

# Hydrogen Rich Water Health Benefits



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## Chapter 1: The Important Role of Free Radicals in Diseases

In order to understand the role of molecular hydrogen in treating health care, we must first understand what free radicals are and what is the relationship between free radicals and diseases. This is an important theoretical basis for the prevention and treatment of molecular hydrogen.

Modern medical research has found that free radicals are closely related to the occurrence of human diseases and play an important role in the occurrence of more than 200 injuries. They are considered to be the enemies of human health, and some say that cytotoxic free radicals For "the culprit of disease, the source of all diseases." The elimination of harmful free radicals in the body can help prevent diseases or cure diseases and improve health.

### 1. What is a free radical

Under normal circumstances, the electrons in the macromolecules that make up our human cells are paired together, as if they were combined by a couple and they are relatively stable. When the human body is affected by certain harmful factors, biomolecules in the body lose their electrons due to external forces. As divorced couples no longer pair up, they become free radicals. In medical biology, free radicals mean these free molecules, ions, atoms, or atom groups that contain 1 or more unpaired molecules.

Free radicals are like a "no-match mob". They like to grab other people's electronics to match. They have a powerful ability to oxidize, easily attacking living molecules in the body, and damaging DNA, protein, and lipids, which can cause harm to the body. Any excess of free radicals in the body can cause many diseases.

### 2. How free radicals are produced

A variety of factors can induce free radicals, exogenous free radicals, and endogenous free radicals.

Exogenous free radicals are induced by external factors. They are important culprits that endanger the health of the body. Such as air pollution, work pressure, food and water pollution, ultraviolet radiation, ionizing radiation, smoking, excessive drinking, poisons and drugs, excessive exercise, strong psychological pressure, long hours of overtime, etc. . These harmful free radicals increase the oxidative stress in the body and attack vital life molecules. Once they exceed the ability of the body to scavenge free radicals and antioxidant systems, they lose the dynamic balance of oxidation. If it is harmful to health, it can cause various diseases.



Endogenous free radicals are free radicals produced in the body's metabolism. It is an indispensable active substance in the body and can be used as a second messenger to participate in the normal activities of cells.

Although the metabolism of healthy people sometimes generates excessive free radicals, the body itself has a system that automatically eliminates free radicals and anti-oxidants, and can remove excess free radicals in time to maintain the dynamic balance of oxidation and antioxidants. However, as the age gets older or the body becomes worse, the body's ability to scavenge free radicals and anti-oxidant systems will decline, and excess free radicals will have no time to clear. This will accelerate aging and participate in the pathogenesis of diseases such as Alzheimer's disease.

### 3. Why can free radicals induce disease

The mechanism of free radicals leading to disease is very complex, but the most important reason is that radicals have two basic characteristics of high chemical reactivity and instability.

High chemical reactivity means radical chemical properties are very active and extremely aggressive. They can react chemically with various biomolecules such as DNA, proteins and lipids, through oxidation reaction, addition reaction, cleavage reaction and oximation reaction. And other destruction of life molecules. And it can expand the damage to the living molecules through the cascade amplification effect, that is, the initially generated free radicals can work with the surrounding vital molecules to produce a new lead molecule and more new free radicals. The new free radicals attack again. Normal life molecules, so repeated, and repeated, so that more life molecules have been destroyed, which led to a variety of diseases.

Instability is due to the presence of unpaired electrons in the free radicals. These electrons are unstable and will rapidly destroy and rob the electrons in close proximity to the biomolecule or atom, pairing with them to recombine, and alter the structure of normal biomolecules. Therefore, free radicals do not exist in the body for a long time. It will certainly take electrons from family members of other molecules and harm the other party, just as a third party destroys other families. These characteristics of free radicals can cause damage to biological macromolecules such as DNA, thereby altering cell structure and normal function and endangering the health of the body.

### 4. Free radicals can cause those diseases

A large number of studies have shown that free radicals are the "culprits of disease," causing or participating in the occurrence of nearly 200 diseases, and even playing a key role in the pathogenesis of some diseases. For example, in ionizing radiation damage and other radioactive diseases, the initial pathogenesis is that ray transfers energy to the body, and in the body it is converted into free radicals such as hydroxyl radicals, hydrogen radicals, and



hydration electrons, and then free radicals attack various living molecules. This causes radiation damage.

Free radicals also play an important "accomplice" role in other diseases, which contributes to the occurrence, development, and deterioration of the disease. For example, atherosclerosis, diabetes, aging of the body, senile dementia, alcoholism, ischemia and reperfusion injury of organs, inflammatory diseases, exercise. As well as heart, liver, lung, kidney, brain, and skin diseases. Therefore, diseases caused by free radicals involve various systems throughout the body. Including the blood system, digestive system, respiratory system, reproductive system, nervous system, endocrine system, blood system, and exercise system.



## Chapter 2: The Unique Role of Molecular Hydrogen and Its Mechanism of Disease Prevention and Control

It has long been known that people who are deprived of oxygen can die; the inhalation of oxygen, carbon monoxide and other gases can be fatal. However, the lack of understanding of hydrogen over a long period of time has been mistaken for physiologically inert gases without any biological activity. This erroneous understanding was not overthrown until May 2007! In that year, foreign scholars reported that hydrogen has a good biological activity in the world's top medical journal "Natural Medicine" and can effectively prevent and treat cerebral ischemia-reperfusion injury. The effect is better than that of edaravone, a frequently used therapeutic drug in clinical practice. This amazing discovery unveiled the prelude to humans re-recognizing hydrogen biological activity and studying its prevention and treatment. Since then, there has been an upsurge of research on the biological effects of molecular hydrogen at home and abroad, and the role of prevention and control of molecular hydrogen has been continuously explored and expanded.

So. What is molecular hydrogen? What are the unique biological activities? Why does it have the effect of preventing or treating diseases? What are the benefits to the human body? These issues are hot spots that people are extremely concerned about. This chapter will briefly explain these issues and explain the scientific truth that molecular hydrogen contributes to physical health.

### 1. What is molecular hydrogen

Molecular hydrogen is a substance that has existed on Earth for a long time. It is hydrogen that exists in a molecular form after two hydrogen atoms are covalently bonded. In layman's terms, hydrogen is also called hydrogen molecule and its chemical symbol is H<sub>2</sub>. Whether it is molecular hydrogen, hydrogen, or hydrogen molecules, it is actually the same substance. The English name is molecular hydrogen. In Japanese, hydrogen and hydrogen are commonly referred to as "hydrogen", and water containing hydrogen is referred to as "hydrogen water."

Why then is there a different name for the same substance in China? This is because different natural sciences have different names or rules for materials. Regarding the nomenclature of natural materials, it is stipulated in astronomy that a substance that is covalently bonded by two hydrogen atoms is called "molecular hydrogen", and most of them are also written as "molecular hydrogen" in international medical journals, and domestically. Many scholars use the name of molecular hydrogen. We believe that the use of molecular hydrogen is more scientific and reasonable.



The term "hydrogen" is often used in the field of physics. Physics states the existence of matter in solid, liquid, and gaseous states. Some substances can change from solids to liquids with increasing temperature, and then change from solid to gas. For example, if water is below 0°C, it is solid ice, and when it is above 0°C it becomes liquid water, and when it is above 100°C it becomes gaseous water vapor. The same applies to molecular hydrogen. It is a solid at temperatures below about -259.1°C. It becomes a liquid when the temperature rises above -259.1°C, and it becomes a gas when it rises above -253°C. Therefore, the substance is called in physics. hydrogen.

In the chemical field, the molecular structure of the material is mainly named, so the molecular hydrogen is called "hydrogen molecule" or directly called hydrogen gas.

In particular, the hydrogen ions, hydrogen ions, hydrogen atoms, hydrogen elements, etc. all have "hydrogen", but they are not a substance with molecular hydrogen! Molecular hydrogen has biological activity and health care effects, does not mean that other hydrogen-containing substances also have active and health-care effects. Do not be confused! The hydrogen-bearing substances on the earth abound, and what is generally accepted by the national medical community as beneficial to human health is only hydrogen in molecular form (ie molecular hydrogen), rather than other substances containing hydrogen. Therefore, we cannot simply think that as long as there is "hydrogen," there will be health and health care!

## 2. Molecular hydrogen prevention and treatment mechanism

Based on the results of the existing studies at home and abroad, the reason why molecular hydrogen can maintain health care and play a unique role in disease prevention and treatment is summarized in seven reasons. It is the result of a combination of mechanisms.

1) It can selectively remove toxic and harmful free radicals in the body. Various harmful factors on the outside of the body can cause the body to produce a large amount of excess free radicals, many of which are toxic free radicals (such as hydroxyl radicals) that are harmful to the body. They can cause various diseases or make the disease worse. Molecular hydrogen has a lethal effect on the body while it does not affect the free radicals needed for normal physiological conditions. In other words, molecular hydrogen specifically "fixes the elimination of" "black sheep" in free radicals in the body, removes these harmful wastes, and acts as a "defensive guard", thus preventing or reducing the harm of toxic free radicals and preventing diseases at the source of the disease. Delay cell aging.

2) It can enhance the antioxidant capacity of the body. With the increase of the age, the body's antioxidant capacity will decline; or due to various factors leading to excessive body oxygen, the body's oxidation-anti-oxidation system will appear imbalance. These conditions can cause the destruction of biological macromolecules such as DNA, accelerate aging of the body, and cause various



diseases. Molecular hydrogen can significantly increase the activity of various antioxidant enzymes in the body (such as SOD, GSH, etc.), improve the body's ability to resist oxidative damage, help maintain the homeostasis of oxidative and antioxidant systems in the body, and reduce oxidative damage to cells by reactive oxygen species. Maintain good health.

3) It can act like a signal molecule. In recent years, the study of molecular hydrogen as a signal molecule has become more and more popular following the discovery of the role of signal molecules in niobium monoxide and oxygen sulfide gas, and there have been major development trends for latecomers. Because nitric oxide, sulfur oxidation and other insurmountable toxic and side effects, it can not be used for health care. Molecular hydrogen, however, has no toxic or side effects and is more promising. Studies have shown that molecular hydrogen can exert anti-inflammatory effects, promote cell repair, and enhance immunity by activating some important signaling pathways in cells. For example, molecular hydrogen can activate a transcription factor Nrf2, which plays an important role in many aspects such as anti-inflammatory, anti-oxidation, immune response and anti-cancer, or activate antioxidant system through a pathway called protein transcription factor 1 of the forkhead; For another example, molecular hydrogen can also inhibit the overactive Wnt/ $\beta$ -catenin signaling pathway in certain inflammatory diseases and tumor cells, regulate cell division, and help the signal system return to normal.

4) It protects cell membrane molecules. There are many kinds of cell membranes and important physiological functions. Touching biomolecules, especially membrane phospholipids and lipoproteins, are easily destroyed by oxidative attack. Molecular hydrogen can reduce the auto-oxidation-induced intracellular calcium ion-related gene expression by directly oxidizing itself against a fatty acid linoleic acid and a phospholipid palmitic phospholipid to protect cell membrane phospholipids. Molecular hydrogen can also protect cardiomyocytes and cell membranes through a variety of ways, reduce the damage of external harmful factors, and protect organ function.

5) It has excellent tissue diffusion capabilities that other drug molecules do not possess. Some organs in the human body are surrounded by dense tissues (eg, eyeballs, testes, etc.), and there are multiple tissue barriers (eg, blood-brain barrier, blood-fetal barrier, etc.) or sites with insufficient blood supply (eg, inner ear). Therefore, many medicines or health supplements are difficult to enter into these tissues and organs due to their relatively large molecular weight, which leads to treatment failure or poor treatment. Molecular hydrogen does not have these drawbacks. It is the smallest molecule in the natural world. It can easily reach various tissues of the body through various barriers and evenly distribute itself. It can easily penetrate the cell membrane and enter the cell to exert its biological activity. "There is nowhere to hide," the "enemy" has nowhere to hide. This is the unique advantage of hydrogen prevention and treatment of diseases. Other health products or drug molecules cannot do this.



6) Molecular hydrogen can be flexibly combined with other control technologies. Molecular hydrogen does not affect the use of other methods of disease prevention. This advantage allows molecular hydrogen to be used in conjunction with a variety of control techniques. Such as the combination of drug therapy, radiation therapy to improve the effect of killing tumor cells, while reducing the side effects of anti-cancer drugs, irradiation, etc., reduce pain, improve overall efficacy. Can also be combined with hypolipidemic, hypoglycemic, anti-inflammatory drugs, etc., synergistic prevention and treatment, improve the control effect. As a new daily health care method, molecular hydrogen can be used alone or in combination with other health care measures to complement each other.

7) The use of molecular hydrogen products is simple and convenient, safe and non-toxic. As the saying goes: "It's a three-point poison." Many health products also have some side effects. Hydrogen molecules are not! It is not a medicine. It is a substance that has existed in nature for a long time. It is also a

substance that originally existed in the body. Since ancient times, there has been a small amount of endogenous hydrogen in the body. For a long time divers have also been using extremely high concentrations of hydrogen, and no molecular hydrogen has been found to have any toxic side effects on the human body. In the past three years, the safety of human use of molecular hydrogen has been recognized at home and abroad. Several countries have approved the use of molecular hydrogen as a food additive, and they can be used in an unlimited amount. Some countries have even included molecular hydrogen prevention and control diseases in the scope of medical insurance (such as Japan). A variety of molecular hydrogen products are on the market and they are very convenient to use.

