

PRESS RELEASE

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MiZ Company Limited

Pre-symptomatic diseases (“mibyou”) can be prevented and improved with molecular hydrogen

MiZ Company Limited, in collaboration with the University of California, Berkeley and Professor Emeritus Yoshiyasu Takefuji of Keio University, has published a review paper titled “Molecular Hydrogen as a Novel Protective Agent against Pre-Symptomatic Diseases” in the International Journal of Molecular Sciences.

The term “mibyou” refers to a state of health in which a disease is slowly progressing in the body, yet the symptoms are not apparent. The causes of “mibyou” are thought to be oxidative stress and chronic inflammation, which is in turn the main cause of many intractable diseases. In a previous paper, the authors reported the possible mechanisms by which molecular hydrogen scavenges hydroxyl radicals, which are reactive oxygen species (Note 2) generated in the mitochondria (Note 1) of cells, to suppress the progression of chronic inflammation. Based on these mechanism by which hydrogen suppresses chronic inflammation, the authors showed in this review that hydrogen has the potential to prevent and ameliorate various inflammatory diseases in their pre-symptomatic stages.

The paper was released online on July 5, 2021 (European time) in the International Journal of Molecular Sciences (Impact Factor: 5.9), an international scientific open-access journal published by MDPI, a Swiss-based publisher.

1. Background of the paper and the effects of hydrogen on chronic inflammation

Since chronic inflammation is involved in many diseases, it is often said that “chronic inflammation is at the root of all diseases”. Modern medicine can control acute inflammatory diseases, while the same cannot be said for chronic inflammatory diseases. Inflammation is triggered by the release of inflammatory cytokines (Note 3) produced by certain types of white blood cells. Prolonged inflammation can damage the host organism and induce chronic inflammation. In a previous paper, the authors reported that hydroxyl radicals produced in the mitochondria activate the NLRP3 inflammasome (Note 4) through a complex pathway, and that this stimulation triggers the production of

inflammatory cytokines. Since hydrogen is a selective scavenger of hydroxyl radicals in the mitochondria, the authors showed that hydrogen can block such a cascade (Note 5) that leads to the activation of the NLRP3 inflammasome. Since hydrogen is the only substance that can both enter the mitochondria and scavenge hydroxyl radicals, hydrogen has novel prospects in curing chronic inflammatory diseases and many diseases related to chronic inflammation.

2. “Mibyou” is caused by chronic inflammation

The term “mibyou” refers to a state of health in which a disease is slowly progressing in the body, yet the symptoms are not apparent. It can be broadly defined as a condition between health and disease, as there is no clear boundary between the two. As introduced in the previous section, chronic inflammation is the cause of many intractable diseases, and in this paper, the authors argue that chronic inflammation is involved in the pathogenesis of cancer, chronic kidney disease, type 2 diabetes, hepatitis, Parkinson's disease, Alzheimer's disease, and hypertension, and that hydrogen may suppress the activation of NLRP3 in order to prevent and improve “mibyou”. The possibility of a mechanism by which hydrogen suppresses the activation of NLRP3 to prevent or improve “mibyou” was demonstrated. As a specific example in which hydrogen has shown to improve “mibyou”, two clinical trials have been reported corroborating that hydrogen improves mild cognitive impairment (MCI), which is dementia (Alzheimer's disease) in its pre-symptomatic state, which means that these papers support the effects of hydrogen in improving pre-symptomatic diseases. In addition, modern medicine is based on a one-to-one treatment for various diseases, whereas hydrogen showcases a characteristic “machine gun therapy” that can target chronic inflammation in various cells throughout the body. Hydrogen is a substance that represents a completely different concept from modern medicine; a new way of preventing and improving untreated diseases.

3. Article Information

Title: Molecular Hydrogen as a Novel Protective Agent against Pre-Symptomatic Diseases

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[Glossary]

(Note 1) Mitochondria: This is an intracellular organelle. It consists of two biological membranes, has its own DNA, divides, and multiplies. Mitochondrial DNA is involved in biological phenomena other than ATP synthesis (energy synthesis), and is also known as a site for aerobic respiration.

(Note 2) Reactive oxygen species: A general term for oxygen in the air that has been transformed into a highly reactive compound, and there are generally four types: the superoxide, hydroxyl radical, hydrogen peroxide, and singlet oxygen.

(Note 3) Inflammatory cytokines: Cytokines are proteins secreted mainly by immune cells that play a role in transmitting information between cells. Among cytokines, those that cause inflammatory symptoms are called inflammatory cytokines.

(Note 4) Inflammasomes: Inflammasomes are complexes composed of multiple proteins that recognize foreign substances in the cytoplasm (e.g., components of pathogenic microorganisms and uric acid crystals) as danger signals to the host cell in order to release inflammatory cytokines via intracellular signaling, playing an important role in the induction and progression of inflammatory reactions.

(Note 5) Cascade: The original meaning is a string of beads, but in medical terms, it refers to the phenomenon of stepwise amplification of a single signal through several biochemical and physiological reactions.

[For further information on this presentation]

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