogen is chemically stable in its molecular form, it can participate in various chemical reactions and serves as an important energy carrier. Molecular hydrogen, with its simple diatomic structure (H_2), exerts its diverse physiological and biochemical effects through a multifaceted mechanism involving several key processes.

Antioxidant Activity

Hydrogen is often marketed as a "powerful" antioxidant. However, scientifically speaking, hydrogen does not act as a direct antioxidant like Vitamin C or glutathione. Unlike these conventional antioxidants, hydrogen has a unique mechanism - It doesn't directly neutralize harmful molecules but influences the body's processes to enhance our natural defenses against them.
While hydrogen is not a conventional antioxidant, it exhibits antioxidant-like effects through signal modulation, influencing metabolic pathways and upregulating the body's own antioxidants, selectively targets harmful radicals, and helps prevent imbalance in the body.

Cell Signalling and Gene Expression

Molecular hydrogen can influence cell signalling pathways and gene expression. It may activate certain transcription factors like Nrf2 (nuclear factor erythroid 2-related factor 2), which regulates the expression of antioxidant enzymes and phase II detoxification enzymes. This activation can enhance the cell's defence mechanisms which is essential for maintaining cellular redox balance and protecting cells against oxidative stress induced damage. Dysregulation of this pathway has been linked to various disease processes. Nrf2 pathway regulates more than 200 cytoprotective proteins within the cell, so molecular hydrogen increases our endogenous antioxidants - like glutathione, superoxide dismutase, catalase. The Antioxidant Response Element (ARE) is a specific DNA sequence found in the regulatory regions of genes that are involved in the cellular defence against oxidative stress. It plays a crucial role in the transcriptional regulation of many antioxidant and detoxification genes.

Anti-inflammatory effect

H_2 demonstrates anti-inflammatory properties by modulating various signalling pathways and pro-inflammatory mediators. It can suppress the production of pro-inflammatory cytokines and molecules. This anti-inflammatory action helps mitigate excessive immune responses and inflammation-driven tissue damage.

Regulation of Cellular Biochemistry

H_2 appears to interact with cellular signalling molecules, enzymes, and receptors, modulating biochemical processes. For instance, it can affect the activity of kinases and phosphatases, potentially impacting cell growth, apoptosis, and proliferation pathways.

Mitochondrial Function

Molecular hydrogen can target and positively influence mitochondrial function. This includes improving mitochondrial respiration, reducing oxidative stress within these organelles, and optimizing adenosine triphosphate (ATP) production. Enhanced mitochondrial health can translate into improved energy metabolism and cellular vitality.

Selective Action and Cellular Penetration

The small size and non-polar nature of H_2 molecules enable them to easily penetrate cellular membranes and access subcellular compartments, including mitochondria and the nucleus. This allows for a highly selective and localized antioxidant action, safeguarding critical cellular structures.

Microbiota Modulation

H_2 may influence the gut microbiota composition, promoting the growth of beneficial bacteria while inhibiting harmful pathogens. This modulation of the gut microbiome can have far-reaching implications for overall health, including immune function and metabolic balance.

Synergistic Effects

Molecular hydrogen has been studied in conjunction with various therapies and interventions, showcasing potential synergistic effects. These interactions can enhance the efficacy of certain treatments while minimizing side effects.

Summarised Benefits

- selective antioxidant like effects
- anti-allergic effects
- anti-inflammatory effects
- anti-cellular death effects
- anti-aging effects
- support the immune system
- increases the cellular metabolism
- improves the body's antioxidants or the redox status of the cell
- reduces muscle fatigue
- anti-diabetic effects
- anti-cancer effects
- improves cognitive function or beneficial effects of brain
- protects DNA and RNA
- increases energy or ATP production
- protects from radiation
- protects mitochondria
- increases mitochondria biogenesis