### **3. Molecular hydrogen has preventive health care or control effects on those diseases**

At present, there are many medical research reports on molecular hydrogen health care and disease prevention at home and abroad, covering a wide range of diseases, covering almost every system of the body, and discovering that it can play a preventive or therapeutic role in over 100 injuries and injuries. A series of injuries related to free radical oxidative damage. Of these, more than 20 diseases have been tested for human use, and some have been the result of animal experiments. Large-scale human verification is underway or will be carried out, and more prevention and control effects will be continuously discovered.

The diseases in which molecular hydrogen can exert preventive health effects can be summed up in the following categories: radiation hazards (injuries caused by ultraviolet radiation, nuclear radiation, X-rays, and space radiation); cardiovascular and cerebrovascular diseases (atherosclerosis, stroke, brain Bleeding, cerebral thrombosis, myocardial infarction, hypertension, myocardial



fibrosis, etc.; metabolic disease (diabetes, fatty liver, gout osteoporosis, obesity, etc.); neurodegenerative diseases (Alzheimer's disease or commonly known as Alzheimer's disease, Parkinson's disease, etc.); Inflammatory diseases (hepatitis, pancreatitis, colitis, periodontitis, sepsis, etc.); Toxic side effects of radiotherapy or chemotherapy in cancer patients; Drunk, smog, carbon monoxide poisoning, etc.; Diseases such as lesions, noise deafness, and other audio-visual system diseases; sports injuries, reproductive system diseases, skin diseases, and malignant tumors.

Many of the above-mentioned diseases currently lack specific health care and health care measures. Molecular hydrogen can protect normal tissues by selectively eliminating toxic free radicals, reducing oxidative damage, and alleviating inflammatory reactions. It plays a unique role in health care and maintenance. "No disease" reduces disease occurrence. Molecular hydrogen can also be used as an adjunct treatment to improve the pathological state of some diseases, relieve symptoms, and improve the quality of life of patients. The specific circumstances we will introduce in the following chapters.



## Chapter 3: Anti-radiation health effects of molecular hydrogen

In the environment, there are many kinds of radiation harmful to health (nuclear radiation, X-rays, space radiation, ultraviolet rays, electromagnetic radiation, etc.), which can induce the body to produce a large number of harmful free radicals, and use oxidative damage as an outstanding action to endanger the health of the body. Life, when in danger, is life-threatening. Persons exposed to radiation for a long period of time suffer from low immunity, decreased immunity, acute and chronic radiation sickness, internal radiation damage, radiation damage to the skin, and radiation and carcinogenesis when exposed to radiation. How to medically prevent or reduce the adverse effects of radiation on health is always a national problem.

The scientific team led by Professor Cai Jianming of the Second Military Medical University passed the massive screening of hundreds of compounds and natural substances. The first occurrence of molecular hydrogen in the world can effectively eliminate radiation-induced toxic and harmful free radicals and increase the resistance to SOD and GSH. The activity and antioxidant capacity of oxidizing substances reduce the damage of DNA and other biological macromolecules, promote the repair of free radicals damaged by molecules, cells and tissues, effectively prevent the harm of free radicals to systemic organs, and solve the national problems in radiation protection research. A major breakthrough was made.

### 1. Molecular hydrogen protection hematopoietic system

Hematopoietic system is very sensitive to radiation, radiation can destroy hematopoietic stem cells and hematopoietic microenvironment, high-dose irradiation can cause symptoms such as aplastic anemia, resulting in various types of blood cell reduction and multiple bleeding and various infections. Studies have found that molecular hydrogen can reduce the damage of bone marrow caused by ionizing radiation, protect hematopoietic stem cells, increase the number of hematopoietic cells, and increase peripheral blood leukocyte and platelet levels. It shows that molecular hydrogen can effectively prevent radiation damage of the hematopoietic system, reduce the harm of radiation to the hematopoietic tissue of the body, and reduce the decline of white blood cells and platelets. It helps to prevent and treat some diseases with poor hematopoietic function (such as aplastic anemia).

### 2. Molecular hydrogen protects gastrointestinal tissue

Gastrointestinal epithelial cells are also very clear about radiation, rays can damage the gastrointestinal stem cells, destroy the intestinal mucosal tissue



barrier, causing nausea, vomiting, blood in the stool, toxins into the blood, loss of appetite and other symptoms. Research has found that molecular hydrogen can reduce the damage effects of radiation on gastrointestinal tissues, protect intestinal stem cells, protect the intestinal mucosa, promote the repair of damaged intestinal tissues, and improve the function of the gastrointestinal system. These results not only indicate that molecular hydrogen can prevent intestinal radiation damage, but also suggest that it is beneficial in improving the radiotherapy side effects of gastrointestinal tumors, relieve symptoms such as nausea, vomiting and loss of appetite, and improve the quality of life. It also has certain significance for preventing and treating certain free radical-related intestinal diseases.

### **3. Minutes of hydrogen protection of liver and liver function**

The liver is one of the important organs of the human body. When radiotherapy is performed on liver tumors and abdominal tumors, the liver can not avoid producing side effects and causing some normal liver tissue damage. Studies have found that molecular hydrogen can protect normal liver cells, reduce radiation damage to liver tissue, reduce hepatocyte death, and promote the repair of damaged hepatocytes; reduce irradiation-induced elevation of glutamic-pyruvic transaminase, aspartate aminotransferase, and protect liver function. This result not only shows that molecular hydrogen can prevent liver radiation damage, it is also beneficial in improving the side effects of tumor radiotherapy patients, can protect normal liver tissue and promote liver function recovery. Its liver protection reduces hangover symptoms and reduces post-drinking discomfort.

### **4. Molecular Hydrogen Protects the Male Reproductive System**

Radiation is an important environmental factor for infertility and declining fertility in people of childbearing age in modern society. The reproductive system is highly sensitive to radiation. Protecting the reproductive system from being harmed by free radicals is of positive significance to improving reproductive quality. Studies have found that molecular hydrogen can reduce the damage effects of ionizing radiation on the testis, promote the repair of damaged tissue; reduce radiation-induced sperm variability, increase sperm count, and improve sperm quality. These results not only demonstrate that molecular hydrogen can prevent radiation damage in the male reproductive system, but also suggest that it is beneficial in preventing the effects of environmental radiation on the testis and sperm, which is conducive to the protection of normal reproductive function.

### **5. Molecular hydrogen protects the skin**

The skin is susceptible to accelerated aging by ultraviolet and ionizing radiation. Studies have found that molecular hydrogen can reduce the skin damage caused by ionizing radiation, manifested as weakened skin inflammatory response, reduced tissue lesions, skin cell repair and hair



regeneration faster. In addition, scholars from Korea, Nanjing Medical University and Tianjin Medical University also discovered that molecular hydrogen can prevent ultraviolet damage to the skin and speed up the repair of damaged skin tissue, proving that systemic use or partial spraying of molecular hydrogen products can counteract UV-induced skin damage. . These findings not only indicate that molecular hydrogen can prevent radiation damage from skin tissue, but also suggest that it is beneficial for daily skin care.

## 6. Molecular Hydrogen Protects Lungs

The lung is the most important respiratory organ of the human body, and it is also the main target of various harmful substances such as smog. R & D found that molecular hydrogen can reduce the radiation caused by ionizing radiation pneumonitis and subsequent pulmonary fibrosis, reduce inflammation, protect lung cells, improve lung function. These results suggest that molecular hydrogen is very useful in the treatment of patients with breast tumor radiotherapy, because radiation pneumonitis and pulmonary fibrosis are common complications during radiotherapy of the chest and are an important factor constraining the efficacy of cancer therapy. Molecular hydrogen protects the normal lung. Cells, reduce complications, reduce radiation pneumonitis and pulmonary fibrosis.

Molecular hydrogen protection of the lungs is also good for protecting smokers. Because smoking generates more free radicals and adversely affects health, molecular hydrogen can reduce the harm of smoking by removing harmful free radicals and reducing oxidative damage.

## 7. Molecular hydrogen protection immune function

The immune system is extremely important for the prevention of diseases in the human body, and people with low immune function are prone to various diseases. The immune system is also very sensitive to radiation and is vulnerable to radiation free radicals. Research has found that molecular hydrogen can protect important immune organs such as thymus and spleen, reduce lymphocyte death caused by ionizing radiation, increase the secretion of immune factors, improve blood circulation, and increase the number of peripheral blood immune cells by more than double. This result not only shows that molecular hydrogen can not only prevent radiation damage of the immune system, but also suggest that it is beneficial to prevent other harmful factors from harming the immune system, and it helps to enhance immunity and maintain good health.

## 8. Application of molecular hydrogen anti-radiation effect

Molecular hydrogen anti-radiation has wide application value in the field of radiation protection and prevention of free radical-related diseases. The hydrogen molecular products transformed from the above research results have been popularized and applied in the daily health care of some troops. They are



very popular and can be used for the prevention and treatment of a series of injuries related to toxic free radicals and oxidative damage to the body.

Molecular hydrogen anti-radiation effects can also benefit ordinary people. Can be used for radiation protection of various radiation professionals and other professional personnel, for example, pilots, astronauts, nuclear submarine crews, nuclear power station workers, medical radiation personnel (physicians and patients), nuclear accident rescuers, nuclear material mining and production personnel People who use computers and electronic products for a long period of time, astronauts in the United States are also using our achievements in this area to protect the astronauts' health.

Molecular hydrogen anti-radiation can also be used to reduce the radioactivity side effects of cancer patients. Clinical human trial data show that molecular hydrogen can increase white blood cells in radiation therapy patients, reduce nausea, vomiting, diarrhea, increase appetite, etc., improve the quality of life of patients.



## Chapter 4: Molecular Hydrogen Anti-Aging Effects

Everyone will eventually grow old. The aging of the body is a natural law, and health problems such as senile dementia will occur in some elderly people. How to delay aging and prevent or reduce the occurrence of diseases such as Alzheimer's is a topic of common concern. Studies in Japan have found that many centenarians have three times more molecular hydrogen levels in the respiratory gases than ordinary people. This suggests that the unique biological activity of molecular hydrogen may be a beneficial element in promoting longevity to a large extent, for longevity and for the elderly. The quality of life adds new hope.

### 1. Causes of human aging

If you want to understand why molecular hydrogen can fight aging, you must first understand why people age. For a long time, scientists from various countries have conducted extensive research on why people age. Some scientists believe that free radicals are the main cause of aging. Inflammation and oxidative damage caused by free radicals are the key to tissue cell aging. Prof. Harman of the United Kingdom took the lead in 1956 to suggest that free radicals are related to aging and diseases of the body, proving that using free radical scavengers to reduce free radicals in the body can prolong lifespan. Because the free radical theory can clearly explain the symptoms of the body during the aging process, such as age spots, wrinkles, decreased immunity and Alzheimer's disease, it has attracted widespread attention and has been generally accepted by people.

Why do free radicals cause aging? Its main mechanism can be summarized as the following three aspects.

(1) Free radicals can promote lipofuscin accumulation and cross-linking polymerization of macromolecules in the body

Free radicals act on lipids to produce peroxidative reactions. Oxidation products cause cross-linking polymerization of macromolecules such as proteins and nucleic acids that cause the destruction of living molecules. Lipid peroxidation can contribute to the aging effect of lipofuscin that accumulates in lipofuscin producing tissues and cells. For example, lipofuscin accumulated in skin cells becomes a senile plaque; lipofuscin accumulated in brain cells causes memory loss or mental retardation, and even Alzheimer's disease occurs. Peroxidation of lipids can also lead to retinopathy of the lens of the eye, and free radical-induced collagen cross-linking polymerization of age-related visual disturbances (such as vertigo, cataracts, etc.) may result in decreased collagen solubility, reduced elasticity, and decreased hydration capacity. Causes older skin to lose tension and wrinkles, as well as weakened bone regeneration in the elderly.



(2) Free radicals cause destruction and reduction of organ cells

Human organs are composed of tissue cells. The destruction and reduction of cells is one of the causes of aging. This process is closely related to free radicals. Because unsaturated fatty acids on cell membranes and organelle biofilms are extremely vulnerable to the attack of free radicals and undergo an overoxidation reaction, free radicals accelerate the reduction of cells through the invasion of lipids and accelerate the aging process. For example, the number of neurons in the brain is significantly reduced, causing the elderly to feel and memory loss, dullness, and mental retardation. Free radicals can also act on genes, change the transmission of genetic information, cause errors in the synthesis of proteins and enzymes, and reduce enzyme activity. The long-term accumulation of these factors has caused the destruction and reduction of organ cells, and the aging and dysfunction of organs.

(3) Free radicals reduce immune function

The immune system is susceptible to free radicals. The free radicals acting on the immune system will cause the weakening of the immune function of the elderly, will increase the susceptibility of the tumor and the occurrence of various tumors, and will reduce the immune recognition ability to appear autoimmune diseases. The so-called autoimmune disease means that the immune system not only attacks pathogens and abnormal cells, but also invades normal healthy tissues and attacks its own tissues as foreign foreign bodies. Such as disseminated scleroderma, systemic induration, ulcerative colitis, rheumatoid arthritis, autoimmune diseases such as lupus erythematosus. Studies have shown that the pathological process of autoimmune diseases has a lot to do with free radicals.

## 2. Why do hydrogen molecules have anti-aging effects?

Today's scientific research shows that the elimination of harmful free radicals in the body, maintaining the balance between oxidative stress and antioxidants, and reducing the body's oxidative stress can reduce the incidence of geriatric diseases. Hydrogen molecules have many functions in this area.

Molecular hydrogen has the function of removing harmful free radicals in the body. With age, the damage of free radicals to proteins and DNA is much higher than that of young people, especially mitochondrial DNA. The degree of mutation and deletion is more obvious. Over-accumulation of reactive oxygen species aggravates oxidative stress. Mitochondrial gene mutations and deletions affect the mitochondrial lifespan. The molecular hydrogen can precisely resist harmful free radicals, reduce the accumulation of lipofuscin in the body and the cross-linking polymerization of macromolecules, and delay the free radicals from destroying and reducing the organ cells.

Molecular hydrogen has the function of anti-oxidation, and the decline of body's anti-oxidation ability is one of the important causes of aging. Molecular hydrogen can increase the antioxidant capacity of the body, reduce the increase of oxygen free radicals, increase the damage of proteins, lipids, and DNA,



increase cell activity, and Functions to reduce central nervous system inflammatory response and prolong cell vitality.

Molecular hydrogen can also reduce the decline in body immune function caused by free radicals and through a variety of comprehensive effects so that the body less disease, less disease, thus delaying the aging of the body. Studies abroad have shown that long-term consumption of molecular hydrogen water can reduce body weight by optimizing cellular energy metabolism, reduce obesity-related diseases, increase the life span of obese animals, and prolong the lifespan of premature aging animals.

Professor Zhao Chao from the Center for Gerontology at Fudan University puts forward: Molecular hydrogen exerts its anti-aging effects by selectively eliminating harmful oxygen free radicals. Studies at the Toho University School of Medicine in Japan showed that molecular hydrogen has anti-aging effects on endothelial tissue. Researchers at the Korea University of Lights have found that molecular hydrogen has anti-aging effects. In addition, a large number of basic studies have shown that molecular hydrogen has a very good selectivity to remove harmful free radicals and antioxidant activity, help the body to improve antioxidant capacity, reduce oxidation pressure, and help the body maintain the balance between oxidative stress and antioxidant ,Reduce the damaging effects of free radicals on biological macromolecules and cells. These studies suggest that molecular hydrogen can retard the aging process, prolong cell life, and make the body live a healthier life.

Some members of the longevity family in Japan have more hydrogen in their intestines than ordinary people, and their molecular hydrogen levels are higher than in ordinary people. Many people live long lives. Therefore, many people try to use molecular hydrogen health care anti-aging, and some patients with early Alzheimer's disease often inhaled molecular hydrogen after a period of time, to achieve a significant reduction in symptoms, brain thinking and discriminating ability to get a greater recovery. All indications suggest that the use of molecular hydrogen in daily life may be of great help in delaying aging.

### **3. The health effects of molecular hydrogen on neurodegenerative diseases such as Alzheimer's disease**

Diseases such as Alzheimer's disease and Parkinson's disease are common and frequently-occurring diseases in the middle-aged and the elderly. As people's living standards improve and life expectancy per capita increases, the incidence of such diseases increases rapidly and seriously endangers the health of middle-aged and elderly people. How to prevent or reduce the occurrence of such diseases has become a widely concerned social issue. More and more medical research data show that molecular hydrogen can bring healthy gospel to the elderly.

Alzheimer's disease (also known as Alzheimer's disease) is a primary degenerative brain disease that occurs in the pre-senile and old age stages and is a persistent high-level neurologically active disorder. The characteristic



pathological changes are the decrease of cerebral cortical cells, the atrophy of brain tissue, accompanied by amyloid deposition and neurofibrillary tangles, and the number of memory neurons is greatly reduced. Mainly manifested as obstacles such as memory loss, poor thinking ability, ability to analyze and judge, ability to identify things, and emotion control. Researchers at home and abroad (such as China Medical University, Li Jian et al.) found that molecular hydrogen can reduce the level of oxidative stress in the brain, reduce the concentration of inflammatory cytokines, reduce the activation of astrocytes, and reduce Alzheimer's resistance by inhibiting the activation of inflammatory pathways. The amyloidosis in the brain of experimental animals with Hemer's disease improves cognitive and memory functions and reduces abnormal behavioral changes. These studies have found that the use of molecular hydrogen products to prevent or treat Alzheimer's patients found a basis, but also brought new hope for the prevention and treatment of Alzheimer's disease.

Parkinson's disease is another common neurodegenerative disease, and it is one of the important diseases that threaten the health and life of the elderly. Small-scale human clinical trials from Japanese experts such as Yorkitaka showed that long-term consumption of high-molecular-weight hydrogen water can improve the symptoms of patients with Parkinson's disease. They took a randomized, double-blind, controlled trial for 48 weeks and drank 1 L of water containing molecular hydrogen every day. The symptoms of the subjects improved significantly, and the overall score improved significantly. The control group without molecular hydrogen was further deteriorated. 18 research institutes in Sweden and Japan are conducting more large-scale multi-center human trials, and molecular hydrogen is very hopeful to become a long-term routine use for the treatment of Parkinson's disease. Japanese medical scientists have also demonstrated that drinking low concentrations of molecular hydrogen can inhibit the expression of tyrosine hydroxylase in the model of Parkinsonism induced by environmental toxins, relieve oxidative stress in the brain of animals, and protect the substantia nigra dopaminergic nerves in the brain. Yuan, showing a better therapeutic effect of molecular hydrogen on Parkinson's disease.



## Chapter 5: Effects of Molecular Hydrogen on Diabetes

With the changes in people's drinking structure, the acceleration of the aging process, and the dramatic changes in lifestyle, diabetes has become the third most serious chronic disease that threatens human health after cancer and cardiovascular and cerebrovascular diseases. In recent years, the number of diabetic patients in China has also increased rapidly. It is expected that the number of diabetic patients will exceed 38 million by 2025. According to the World Health Organization's forecast, the number of adults with diabetes will soar to 300 million by 2025. Diabetes seriously harms human health, how to effectively prevent and treat diabetes, improve the quality of life of patients with diabetes, and prevent and treat complications have become one of the difficult problems to be solved in contemporary medical science work. Studies have found that molecular hydrogen is a great help in preventing and treating diabetes and is a good health care measure.

### 1. The relationship between free radicals and diabetes

In recent years, there is increasing evidence that the pathogenesis of diabetes is closely related to free radical-induced oxidative stress. Free radical-induced oxidative stress plays an important role in the development of diabetic vascular complications. Hyperglycemia can cause increased production of electron donors in the TCA cycle, resulting in excess production of free radicals, and activation of polyols, protein kinase C and other pathways leading to vascular damage, can also affect mitochondrial energy metabolism, resulting in a large number of free radicals causing oxidative damage, freedom Basal-induced oxidative stress can also lead to decreased insulin sensitivity and impaired islet beta cells by regulating relevant signaling pathways. Active oxygen damages vascular endothelial cells and further causes macrovascular and microvascular lesions, causing vascular complications. Therefore, the search for efficient, non-toxic, and easy-to-use toxic oxygen free radical scavenger can provide a new direction for the prevention and treatment of diabetes and its vascular complications. Molecular hydrogen is just such an effective substance.

### 2. The fatal hazard of diabetes

In addition to leading to a decline in the quality of life of patients, diabetes is the main fatal risk of its complications, involving multiple organs, many aspects, such as cardiovascular and cerebrovascular diseases, diabetic nephropathy, eye diseases, nervous system damage, etc., seriously endanger the lives of patients with diabetes. Affect the quality of life. 50% of diabetic lethal factors are vascular complications caused by diabetes. Hyperglycemia leads to vascular tissue damage. Cell proliferation and vasodilation mechanisms are impaired to



cause abnormal vascular functions, and atherosclerosis and other vascular lesions occur.

### 3. The role of molecular hydrogen in the prevention and treatment of diabetes

Molecular hydrogen has a role in the prevention and treatment of certain human diabetes, and more and more studies have been reported in this area.

E.g,

Japanese scholars have adopted randomized, double-blind, placebo-controlled human trials for diabetic patients. The results show that drinking 0.9L high-concentration hydrogen water for two months can improve abnormal glucose metabolism, and the fasting blood glucose lowers the sensitivity to insulin. ,8-Isoprostaglandins in blood low density lipoprotein and urine were significantly reduced, and the glucose tolerance test was normal in patients with abnormal glucose tolerance above 65%.

Another Japanese research institute studied 20 patients with metabolic syndrome with obesity, impaired glucose tolerance, and hypertension, and found that drinking more than 8 weeks of continuous drinking water with 1.5 to 2 liters of water per day can increase the activity of HDH and SOD. Subjects continued to use high-concentration hydrogen water for 8 weeks and discovered that molecular hydrogen has special advantages such as safety, non-toxicity, and effectiveness in the prevention and treatment of diabetes.

According to incomplete statistics, there are thousands of diabetes patients in China who use molecular hydrogen products as a routine health care method to achieve an ideal health effect. Some people have lower blood sugar levels. Some people can reduce the use of hypoglycemic agents and insulin, and some people have diabetes. The disease has eased.

The results of these human applications show that molecular hydrogen is a great help in the prevention of diabetes as a health care product for daily life; it is also very beneficial for reducing the blood sugar of diabetic patients and preventing or reducing the fatal complications of diabetes.



## Chapter 6: Effects of Molecular Hydrogen on Atherosclerosis

Atherosclerosis is closely related to diseases of the cardiovascular system and is a major cause of coronary heart disease, cerebral infarction, and hypertension. Research at home and abroad has found that molecular hydrogen has the effects of delaying atherosclerosis and reducing vascular inflammation, adding new health care methods for the daily prevention of such diseases.

### 1. Atherosclerosis and its mechanism

Atherosclerosis is a long-term disease process involving multiple factors. It is characterized by high lipid oxidative stress and inflammation, resulting in aggregation of macrophages and oxidized low-density lipoproteins and affecting the normal function of blood vessels. The basis of atherosclerosis lesions is lipid metabolism disorder, which is characterized by the affected artery from the inner membrane lesions, usually the first lipid and complex carbohydrate accumulation, hemorrhage and thrombosis, and then tissue hyperplasia and calcification, and there The gradual metamorphosis and calcification of the middle artery lead to thickening and hardening of the arterial wall, narrowing blood vessels, and difficulty in blood circulation. Since the lipid accumulated in the arterial intima looks yellow, it is called atherosclerosis.

### 2. The main hazards of atherosclerosis

The consequences of atherosclerosis mainly depend on the degree of ischemia in the site of vascular lesions and involved organs. Coronary heart disease, cerebral infarction, and peripheral vascular disease are the main clinical manifestations. Atherosclerosis occurs in the coronary arteries. If the stenosis of the uterine cavity is more than 75%, angina pectoris, myocardial infarction, arrhythmia, and even sudden death may occur. Cerebral atherosclerosis may cause cerebral ischemia, brain atrophy, and cerebrovascular rupture. Renal artery atherosclerosis, often caused by refractory hypertension, nocturia increased, severe cases may have renal insufficiency; intestinal atherosclerosis, can be expressed as abdominal pain, indigestion, constipation, etc., can cause severe Intestinal wall necrosis hematochezia, intestinal obstruction, etc.; Peripheral vascular atherosclerosis can also cause hypertension, the incidence of atherosclerosis in hypertensive patients was significantly increased, both often exist at the same time, each other is a causal relationship.



### 3. The prevention and treatment of atherosclerosis by molecular hydrogen

The scavenging of free radicals and anti-oxidation are considered as an important measure to prevent atherosclerosis and cardiovascular diseases. Molecular hydrogen has the advantages of scavenging free radicals and anti-oxidative stress reaction. It also reduces the plasma total cholesterol, triglyceride and low-density lipoprotein, anti-inflammation, and stabilizes already formed atherosclerotic plaque, which can slow down the arteriosclerosis. Progression of hardening.

The team led by Professor Qin Shuceng, Director of the Institute of Atherosclerosis at Taishan Medical College, conducted in-depth research in this regard. They conducted a double-blind controlled clinical study of humans based on animal experiments and found that continuous application of molecular hydrogen water for 2 months can Regulating blood lipids, increasing high-density lipoproteins, and lowering low-density lipoproteins suggest that molecular hydrogen can prevent and treat atherosclerosis and dyslipidemia in humans. Related research has won the second prize of scientific and technological progress in Shandong Province and enriched the molecular hydrogen health. The scientific basis of health care.

Clinical trials conducted abroad have also demonstrated that drinking saturated hydrogen saline can reduce the production of oxidative lipids. In addition, drinking saturated hydrogen saline can also reduce the level of oxidative stress in arteries and reduce macrophage accumulation at atherosclerotic lesions. In animal models of atherosclerosis, hydrogen may reduce the occurrence of atherosclerosis at the level of genes and proteins by inhibiting the activation of pro-inflammatory nuclear transcription factors. These experimental studies and clinical observations provide a theoretical basis for the use of molecular hydrogen to prevent and treat atherosclerosis.



## Chapter 7: The Role of Molecular Hydrogen in Maintaining Immunity

Immunity is the natural shield of the body's own defense against invasion by foreign enemies. Its important role is to: identify and destroy any foreign invading foreign substances (bacteria, viruses, harmful substances, etc.), clean up abnormal cells (mutant cells, necrotic cells, senescent cells, cancer cells, etc.) and infected cells in time, identify and eliminate adverse effects. Healthy variety of "dissidents." Normal immunity is extremely important for maintaining good health. People with low immunity are prone to be infected or have cancer. Excessive immunity can also lead to adverse effects on the body, such as triggering allergic reactions and autoimmune diseases. Free radicals are related to human immunity, and molecular hydrogen plays an important role in removing harmful free radicals. Therefore, it is not difficult to understand that molecular hydrogen can play a role in anti-inflammation and immunity enhancement in maintaining normal immunity.

### 1. The relationship between free radicals and human immunity

Human immunity depends on its own immune system. This system consists of immune organs, immune cells, and immunologically active substances. It is the most effective weapon against invasion of pathogens, and it is also a strong expert in maintaining the human body's environmental stability. The immune organs mainly include bone marrow, spleen, lymph nodes, and thymus. Tonsils, etc.; immune cells are mainly lymphocytes, neutrophils, monophagocytes, and so on; immunologically active substances contain immunoglobulins, antibodies, interferons, lysozyme, interleukins and so on. Abnormalities in any part of the above immune system can affect physical health. Free radicals can act on the immune system, causing lymphocyte damage, resulting in decreased human immune function, resistance to disease is also reduced, easily infect bacteria, viruses, fungi and other infections, the body is prone to illness; free radicals can destroy the cell membrane, leading to Denaturation of cell membranes, making cells unable to absorb external nutrients, but also unable to exclude intracellular waste, and loss of resistance to bacteria, viruses, etc.; free radicals cause allergies to cause allergic reactions, allergic rhinitis, allergic asthma, allergic Dermatitis, etc.; free radicals can also lead to autoimmune diseases, such as systemic lupus erythematosus, rheumatoid arthritis, etc., either directly or indirectly. Therefore, timely removal of excessive free radicals in the body, reduction of free radical accumulation, and production of peroxidative reactions can play a role in maintaining normal immunity, preventing free radical damage, resisting aging, and delaying aging.



## 2. Scientific basis for molecular hydrogen to improve immunity

Existing studies have found that the role of molecular hydrogen in improving immunity is manifold. It can not only protect immune organs and reduce immune cells from free radical damage and oxidative damage, but also can play a role in the regulation of immune active substances. For example, molecular hydrogen can effectively reduce radiation, damage of free radicals to important immune organs such as thymus and spleen, and protect immune organs; it can significantly reduce immune cell death caused by hydroxyl radicals, etc., and increase lymphocyte and neutrophils. The number of single phagocytic cells, etc., improve the peripheral blood; it can promote the proliferation of hematopoietic stem cells and the secretion of hematopoietic factors. Accelerate the recovery of immune cell regeneration; It can regulate the secretion of interleukins, interferon and other immune factors; It can also maintain the function of various biological membranes of the immune system by reducing the oxidative damage of cell membrane.

These findings suggest that the frequent use of molecular hydrogen is helpful in protecting the immune system, reducing the effects of harmful substances on the immune system, and improving physical health.

## 3. Shen Ziqing's treatment of inflammatory diseases

Inflammation is an immune reaction and it is a common basic pathological process of many diseases. It is closely related to oxidative stress. Inflammation tissues have a high concentration of active oxygen involved in inflammation. Molecular hydrogen can reduce the damage of the inflammatory response to the cells of the body, and has a certain therapeutic effect on inflammation-related diseases.

There are many domestic and international research reports in this area. It has been found through various animal models that molecular hydrogen can treat colitis, pancreatitis, chronic hepatitis, periodontitis, obstructive jaundice, sepsis, rheumatoid arthritis, and asthma. A series of inflammatory diseases, to achieve a certain effect. For example, the molecular hydrogen water was found in the arginine-induced acute pancreatitis model by inhibiting the infiltration of neutrophils and the body's oxidative stress reaction, while inhibiting pancreatic cell apoptosis and NF-KB activity and promoting pancreatic cell Proliferation, thereby reducing pancreatic tissue edema, and inhibiting the elevation of pancreatic amylase in blood. For another example, scholars from the Tokushima University of Dentistry in Japan have demonstrated that molecular hydrogen water can promote wound healing in rats. Ishibashi et al learned that randomized, double-blind, placebo-controlled studies have found that molecular hydrogen is helpful in the treatment of rheumatoid arthritis. Ulcerative colitis is common in China and Asia. Crohn's disease and other chronic inflammatory bowel diseases not only cause patients suffering from repeated abdominal pain, diarrhea, mucous bloody stools, blurred vision, and uncomfortable joints, but



also may be transformed into tumors as precancerous lesions. Many patients tried to drink high-molecular-weight hydrogen water and achieved satisfactory results. Many patients were relieved of surgical treatment. Animal experimental studies have shown that molecular hydrogen has a good preventive and therapeutic effect on inflammatory bowel disease.

The reason why molecular hydrogen has a curative effect on inflammatory diseases is that its mechanism of action is manifold. The first is the selective antioxidation of molecular hydrogen, which removes malignant free radicals, inhibits lipid peroxidation, inhibits infiltration of neutrophils and oxidative stress response of the body, and reduces inflammation organs and tissues through its powerful antioxidation. Oxidative damage; followed by molecular hydrogen can significantly reduce the expression of pro-inflammatory cytokines in the lesion, the concentration of inflammatory cytokines such as interleukin, tumor necrosis factor, interferon, etc. is significantly decreased, and the infiltration of inflammatory cells is significantly inhibited; the third is probably through some antibodies in vivo. Activation of inflammatory signaling pathways mobilizes anti-inflammatory immunity in the body.

#### 4. The role of molecular hydrogen on immune-related skin diseases

Professor Luo Xiaoqun, Director of the Laboratory of Skin Immunization at Huashan Hospital Affiliated to Fudan University, introduced the use of molecular hydrogen in psoriasis, atopic dermatitis, dermatomyositis, skin allergy, and skin lymphocyte hyperplasia at the 2016 International Forum on Clinical and Translational Medicine. The initial clinical treatment of refractory skin diseases such as sexual diseases. From the overall situation, the effective rate reached 81% (approximately 54% were cured, 27% were improved, and 19% were invalid). She believes that the use of molecular clearance aids in the treatment of intractable diseases has great potential, and hopes and challenges coexist, the challenges are mainly the need to expand the size of the patient population in clinical research, as well as to clarify the detailed mechanism of treatment.

Previously, Japanese scholars have demonstrated that molecular hydrogen has a potential therapeutic effect on skin allergies. Recently, scholars from Yonsei University in South Korea demonstrated that molecular hydrogen can combat skin allergies caused by dust mites. The results of this study show that mice that are allergic to dust mites continuously take molecular hydrogen water for 4 weeks, and the number of allergy-related inflammatory factors in the blood is significantly reduced.

Skin pigmentation has brought a lot of trouble to many people who love the beauty. In fact, after the burn, the pigmentation of the skin is heavy and there is no ideal treatment method. A recent human trial conducted by the People's Liberation Army General Hospital of the Shenyang Military Region found that the molecular hydro-wet compress can treat skin pigmentation after burns. In this study, 67 patients with hyperpigmentation after facial burns were randomly



divided into two groups (34 in the molecular hydrogen-water treatment group and 33 in the saline control group), and they were wetted with molecular hydrogen water and saline for 3 times a day. After half an hour each time for 30 consecutive days, there was a significant difference between the two groups. The facial pigmentation of the patients treated with molecular hydrogen water basically subsided, the cure rate was high and the subjective satisfaction was high; while the facial pigmentation of the saline control group was decreased despite . However, there is still residual, subjective satisfaction is low.

## 5. Effect of molecular hydrogen on graft-versus-host disease

Graft-versus-host disease is an immune rejection disease and it is a common complication of bone marrow transplantation. It can often endanger life. At present, there is no other good therapeutic drug other than the use of immunosuppressants. The research team led by Professor Cai Jianming of the Second Military Medical University and the Department of Hematology of the General Hospital of Naval Jointly carried out research on molecular hydrogen treatment of graft-versus-host disease, and initially achieved satisfactory results. Previous animal experiments were published in the International Journal of Transplantation in 2012. Recently, preliminary clinical observations were published in international journals, focusing on the use of molecular hydrogen in the treatment of severe chronic graft-versus-host disease. The 54-year-old male patient was treated with bone marrow transplantation for myelodysplastic syndrome. He was diagnosed as severe chronic graft-versus-host disease in the third year after transplantation. The lesion involved the skin, mouth, eyes, intestines, liver, lungs, joints, etc. Multiple tissues and organs use multiple treatments to control the progression of the disease. The symptoms of daily household molecules were gradually reduced or reduced. After 3 months of continuous administration, the function of various lesions and organs was significantly improved. After 6 months, only some lesions remained in the skin and eyes, and better therapeutic effects were obtained.

## 6. Application of molecular hydrogen in hemodialysis

Professor Nihon Sansuke of Kyosuke University in Japan dissolved hydrogen in a hemodialysis solution and found that the blood monocyte chemoattractant protein-1 and myeloperoxidase activity, which represent the inflammatory response, were significantly reduced in the blood of patients using the dialysate. In 12 uremic patients, reduced albumin increased and dialysis improved. Such studies have been reported more and more in recent years. Shows the good development prospect of molecular hydrogen in hemodialysis treatment.



## Chapter 8: The role of molecular hydrogen in anti-tumor

Tumors are the first public enemy threatening human health, with rapid population growth and rapid industrial development. The environment for human survival is getting worse and worse, and the incidence of cancer increases year by year. How to prevent tumors from occurring and how to treat them effectively has become a primary health concern. It has been found in molecular and animal model studies that molecular hydrogen has a certain anti-tumor effect, but does molecular hydrogen have anti-human tumor effects? In this regard, relatively few domestic and foreign research materials are still difficult to draw conclusions.

The most noteworthy aspect of molecular hydrogen's resistance to human tumors is the prevention of cancer. Molecular hydrogen has a selective antioxidant effect, reducing DNA mutations; molecular hydrogen also has anti-inflammatory effects, can reduce precancerous lesions and reduce gene mutations. In addition, molecular hydrogen itself is non-toxic and harmless, and has no side effects. As a routine health care method for cancer patients at high risk of "prevention of illness", it is still meaningful to use safe and effective molecular hydrogen products, perhaps to control precancerous lesions and prevent cancers. The positive effect. The second is to reduce the side effects of cancer treatment, and finally combine various therapies to improve the therapeutic effect.

### 1. The mechanism of free radicals causing cancer

The occurrence of cancer is also related to free radicals. There are many oxidative pictures in the course of many cancers. There are also many precancerous conditions that become chronic inflammatory processes. There are many reasons for the cause of cancer. It seems that many factors around life are related to cancer. Such as genetic, chemical, dietary, lifestyle habits and other factors. With the development of free radical medicine, the role of free radicals in cancer has become the focus of experts. Studies have found that the relationship between free radicals and cancer is extremely close. Carcinogenic factors such as fluorescence, ultraviolet light, radiation, etc. stimulate the production of free radicals in the body; chemical carcinogens such as nitroso, benzopyrene, etc. react with cells to generate free radicals; free radicals in smoke tar and smog, etc. can make lipids Peroxidation destroys many key cellular functions such as mitochondria, microtubules, enzymes, and proteins; some carcinogens also activate free radicals through metabolic activation in the body. And attack DNA and cause cancer. In addition, free radicals cause DNA



damage, chromosomal aberrations, and expression of modified genes, causing mutations and deterioration of cells. For example, free radicals can interact with paper to produce peroxide products, and these peroxidation products can cause changes in the normal sequence of DNA, causing gene mutations, leading to malignant mutations in cells and producing tumors. Research data also show that free radicals are produced and involved in the three stages of carcinogenesis and development (carcinogenesis, carcinogenesis and carcinogenesis, and cancer development). There are two kinds of direct and indirect toxicity of free radicals, direct toxicity, that is, certain free radicals can directly damage cellular components, causing mutations and the formation of cancer; indirect toxicity is the outbreak of environmental harmful factors release a large number of reactive oxygen species, these reactive oxygen species Free radicals and cytotoxic free radicals damage cells together, leading to the occurrence and development of cancer.

## 2. Anti-tumor effect of molecular hydrogen

Based on the important role of free radicals in the occurrence and development of cancer, it is not difficult to see that effective removal of excess free radicals in the body can reduce tumor development or reduce the development of cancer. Daily use of free radicals to clear memory and antioxidants is of great significance in the prevention of cancer. Well, molecular hydrogen has the unique role of selectively eliminating harmful free radicals in the body. Does it have anti-tumor effects?

As early as the 20th century, studies have confirmed the anti-cancer effects of molecular hydrogen. In 1975, foreign scientists published papers in the world's top scientific journal that continuously breathing eight atmospheres of 97.5% hydrogen for 14 days can effectively treat animal skin malignancies. Squamous cell carcinoma is effectively controlled. For the first time, the concept of molecular hydrogen antioxidation has been proposed, and it is believed that molecular hydrogen exerts antitumor effects through antioxidation. However, due to technical and methodological reasons, it did not cause sufficient attention and follow-up research in the scientific community at that time.

Japanese scholars have found that drinking water containing molecular hydrogen in animals with cirrhosis can prevent the occurrence of primary liver cancer. In recent years, foreign researchers used molecular hydrogen water to treat tumor cells. It was found that molecular hydrogen significantly eliminated toxic free radicals in tumor cells, harmful hydrogen peroxide and peroxide, and inhibited the growth of tongue cancer cells, but Does not inhibit normal human tongue epithelial cell growth, showing a selective anti-tumor effect. In addition, molecular hydrogen can also inhibit the reorganization of human fibrosarcoma cells and invasion of the basement membrane, and play a dual effect of inhibiting tumor growth and inhibiting tumor invasion.

Researchers at Shanghai Jiaotong University have studied the inhibitory effects of molecular hydrogen on tumors in tumor-bearing mice. The molecular



hydrogen-containing water can exert its anti-tumor activity by inhibiting the proliferation of tumor cells, promoting the apoptosis of cancer cells, regulating the intracellular redox environment, and the expression of interferon-related genes. Some scholars also reported the inhibition of molecular hydrogen on other tumor cells.

The research on the anti-tumor effect of molecular hydrogen is still deepening, suggesting that molecular hydrogen has application value in preventing and inhibiting tumor growth and invasion.

### **3. The application of molecular hydrogen in the treatment of tumor radiotherapy and chemotherapy**

Radiochemotherapy is currently one of the main methods for the treatment of tumors in the clinic. It is through the use of radiation and drugs to kill tumor cells to achieve therapeutic effects. However, rays and drugs kill normal tumor cells while killing tumor cells, causing a series of side effects such as skin radiation damage, leucocyte and platelet drop, nausea and vomiting, loss of appetite, radiation enteritis, radiation pneumonitis, and hair loss. Wait. These side effects not only directly affect the quality of life of patients, but also seriously affect the therapeutic effect. How to kill the tumor cells while protecting the normal tissue cells from the toxicity of radiation and chemotherapy drugs has always been a headache. Molecular hydrogen has dual effects of anti-tumor and alleviating the toxic and side effects of normal cells. Undoubtedly, new assistive treatment is provided for cancer patients. It is believed that with the continuous development of molecular hydrogen biomedicine, more and more research data will confirm the importance of molecular hydrogen in alleviating the side effects of radiotherapy and chemotherapy for various tumors, improving the quality of life of patients, and even increasing the efficacy of cancer.

A joint research report from abroad showed that drinking high concentrations of molecular hydrogen water to patients with liver cancer undergoing radiation therapy significantly reduced and reduced the side effects of radiotherapy, and the quality of life during radiation therapy was significantly improved. Mainly manifested as reduced nausea and vomiting and diarrhea, increased appetite, taste become better and so on. Another research report shows that molecular hydrogen can not only significantly reduce and reduce the side effects of radiotherapy, but also can improve the killing effect of radiation on liver cancer, while reducing

## Chapter 9: Molecular Hydrogen Protecting Liver

In recent years, people have increasingly noticed the relationship between free radicals and various diseases in the liver. Removing harmful free radicals in time can protect liver cells, reduce liver damage, and improve liver function. Therefore, many scholars have conducted studies on the prevention and treatment of liver damage by molecular hydrogen. The earliest report was reported by French scholars. In 2001, hydrogen hydrogen was used to treat schistosomiasis liver cirrhosis. In 2007, Japanese scholars carried out research on hepatic ischemia-reperfusion injury. Since then, many domestic scholars have studied the prevention and treatment of hydrogen molecules on liver cirrhosis, fatty liver, liver transplantation, alcoholic liver injury, cholestatic liver injury and drug-induced liver injury.

Studies have shown that molecular hydrogen, as a new type of antioxidant and anti-inflammatory active substance, can help the liver to remove inflammatory necrotic cells for a long period of time. It can effectively eliminate malignant free radicals, significantly inhibit lipid peroxidation, and reduce liver cell oxidative damage. In order to effectively prevent a variety of liver diseases or the occurrence and development of life, play the role of Liver Liver.

### 1. Hydrogen molecules have protective effects against toxic free radical induced liver damage

The Second Military Medical University Professor Cai Jianming's research group found that molecular hydrogen can effectively prevent and treat harmful free radical induced hepatic tissue damage such as hydroxyl radicals and hydration electrons, and significantly inhibits a series of oxidative and inflammatory reactions triggered by hydroxyl radicals in liver tissues, and promotes injury. Organization repair. After the animals used molecular hydrogen, the radiation damage effect of liver tissue was significantly reduced, the degeneration and necrosis of hepatocytes decreased, the variation of abnormal structure was reduced, the damage repair was accelerated, and the vitality of liver cells was increased.

The indicators of liver function injury were also significantly improved, and alanine aminotransferase, aspartate aminotransferase and other enzymes were effectively reduced. A joint study of Japanese and Korean scientists also found that molecular hydrogen can improve the side effects such as fatigue, anorexia, and indigestion caused by radiotherapy for liver cancer patients.

Some scholars have found that by inhaling 2% hydrogen and drinking hydrogen water can effectively inhibit the hepatocyte injury caused by hepatic ischemia-reperfusion injury, and effectively reduce the level of transaminase protection of liver function. Molecular hydrogen can be used not only for the treatment of acute hepatocyte injury, but also for the treatment of cirrhosis, jaundice after



bile duct obstruction, and liver injury. The results of a study in Japan showed that long-term consumption of hydrogen water can significantly improve fatty liver caused by high-fat diet, improve liver function, and prevent liver fibrosis. Hydrogen also stimulates the expression of FGF21, a liver fibroblast factor, which plays an important role in regulating glucose metabolism.

## 2. Molecular hydrogen helps liver detoxification

According to a study conducted by Prof. Yang Jiamei of the Second Military Medical University Hospital Affiliated to the Eastern Hepatobiliary Surgery Hospital, molecular hydrogen has protective effects on liver tissue oxidative and inflammatory lesions after drug-induced liver injury and reduces the degree of damage. In addition, scholars of liver surgery at the First Affiliated Hospital of Xi'an Jiaotong University have also demonstrated that molecular hydrogen can reduce the oxidative damage and inflammation caused by paracetamol, alleviate tissue pathological changes, protect liver function, and promote hepatocyte regeneration. Researchers from the Zhejiang University's Shaoxing People's Hospital found that the hydrogen produced by intestinal bacteria can also promote liver cell regeneration.

It is interesting that many people found that molecular hydrogen can also hangover, which can reduce alcoholic liver damage. The liver is the heart of the body's treatment of alcohol. Alcohol is converted to acetaldehyde in the liver by alcohol dehydrogenase and catalase and then converted by acetaldehyde dehydrogenase to acetic acid, which undergoes a series of complex biochemical reactions. Carbon dioxide and water. When excessive alcohol enters the body beyond the metabolic capacity of the liver, it accumulates in the body. Injuries to the liver and into the brain and systemic organs produce adverse effects. In addition, alcohol itself can induce free radicals in the body. In many ways of alcohol-induced injury, the generation of excess free radicals and the resulting oxidative stress response are believed to play a key role. According to the analysis of alcohol poisoning, it is not difficult to understand that molecular hydrogen water contributes to the anti-alcoholism. Animal experiments have shown that molecular hydrogen has a protective effect on alcoholic liver injury, can reduce alcohol-induced acute and chronic liver injury in rats, and effectively improve liver function. Its mechanism of action may be related to scavenging free radicals, anti-oxidative stress, reducing inflammatory response, reducing lipid peroxidation, and inhibiting certain signaling pathways that cause alcoholic injury.

What is even more gratifying is that people who have used large amounts of molecular hydrogen products report that drinking high concentrations of molecular hydrogen water has better hangover effects, significantly less hangover symptoms, better physical and energy recovery, fatigue, headache, nausea, and appetite. Symptoms of hangover, such as lack of strength, have been significantly reduced or even disappeared.



### 3. The protective effect of molecular hydrogen on liver function after hepatectomy

Liver resection is the most commonly used surgical method for the treatment of liver cancer and other diseases. Such surgery will inevitably cause a certain degree of liver function damage, and may cause liver failure. Effective protection of liver function in patients with surgery is a clinical concern and concern. The Prof. Yang Guangshun's research group of the Eastern Hepatobiliary Surgery Hospital of the Second Military Medical University attached great importance to this research field. They used a pig to establish a reconstructive hepatectomy model. After resection of the portal vein with an enlarged hepatectomy, the right gastric vein was infused with 250ml of molecular normal saline and continued to instill in the first 3 days after surgery. The results of molecular hydrogen saline showed that the molecular hydrogen saline can effectively reduce hepatocyte injury after hepatectomy and promote hepatocyte regeneration; it can reduce oxygen free radicals tissue damage during ischemia and reperfusion, and can effectively inhibit apoptosis.

### 4. Molecular hydrogen assisted treatment of hepatitis

Dr. Xia Chunxiang of Huai'an Fourth People's Hospital of Jiangsu Province conducted a clinical study of chronic hepatitis B. The results showed that 30 patients with clinically diagnosed chronic hepatitis B consumed 1.2 to 1.8 L of molecular hydrogen per day for six consecutive weeks, although they could not affect the hepatitis B virus gene. Negative, but molecular hydrogen can resist oxidative stress in patients, reduce oxidative damage, and make sense in adjuvant therapy. Research at the Harvard Medical School in the United States suggests that hepatitis B can help treat hepatitis by increasing the level of molecular hydrogen in the body. Although there are not many research reports in this area, it is beneficial to use molecular cleansing for body care in patients with hepatitis in view of the fact that molecular hydrogen does not have any toxic side effects and does not affect the safety of other drug treatments.

After drinking 1.2~1.8L of molecular hydrogen water every day for 6 consecutive weeks, although it can not affect the conversion of hepatitis B virus gene, molecular hydrogen can resist oxidative stress reaction and reduce oxidative damage, which is of significance in paving treatment. Research at the Harvard Medical School in the United States suggests that hepatitis B can help treat hepatitis by increasing the level of molecular hydrogen in the body. Although there are few reports in this area, given the molecular hydrogen's non-toxic side effects and the safety of other drug treatments, the use of molecular hydrogen in hepatitis patients should be beneficial to body health.

### 5. Other health effects of molecular hydrogen on fatty liver

Scholars at the University of Okayama, Japan, have demonstrated that fatty liver can improve the fatty liver caused by high-fat diet in the long-term drinking.



The liver tissue structure and liver function can be improved. The effect can be compared with the traditional drug pioglitazone in the treatment of fatty liver. Compared with pioglitazone, hydrogen is more toxic and has better side effects and safety. And they also found that long-term consumption of molecular hydrogen water can reduce the incidence of liver cancer associated with fatty liver.

Professor Wang Qijin, Department of Endocrinology, Changhai Hospital Affiliated to the Second Military Medical University, studied the therapeutic effect and molecular mechanism of molecular hydrogen on fatty liver caused by high-fat diet, and found that molecular hydrogen has a significant therapeutic effect on fatty liver-induced hyperglycemia and hyperlipidemia. Liver cells have obvious protective effects and have positive significance for preventing fatty liver.

The research group led by academician Wang Hongyang from the Eastern Hepatobiliary Surgery Hospital attached to the Second Military Medical University found that the treatment of liver cirrhosis model animals with a normal saline solution containing hydrogen for one month has an effect on the treatment of cirrhosis. The experimental results show that molecular hydrogen can improve the portal hypertension caused by liver cirrhosis through anti-oxidative stress, inhibition of inflammatory response, reduction of blood vessel regeneration and reduction of vascular resistance, and has potential clinical therapeutic value for cirrhosis. Recently, from the mitochondrial oxidative damage pathway, Liu Qu and other scholars of the General Hospital of the People's Liberation Army conducted an in-depth study of the mechanism of action of molecular hydrogen on the treatment of obstructive cirrhosis of the bile duct.



## Chapter 10: Molecular Hydrogen Prevention and Treatment of Ischemia-Reperfusion Injury

Ischemia-reperfusion injury refers to ischemic diseases such as myocardial infarction, stroke, etc. After being restored to blood supply, they are attacked by free radicals, causing damage to the cells in the tissues that recover blood supply. In the process of rescue and treatment of ischemic diseases, physicians gradually found that the ischemic tissue damage is not mainly from the ischemia itself, but only when the blood supply suddenly resumes after a period of ischemia. This type of injury is called ischemia-reperfusion injury. A large number of experimental studies have found that the important mechanism of ischemia-reperfusion injury is recognized as the oxidative damage induced by the increase of reactive oxygen free radicals after ischemia, and molecular hydrogen is effective in preventing and treating ischemia-reperfusion injury.

### 1. Therapeutic effect of molecular hydrogen on ischemia-reperfusion injury

Scholars from a number of countries have conducted extensive animal experiments with molecular hydrogen on various ischemia-reperfusion injuries, including cerebral ischemia, myocardial ischemia, hepatic ischemia, lung ischemia, intestinal ischemia, kidney and retinal ischemia, etc. Severe ischemia-reperfusion injury occurs when these tissues and organs are reperfused after ischemia. It was observed that sufficient amounts of molecular hydrogen can be administered to experimental animals before, during and after injury, which can significantly reduce the severity of these tissues and organs and reduce tissue necrosis. At present, the main mechanism of molecular hydrogen in reducing ischemia-reperfusion injury is the selective clear radical and antioxidation of molecular hydrogen, which significantly reduces the oxidative damage marker products, such as 8-OHdG, the final product of DNA oxidative damage, and lipid peroxidation end products. MDA and 4-HNE and the like also significantly reduce the apoptosis and necrosis of the lesion tissue cells.

### 2. Therapeutic effect of molecular hydrogen on cardiovascular and cerebral ischemic diseases

Molecular hydrogen has a role in the treatment of cerebral infarction, myocardial infarction, subarachnoid hemorrhage, brain injury in children, retinal ischemia and other ischemic tissue diseases, can be significantly reduced tissue infarct size, cell death and withered The number of deaths has significantly decreased and the organization has been quickened. At present, there are many teams and experimental reports in this field at home and abroad. For example, Prof.



Zhang He from the United States studied the treatment of hydrogen and cerebrovascular diseases. He has published nearly 20 papers in one unit alone. Overall, the therapeutic effects on cells and animals have been widely recognized by researchers at home and abroad. There has also been encouraging progress in human clinical research. Researchers have demonstrated that the injection of molecular hydrogen saline has a significant therapeutic effect on brainstem stroke patients and can improve cognitive function after cerebral ischemia. A clinical study conducted by more than 10 national hospitals in Japan found that inhalation of 2% hydrogen has a protective effect on brain damage caused by cardiac arrest, and can independently use molecular hydrogen, which is better when combined with low temperature measures. A preliminary clinical study led by Professor Suzuki from the Department of Critical Care Medicine at Shimae University Hospital demonstrated that breathing 2% hydrogen for 16 hours can be safely used to protect against brain damage caused by cardiac arrest. The study found that it was included in Japan's Advanced Medical Class B system by the Japanese Ministry of Labour, Health and Welfare. Some commentators believe that the inhalation of hydrogen into patients with resuscitated heartbeats is a revolutionary new therapy that can protect patients' lives and brain function, promote their recovery and return to society as soon as possible.

In July this year, Professor Hirohisa Ono of Shuntian University in Japan reported in the *Journal of Stroke and Cerebrovascular Disease* that inhaled molecular hydrogen was used to treat stroke in humans. A total of 50 patients with memory-related cerebral infarction were observed, 25 of which were used as molecular hydrogen. In the treatment group, another 25 cases served as a control group that did not use molecular hydrogen. The patients in the molecular hydrogen treatment group did not receive edaravone. Instead, they were given inhalation of 3% hydrogen twice a day for 1 hour each time for 7 days. The control group did not inhale hydrogen, and conventional treatments such as edaravone were used. The results showed that a number of indicators in the molecular hydrogen treatment group were significantly better than the treatment group, and the functional recovery was also significantly better than the control group. It is shown that the use of molecular hydrogen in the treatment of strokes is not only safe and has no toxic side effects, but also can promote the recovery of brain damage in patients, and has a certain therapeutic value.

### **3. The role of molecular hydrogen in organ transplantation protection**

There is also ischemia and reperfusion in the process of organ transplantation, which often results in inflammation, dysfunction, and even organ failure in the transplanted organs. The preventive and therapeutic effects of molecular hydrogen on ischemia-reperfusion injury can also be used for organ transplantation as a protective agent for transplanted organs.



Professor Nakao from the University of Pittsburgh, USA, reported for the first time that continuous breathing of 2% hydrogen can prevent the peristaltic disorder after small bowel transplantation in rats, significantly enhance the contractility of jejunal smooth muscle, and relieve the morphological damage of the intestinal mucosa. Subsequently, they also proved that respiratory hydrogen has a protective effect on heart transplantation, lung transplantation, and kidney transplantation, significantly reducing organ damage after transplantation. They proposed that this protection of molecular hydrogen, in addition to its antioxidative effects, may be related to the induction of antioxidant enzymes and enhancement of anti-inflammatory effects in the body.

An expert from the Department of Thoracic Surgery at Changhai Hospital, Second Military Medical University, also found that as long as the molecular hydrogen is dissolved in the organ protection solution, the expression level of the cardiac apoptosis protein gene to be transplanted is significantly reduced and the oxidative damage is significantly reduced, and the heart is preserved at 4 degrees Celsius in vitro. After rewarming, the heart that resumes hydrogenation to molecular hydrogen is 75% shorter than the heart without molecular hydrogen, greatly speeding up the pace of cardiac resuscitation, and significantly improving the effect of heart preservation. It is pointed out that molecular hydrogen can protect both before and after transplantation. Device.



## Chapter 11: Molecular Hydrogen Protection of Eyes and Ears

The eyes and ears are important sensory organs. Protecting eyesight and hearing is extremely important for health. There have been many reports on the role of molecular hydrogen in the prevention and control of eye diseases at home and abroad, mainly from the Fourth Military Medical University, Second Military Medical University, Shanghai Jiaotong University, Xi'an Jiaotong University, PLA General Hospital, and Beijing Tongren Hospital. Molecular hydrogen has been found to help protect the visual system and treat certain eye diseases, including blue-induced retinal damage, hypertensive oxygen-induced retinal vascular hyperplasia, diabetic retinopathy and vascular hyperplasia, cataracts and other eye diseases. Japan and other countries have also reported that there is a patented technology that uses a local hydrogen bath to treat diseases around the eyes.

There is relatively little research on the protective effects of the ear. At present, it mainly focuses on the prevention of damage caused by noise.

### 1. Molecular hydrogen on the prevention and treatment of retinal damage

At home and abroad, there have been a number of institutions to study the role of molecular hydrogen in the prevention and treatment of retinal cell injury. For example, Professor Ota of the Japanese Medical University once conducted a protective effect of topical continuous administration of molecular hydrogen eye drops on retinal ischemic injury. It was found that hydrogen can rapidly diffuse into the vitreous and reduce oxidative damage and optic nerve cells caused by rat retinal ischemia-reperfusion Apoptosis. Other studies have shown that molecular hydrogen can inhibit the activation of microglia, which plays an important role in the degeneration of the optic nerve, thereby playing a role in optic nerve protection.

Professor Zhang Zuoming of the Department of Aerospace Medicine at the Fourth Military Medical University found that molecular hydrogen can reduce retinal cell damage caused by strong light irradiation and also protect retinal ganglion cell layers. Some scholars have also found that molecular hydrogen can reduce photoinduced retinal damage by clearing free radicals and antioxidant capacity, effectively protect photoreceptors, protect the structure of the retina, and improve dark adaptation. Some scholars believe that molecular hydrogen can effectively reduce the photoregression of photoreceptor cells and provide a new protective strategy for macular degeneration and retinitis pigmentosa.



Molecular hydrogen also has a certain therapeutic effect on diabetic eye diseases. The incidence of retinal diseases in diabetics is about 26%, which can eventually lead to blindness. Clinical and pattern room studies have confirmed that the occurrence of diabetic eye disease is closely related to oxidative stress. Reactive oxygen species cause structural and functional abnormalities of the retinal blood vessels, destroy the blood-retinal barrier, and weaken the retina's defense against invasion of inflammatory cells and cytotoxic substances. . Foreign studies have shown that molecular hydrogen can reduce retinal cell apoptosis, inhibit drug-induced increase in vascular permeability, reduce retinal thickening, reduce streptozotocin-induced destruction of the blood-retinal barrier, and induce streptozotocin The rat diabetic eye disease has a preventive effect. Although molecular hydrogen has not been clinically validated for the treatment of diabetic eye diseases, a randomized, double-blind, placebo-controlled human clinical study has shown that molecular hydrogen can increase the metabolism of carbohydrates and lipids in type 2 diabetic patients and reduce glucose intolerance It shows that the therapeutic effect of molecular hydrogen may have a good effect on diabetes-related diseases, especially diabetic eye diseases with severe metabolic disorders.

## 2. Molecular hydrogen resistance to cataract

Cataracts are one of the major causes of blindness, affecting 80% of people over the age of 70 and increasing in incidence with aging. With aging society becoming more and more serious, the impact of cataract on the vision and quality of life of the elderly will be even more severe. Classical theory believes that reactive oxygen species are the main culprits in cataracts: Active oxygen initiates a series of biochemical reactions in the lens, leading to cross-linking, degradation, and oxidative damage of the lens proteins, and apoptosis of the lens endothelial cells, which in turn aggravates cataracts.

An ophthalmologist from the Tangdu Hospital Affiliated to the Fourth Military Medical University found that continuous use of hydrogen normal saline daily for 10 days prevented selenite-induced cataract formation in rats. It has also been found that hydrogen saturated saline can reduce the occurrence and development of cataract by maintaining the quality of water-soluble protein in the lens, antioxidant enzyme activity, GSH content, and reducing MDA content. Japanese scholars have also found that topical use of water containing hydrogen can reduce the side effects of cell damage caused by cataract surgery.

Recently, Professor Huang Yifei, a cataract treatment expert and director of the Key Laboratory of Ophthalmology and Visual Science at the PLA General Hospital, cited a recent study in an international journal that introduced that molecular hydrogen can delay the formation of cataracts and can sustain multiple enzymes and The activity of non-enzymatic antioxidants and the antioxidant capacity of the protectors suggest that molecular hydrogen may be



of great potential value for the treatment of cataracts, especially as a supplementary treatment for cataracts.

### 3. Therapeutic effect of molecular hydrogen on corneal injury

Japanese scholars have discovered that molecular hydrogen has a protective effect on corneal chemical burns. Alkali burns in the cornea are not uncommon in the clinic, causing eye damage that can lead to acute inflammation and secondary pathological corneal neovascularization. Existing treatment methods, such as anti-angiogenic drugs, argon laser, photodynamic therapy, limbal stem cell transplantation and other treatment effects are not satisfactory. Active oxygen free radicals are the main pathogenic factors causing eye damage in alkaline chemicals. They can directly lead to pathological angiogenesis through the activation of nuclear transcription factor (NF- $\kappa$ B); they can also lead to the promotion of NF- $\kappa$ B entry into the cell nucleus. Release of a series of inflammatory factors that not only induce corneal neovascularization but also increase inflammatory response by recruiting inflammatory cells. Animal experiments have found that molecular hydrogen can reduce angiogenesis during this process and can also significantly reduce NF- $\kappa$ B activation and reduce inflammatory factor levels. These findings indicate that molecular hydrogen can treat alkali burns through intervention of reactive oxygen radicals and may provide a new approach to the treatment of this disease.

Professor Tsutomu I from Department of Ophthalmology at Nippon Medical University used rabbits as an observation object and found that molecular hydrogen can reduce corneal damage caused by phacoemulsification surgery. Because phacoemulsification treatment, ultrasound will induce the production of toxic hydroxyl radicals, thereby destroying the corneal endothelial cells. Molecular hydrogen has the function of selectively clearing hydroxyl radicals, protecting corneal endothelial cells from free radical damage and oxidative damage.

### 4. Helps prevent noise-induced damage

From a medical point of view, the noise that causes damage to the body mainly refers to continuous, higher-intensity noise. When the body is stimulated by strong impulse noise, it first appears as a severe shearing and squeezing movement between the basement membrane and the capsular membrane, resulting in mechanical damage to the basement membrane, vestibular membrane, spiral device, auditory nerve fibers, and blood vessels, thereby causing inner ear tissue. Ischemia and hypoxia affect the aerobic metabolism of local tissues and produce a large amount of harmful free radicals such as reactive oxygen species and reactive nitrogen species. These free radicals can directly destroy the DNA in the cells and nucleus in the cochlea, and cause a variety of changes in the antioxidant capacity of the cells, eventually triggering apoptosis and hearing loss.



Professor Zhou Yide of the Department of Otolaryngology, Changhai Hospital Affiliated to the Second Military Medical University, demonstrated that saturated hydrogen saline can reduce noise-induced damage by reducing cochlear hair cell apoptosis. Professor Yu Ning of PLA General Hospital and the First Affiliated Hospital of Fujian Medical University also found that molecular hydrogen reduces noise-induced hair cell loss, counteracts noise-induced hearing loss in guinea pigs, reduces hearing threshold reduction, and recovers earlier. The mechanism may be that the molecular hydrogen penetrates quickly, and can effectively pass through the blood-to-labile barrier, thereby effectively clearing out a large number of free radicals produced by the mitochondria in the hair cells, exerting their selective antioxidative effects, and finally reducing the damage of the hair cell lines.

Professor Ssitama of the National Defense Medical University of Japan continued to inhale hydrogen for 5 days per day in guinea pigs exposed to noise stimuli. It was found that reduction in hearing threshold was also reduced in the hydrogen-treated group, and outer hair cell death and apoptosis were significantly reduced. It also proved that hydrogen decreased activity. Oxygen to reduce noise damage.

These studies strongly demonstrate that molecular hydrogen has a certain therapeutic effect on noise-induced noise. What is even more valuable is that molecular hydrogen can quickly cross the blood-labyrinth barrier, effectively reducing the oxidative damage of the inner ear, while most other anti-oxidants are difficult to reach the inner ear for therapeutic effects. The results also suggest that the use of molecular hydrogen often makes sense for people in noisy environments.



## Chapter 12: Hydrogen Protecting the Reproductive System

Reproductive system is more sensitive to environmental harmful factors, easily lead to reproductive dysfunction or sexual dysfunction, these diseases are also closely related to free radicals, oxidative stress, inflammation. The biological activity of molecular hydrogen is also of great significance for protecting the reproductive system.

### 1. Molecular hydrogen protection of the male reproductive system

The team led by the editors of the book took the lead in research at home and abroad and found that molecular hydrogen can reduce the damage of cytotoxic free radicals on the testis and promote the repair of damaged tissues; reduce radiation-induced sperm variability and apoptosis in mice, increase sperm count, and increase Sperm activity improves refined quality; serum testosterone levels increase, and testis size and weight increase compared to experimental groups that do not use molecular hydrogen. Researchers from the Second Affiliated Hospital of Harbin Medical University conducted a similar study and found that molecular hydrogen has a protective effect on the male reproductive system, which helps reduce the harm of environmental unfavorable factors on the testis.

### 2. Effect of molecular hydrogen on male sexual dysfunction in diabetes

Difficulties in erection are a type of sexual dysfunction in men, causing some men to feel distressed. About 50% of male diabetics have different levels of erectile difficulties, which may be due to a large increase in reactive oxygen species in the tissues. The Department of Urology of the Second Affiliated Hospital of Soochow University has demonstrated that drinking hydrogenated water from diabetic animals can reduce oxidative damage, reduce apoptosis and increase endothelial nitric oxide synthase, and regulate blood vessel function to effectively treat erectile dysfunction. .

### 3. Effect of molecular hydrogen on premature ovarian failure

Premature ovarian failure refers to the phenomenon of ovarian failure leading to amenorrhea before the age of 40 and early postmenopausal symptoms of menopause. The mechanism of its occurrence is not entirely clear. It is generally believed that it is related to infection, immune diseases, heavy smoking and



drinking, excessive stress, excessive obesity, and environmental harmful factors.

Recently, researchers from the Reproductive Medical Center of Beijing Obstetrics and Gynecology Hospital, Capital Medical University, have found that molecular hydrogen has a significant therapeutic effect on premature ovarian failure in experimental animals, indicating that molecular hydrogen has application prospects and development potential in protecting ovarian function and improving fertility.

#### **4. Therapeutic effect of molecular hydrogen on endometriosis**

Endometriosis occurs mostly in women of childbearing age. The main pathological changes are ectopic growth of intimal hemorrhage, and peripheral tissue fibrosis forms nodules. Symptoms are dysmenorrhea, chronic lower abdominal pain, infertility, and irregular menstruation. The patient suffers from physical and mental torture. The basic treatment is to block the effects of estrogen, and the adverse reactions are numerous and not very effective. Professor Liu Yuhuan of the Department of Obstetrics and Gynecology at Changhai Hospital Affiliated to the Second Military Medical University recently discovered that molecular hydrogen is effective in the treatment of endometriosis. They inhaled high-concentration hydrogen and oxygen gases once a day for endometriosis rats for 4 weeks. At the 8th week, the division of the endometrium was inhibited and the estrus cycle was not affected.



## Chapter 13: The Effect of Molecular Hydrogen on Sports Injuries

Strenuous exercise in the human body produces a large number of free radicals, and free radicals are closely related to exercise fatigue and exercise-induced muscle damage. The selective removal of harmful hydrogen radicals and anti-oxidative damage by molecular hydrogen helps to prevent and reduce injuries caused by strenuous exercise.

### 1. The protective effect of molecular hydrogen on high-intensity sports personnel

Soochow University selected 40 male athletes from the Beijing Swimming Team to conduct this research. The conclusion of the study is that the free radical production of athletes will increase, and the antioxidant capacity will decrease, resulting in lipid, protein and DNA damage. Athletes drinking molecular hydrogen water can significantly reduce the above-mentioned oxidative stress damage brought about by high-intensity exercise, especially in the pre-, mid- and post-exercise supplementation of molecular hydrogen and water, which is the best, and significantly better than the effect of molecular hydrogen supplementation during exercise.

Hunan Sports Science Research Institute Ou Minghao and others, through the study of 18 women judo athletes, found that supplemental molecular hydrogen water can significantly reduce athletes' free radical rise after high-intensity training, improve antioxidant enzyme activity, and enhance the body's antioxidant capacity. Lipid peroxidation caused by large-load training has a protective effect. It shows that the addition of molecular hydrogen water can reduce the uncomfortable feeling after strenuous exercise, and molecular hydrogen is suitable for preventing sports injuries when exercising. Foreign scholars also have a lot of research reports. For example, a study from Japan divided into molecular hydrogen water is a very good drink for athletes, drinking molecular hydrogen water before exercise can reduce lactate levels in the body after exercise, can relieve muscle fatigue and functional decline. For example, Ostojic SM, a Serbian sports health researcher, demonstrated that drinking molecular hydrogen water can prevent the blood acidification caused by increased lactic acid after the judo athletes exercise vigorously. Blood acidification can cause athletes to fatigue, giving athletes 2L of molecular hydrogen water every day. It can reduce the carbon dioxide and carbonate in arterial blood, reduce blood acidification, and help fatigue recovery.



## 2. The effect of molecular hydrogen on chronic fatigue syndrome

Chronic fatigue syndrome is more common in well-educated white-collar workers, which may be related to heavy work burden, stress in the heart, irregular life, and decreased immunity. The main symptoms are persistent fatigue, short-term memory loss or inattention, muscle aches, sore throat, joint pain, headache, difficulty recovering after sleep, physical discomfort after work, etc., somewhat similar to our familiar neurasthenia or "Healthy" state, there is currently no specific treatment.

The Germans had earlier noticed the effects of molecular hydrogen medicine. As early as 1992, someone applied for a patent on molecular hydrogen therapy. In 2013, a professor of immunology at the world-famous German Max Planck Institute of Medicine paid attention to and conducted research on molecular hydrogen medicine. In a scientific paper, he vividly introduced a laser-printed chronic fatigue syndrome patient in a management office and used molecular hydrogen therapy. The process of disease and rehabilitation. He drank 250~1000ml of molecular hydrogen water every day. After drinking continuously for 4 weeks, the symptoms of chronic fatigue syndrome almost completely disappeared, his memory improved, his attention improved, he had no sore throat, headache, muscle pain, hair loss and regeneration, and his sleep quality improved. Muscle motor function recovery, symptoms of chronic fatigue syndrome did not reappear.

## 3. The alleviation of molecular hydrogen on exercise-related soft tissue injuries

Prof. Hoffman et al. studied the therapeutic effects of molecular hydrogen on exercise-related soft tissue injuries. They studied acute soft tissue injury of male professional athletes and analyzed the results of treatment after 2 weeks of molecular hydrogen. It was found that the plasma viscosity was significantly lower in the molecular hydrogen group than in the control group.



## Chapter 14: Detoxification Protection of Molecular Hydrogen

The detoxification of molecular hydrogen has also been reported in many studies, including carbon monoxide poisoning, residual pesticides, haze damage, toxicity of chemotherapy drugs, and control effects of Psyllium poisoning.

### 1. Molecular hydrogen anti-carbon monoxide poisoning

Carbon monoxide is a toxic gas, which is commonly found in incomplete combustion of carbonaceous materials, coal gas poisoning, coal-fired heating, automobile engines, gas showers, etc. Low concentrations can endanger life. A large number of carbon monoxide poisonings occur in the world every year. Carbon monoxide can not only cause acute poisoning death, it can also cause chronic damage. Acute poisoning mechanism is the combination of carbon monoxide and hemoglobin, the formation of carboxyhemoglobin, the loss of hemoglobin ability and role of oxygen-carrying, causing tissue suffocation, chronic poisoning performance of carbon monoxide on systemic cells toxicity, especially the most serious impact on the cerebral cortex, Can cause delayed-onset encephalopathy. The best rescue method for acute carbon monoxide poisoning is hyperbaric oxygen therapy; currently there is no ideal treatment for chronic carbon monoxide poisoning, and molecular hydrogen is likely to contribute to the recovery of such injuries.

According to Professor Sun Xuejun of the Second Military Medical University, there is a chemical fertilizer plant in a certain place in the north. Carbon monoxide is produced in the production process, and carbon monoxide leakage poisoning is prone to occur. Many people with carbon monoxide poisoning left behind encephalopathy sequelae. These encephalopathy workers were later transferred to the plant's hydrogen purification plant. Unexpected good things happened. Compared with people who had encephalopathy but were not transferred to the hydrogen purification plant, the workers who were transferred to the hydrogen purification plant recovered more rapidly. More thorough! Inspired by this story, he conducted a study of hydrogen toxicity to carbon monoxide and chronic injury, and confirmed that hydrogen-saturated saline has a protective effect against acute carbon monoxide poisoning. Its protective mechanism may be related to the anti-oxidation of molecular hydrogen, anti-cell necrosis, apoptosis and autophagy, as well as the reduction of immune inflammatory damage. Therefore, as a safe, effective, and easy to use new method, molecular hydrogen is expected to be used as an adjunct treatment before and during hyperbaric oxygen therapy to prevent and treat carbon monoxide poisoning after acute carbon monoxide poisoning.



## 2. Side effects of molecular hydrogen on certain chemotherapeutic drugs

Most cancer-fighting chemotherapy drugs have many toxic and side effects, and many patients cannot tolerate the serious side effects of cancer drugs. For example, doxorubicin, cisplatin, and the like are anticancer drugs widely used clinically at present, but these drugs have strong toxicity and side effects to the heart, liver, or kidneys. How to maintain the killing effect of anti-cancer drugs on tumor cells while reducing drug side effects has always been a problem that clinicians and patients hope to solve. Does the biological activity of molecular hydrogen have significance in mitigating the side effects of certain anticancer drugs? Answers can be given as needed.

On the surface of medical research, after the use of molecular hydrogen, doxorubicin and cisplatin significantly reduced the damage to the heart, liver, or kidneys of test animals, and the degree of histopathological changes was weakened, and the functional indexes were improved. Shows that molecular hydrogen can reduce the toxicity of anticancer drugs, which will give many cancer patients the hope of overcoming chemotherapy side effects. A cytology and animal experimental study from the University of Kagoshima, Japan, is even more encouraging. They found that molecular hydrogen can not only reduce the toxic side effects of the antitumor drug 5-fluorouracil but also promote tumor cell apoptosis and increase 5-fluorouracil. Anti-cancer effect.

## 3. Molecular hydrogen anti fog effect

In recent years, many large and medium-sized cities throughout the country have often been shrouded in haze, becoming a hot spot for national attention. Haze can lead to the occurrence of many diseases, and marketing for human health cannot be ignored. The assessment of the World Health Organization shows that PM2.5 in the atmosphere has become the 4th health risk factor in China.

The Respiratory Department of the Second Affiliated Hospital of Hebei Medical University recently launched a study on the protection of haze workers exposed to molecular hydrogen by smog. They selected 96 healthy and non-smoking sanitation workers in the center of Shijiazhuang as the research object, focusing on the protective effect on the lungs. Among them, 50 sanitation workers gave inhalation of hydrogen-containing gas (hydrogen concentration of 67%), and they each inhaled once a day. Suction for 1 hour, continuous suction for 1 month. Another 46 sanitation workers were used as a control group that did not use hydrogen. Through the analysis of blood samples, induced sputum, lung function tests, questionnaires, follow-up and other methods, the effect of hydrogen gas on environmental haze was observed. The results showed that the respiratory symptoms of inhaled hydrogen were relieved, ventilation function was improved, the level of some inflammatory substances was reduced to some extent, and the oxidative stress damage of the respiratory tract was reduced.



Other evaluation indicators were being followed up. The results of this human experiment reflect the fact that molecular hydrogen can contribute to anti-fog and haze by enhancing antioxidative damage in the respiratory tract.

Smoke is also very harmful to the human body. Fire, industrial and agricultural production and daily burning of objects often produce a lot of smoke. People inhaling toxic fumes or chemicals can cause respiratory damage and even directly damage lung tissue. Inhalation of large amounts of smoke, particulates, and irritating chemicals can lead to severe inflammation of the respiratory tract, difficulty in breathing, and even suffocation that endangers life. Recently, research reports from the University of Texas Medical School showed that the inhalation of 2% hydrogen to the respiratory smoke inhalation goats can reduce respiratory inflammatory cell infiltration and inflammatory response, improve ventilation function, and show molecular hydrogen to smoke inhalation. Induced respiratory damage has a therapeutic effect.

#### **4. Effect of molecular hydrogen on residual pesticides**

Pesticide residue is a concern in food safety. An organophosphorus pesticide called "chlorpyrifos" is widely used by farmers as an insecticide that can induce oxidative stress injury and lead to nervous system diseases. People who use crops that have left such pesticides for a long time are bound to have an impact on their health.

A recent study by the Ma Xuemei group of the School of Life Sciences, Beijing University of Technology, found that taking rats' molecular hydrogen water can increase the activity of detoxification enzymes (cholinesterase), increase the ability of the body to resist oxidative damage, and reduce the damage of animal brain tissue caused by chlorpyrifos. Brain function.

#### **5. Effect of molecular hydrogen on acute oxygen toxicity**

Five research institutes of Wisconsin Medical School, Northwestern University in Chicago, and University of Kemakat University discussed the therapeutic effect of molecular hydrogen on hyperoxia-induced lung injury in rats, demonstrating that breathing 2% hydrogen has therapeutic effects on hyperbaric oxygen lung injury. Professor Sun Xuejun and other research results also showed that hydrogen saturation and physiological saline have a significant protective effect on lung oxygen poisoning caused by hyperbaric oxygenation in animals. The pathological damage in the lung tissue is reduced and the inflammatory cell infiltration is reduced.

#### **6. Molecular hydrogen can have auxiliary detoxification**

Recently, a study by Professor Conbin and Hebei University of Hebei Medical University showed that molecular hydrogen may have an alleviating effect on symptoms such as anxiety-like behavior caused by morphine addiction, suggesting that molecular hydrogen is meaningful in helping



detoxification. Relieve the pain caused by detoxification. At present, there are not many research data in this area and deserve further attention.



## Chapter 15: The "holy water" legend of molecular hydrogen health care

Molecular hydrogen has been found to prevent disease from a scientific process of cognition from accident to necessity. In the past, people always wrongly believed that molecular hydrogen had no harm to the organism and no biological activity. What attracted scientists' attention and worked hard to carry out in-depth research, and eventually discovered and confirmed that molecular hydrogen had miraculous health care. What's the role? We have to start with the story of "holy water."

Turning over the history of scientific development, many new scientific discoveries came from accidental inspiration. Scientists suddenly get inspired at a moment of concern and reflection, and discover something unexpected. He was awarded the Nobel Prize in Physiology or Medicine for inspiration from the Eastern Jin Dynasty medical scientist's "Elbow Reserve Emergency" and developed the famous antimalarial drug artemisinin; Newton sat on the grass watching the apple from the tree. Falling down and discovering the gravitational theorem, Fleming forgets to accidentally discover penicillin by coating the lid with a glass lid; chemist Dalton buys a pair of socks and discovers color blindness; Dr. Dunlop waters Inspired by the invention of bicycle tires... This seemingly accidental example can also be cited, but these accidental discoveries must be inevitable. In other words, scientific inventions will be discovered sooner or later. The molecular hydrogen is found to have health benefits as well!

There are legends of magical water and longevity in many parts of the world, of which the most legendary is the Nordenau cave in Germany. This ancient cave is located on the east side of Düsseldorf, Germany, where the water of the cave is called "magic water". In 1992, a reporter wrote a report entitled "My tumor has shrunk since I visited this cave," and introduced 22 cases of healing that he recovered from drinking "magic water." Since then, the cave has attracted more attention. Those who started to use these reports felt unbelievable. Many people came to experience that some of the patients reportedly experience relief or cure, including maternal dementia, diabetes, depression, arthritis, skin diseases, allergies, and high rates. Blood lipids, cardiovascular and cerebrovascular diseases, arteriosclerosis, ulcers, athlete's foot, etc., have improved or recovered somewhat. Some people have also recorded and preserved some of their personal experiences. However, these spontaneous experiences do not have strict medical observations and scientific contrast experiments. They lack rigorous scientific evidence and can only be understood as folk legends.



Many scientists were also very curious after learning about the “magic water” in the Nordenau Cave and hoped to reveal this mystery. Therefore, from a variety of perspectives, scientific investigations, research and analysis, and many hypotheses have been proposed. However, there is an explanation that can be widely accepted by the medical community to find out the true answer. Later, the inspectors accidentally discovered that the water in the cave is rich in hydrogen. It is speculated that the health care function of the cave water is likely related to its hydrogen content, because hydrogen is not normally present on the surface or groundwater. So in June 1998, Japan Asahi TV broadcast a first episode of "Treat Disease - The Magical Water's Truth" for the first time in a scientific column entitled "Probing the Truth." We introduced many patients who used this spring to treat diseases, and based on the objective phenomenon that the water is rich in hydrogen, the fundamental reason for the treatment of the disease is "may be hydrogen."

There is also a spring water known earlier than the Nordoldau Cave, an unspoiled spring in the Lourdes region of southern France. It is said that the spring can also prevent and cure diseases, and many disabled patients after drinking or dipping the spring Injury and illness are self-healing and each year attracts people of different nations of the world, where tens of millions of patients go to make pilgrimages. The miracle of this water spring in Lourdes, France, first took place in 1858. It is said that a local village woman claimed that the Virgin Mary was showing her spirit. Since then, some seriously dying patients have recovered after immersing in spring water.

Why does the water of Lourdes Holy Water have a health effect? In the beginning, everyone was artificially used as a helium element. After investigating the fact that the spring water cave wall was rich in “meteorites”, it contained more than 30 traces of selenium, zinc, nickel, cobalt, manganese, magnesium, and calcium needed by the human body. element. However, this explanation is not supported by scientific research. It is only a rough line from preliminary investigations. Is this really true? Later, after in-depth scientific examination found that this is not the case. "Meteorites" may play only part of the role, and the main material for prevention and treatment is not "meteorites." Scientists found that there is still a large amount of gas in the spring water, and the detection and analysis are molecular hydrogen (hydrogen gas), which inspired the curiosity and inspiration of related medical scientists. They wondered whether molecular hydrogen would be mysterious. effect? Does hydrogen and oxygen have biological effects? It is this flash of light and curiosity that has inspired medical researchers to study the biological effects of molecular hydrogen. Promote scientists to use modern medical research techniques to explore and verify the truth of the prevention and treatment of holy water.

The above two examples illustrate that, although long ago, the health effects of molecular hydrogen have accidentally entered a very small number of people's lives, there have been legendary sporadic news reports and superficial scientific analysis before, but these magical effects only stop at Legendary stage. The



truth has finally been revealed by the scientific community in the past more than a decade, especially since Japanese scientists and technicians have made unremitting efforts in discovering the scientific truth of the holy water legend. What deserves special mention is that the research team led by Professor Otsuka Otsuka of the Japanese Medical University has played an important role in the discovery and confirmation of the molecular hydrogen bioeffects. Through a large number of rigorous medical science experiments, they finally discovered the enormous potential medical value of molecular hydrogen. , And in 2007 published in the world's top medical journals shocking scientific papers, opened the world's research molecular hydrogen prevention and treatment of the upsurge. At present, the medical role of molecular hydrogen has been repeatedly discovered by scientists from many countries, and it has gone through an accidental, inevitable, and exciting scientific journey, ushering in a new era of molecular hydrogen health care.



## Chapter 16: Safety of health care using molecular hydrogen

In recent years, as the role of molecular hydrogen in health care has been continuously discovered, there are numerous molecular hydrogen products on the market. Faced with this new life, consumers will inevitably have doubts: Why do we need to increase the molecular hydrogen in our body? Is there no molecular hydrogen in daily life? Does long-term use of molecular hydrogen products have side effects on the human body like drugs or some health products? What kind of product is safe and secure? This chapter will introduce some of these issues.

### 1. In daily life, we “eat” less than molecular hydrogen, so we need to think of ways to supplement it.

Although molecular hydrogen has many health effects, it is regrettable that there is no molecular hydrogen in the ambient air in our daily lives, and there is no molecular hydrogen in ordinary water sources. This is because hydrogen is the least dense gas in the world and its quality is very light, only one-fourteenth of the air. Hydrogen in nature is floating high in the sky, concentrated in the top of the atmosphere, and people living on the surface of the earth are not in contact with molecular hydrogen.

Therefore, the molecular hydrogen required for health care can only be artificially manufactured by science and technology. As early as many years ago, Japan first developed molecular hydrogen products, and China, South Korea, etc. also developed a series of new products immediately after Japan. For example, water cups, water machines, kettles, and showers that produce molecular hydrogen by electrolysis, molecular hydrogen water in cans or aluminum bags, medical or civilian molecular hydrogen ventilators, and chemical products that produce molecular hydrogen using various chemical methods. These products can dissolve molecular hydrogen into liquids and enter the body, or can be inhaled directly through gas production devices, or can be used to produce hydrogen-producing substances to increase the molecular hydrogen content in the body to achieve the purpose of preventing and curing diseases.

### 2. Molecular hydrogen has no side effects on the human body and can be used for a long time

As the saying goes: "It is a poison for three drugs." Most drugs have side effects, and some drugs are still relatively large. However, in order to cure diseases, patients have to eat; some long-term use of health products may also



have a negative impact on the human body, molecular hydrogen will not have side effects like they do?

the answer is negative! No molecular side hydrogen has been found to have any side effects. The main scientific basis is as follows:

1) Hydrogen has been used in the diving industry for several decades and has not been found to have adverse effects on the human body. As early as the 20th century, divers medical researchers used hydrogen and oxygen gas mixtures to conduct underwater saturated diving studies to counter the effects of underwater high pressure on divers. When human and marine hydrogen and oxygen are used for human diving operations at home and abroad, the concentration of hydrogen used by divers far exceeds the current concentration of molecular hydrogen health products, which is tens or even hundreds of times higher, and no toxic or side effects have been found. This research achievement in the field of diving hospitals provides a wealth of theoretical and practical basis for the safety of molecular hydrogen health care applications.

2) There is a trace amount of molecular hydrogen in the body itself, which is a normal physiological phenomenon. There is a group of hydrogen-producing bacteria in the intestinal flora of the human body. The small amount of hydrogen produced by such bacteria reaches various tissues and organs through blood circulation and plays an important role in the regulation of health. There are significant individual differences in the amount of molecular hydrogen produced by intestinal bacteria. Some individuals are high, some are low, and the average person produces 150 ml of molecular hydrogen per day per day. In Japan, some people in the longevity family have several times higher levels of molecular hydrogen than ordinary people. Many people live for a long time and believe that high levels of molecular hydrogen in the body contribute to longevity. Molecular hydrogen is also one of the active molecules that physiologically regulate intestinal peristalsis, and it has the function of promoting peristalsis. The constipation occurs in some habitual constipation workers. It is likely that the capacity of intestinal bacteria to produce hydrogen is insufficient, resulting in weakened peristalsis. The proper drinking of molecular hydrogen water may relieve constipation in this group of people.

Such cases have been common.

3) Molecular hydrogen has been approved by relevant countries as a food additive. Scientists at home and abroad, from cell experiments to animal experiments, from laboratory research to clinical research, have carried out extensive demonstrations of molecular hydrogen biosafety, and the safety of human use of molecular hydrogen has finally been approved and approved by government agencies. In 2014, the National Health and Family Planning Commission of the People's Republic of China promulgated national standards for hydrogen as a food additive; the Japanese Ministry of Labour, Health, and



Welfare also stipulates that hydrogen can be used as a food additive; the EU's food additives list also proposes unlimited use of hydrogen as a food additive. The U.S. Food Addition Security Office publicly stated that it is safe to use hydrogen dissolved in water. The approval of government departments and the introduction of these policies and regulations further demonstrate that the safety of human use of molecular hydrogen is very high and can be used for health care.

### 3. What kind of molecular hydrogen health products are safe to use without worry

In recent years, businesses that produce and sell molecular hydrogen products have mushroomed. Online is also flooded with a variety of domestic and foreign products. There are regular, cottage, quality, and poor quality. There are also commodities with unknown products, or inferior products with extremely low molecular hydrogen yields. Make consumers confused and at a loss. Here we set out from the rigor of the medical science, based on our laboratory's detection results of domestic and foreign products and related domestic and international medical theory, put forward some basic views on the safety and effectiveness of molecular hydrogen health products.

- 1) It must be able to produce true molecular hydrogen, not "hydrogen-containing" other substances. Because it is proved by modern medicine that it can function as a health care agent, it is hydrogen that exists in a molecular state. It is a combination of two hydrogen atoms, namely molecular hydrogen, or hydrogen. If you only have other substances (such as hydrogen ions, negative hydrogen ions, hydrogen atoms, etc.) that have "hydrogen", they are not the same substances as molecular hydrogen and should not be confused.
- 2) Must be able to produce enough molecular hydrogen. Although human intestine bacteria produce a small amount of molecular hydrogen per day, this is far from adequate in terms of health care. It takes a few additional exogenous molecular hydrogens to be beneficial to health, especially in a sub-healthy state or susceptible to free radicals. The disease population needs to supplement molecular hydrogen. If the product produces less molecular hydrogen, it may not achieve the desired effect of health care. Therefore, it is generally recommended that the concentration of molecular hydrogen in water be better than 800 ppb, and the higher the concentration, the better. If the device is used for inhaling molecular hydrogen, it is generally recommended that the concentration of hydrogen should be controlled at about 3%. The concentration of hydrogen should be less if the concentration is too low, and there is a risk of explosion if the concentration is too high. If a high-concentration molecular hydrogen inhalation device is used for clinical treatment, the hydrogen concentration will be higher, and it should be better for the treatment of diseases. It needs to refer to the



national medical device registration management system according to the law to complete the registration and obtain the accession number before it can be used. . 3) The product must not contain other harmful substances. Currently, there are many technical approaches or methods that can produce molecular hydrogen on the market. A good product, which only considers the yield and concentration of molecular hydrogen, is still far from enough. It must also consider whether or not there are incidental harmful products. For example, some simple electrolysis cups convert residual chlorine in tap water to toxic chlorine. Some also produce ozone; for example, magnesium rods or other chemical products that use molecular chemistry to produce molecular hydrogen can generate chemical reactions other than hydrogen, and their long-term effects on the human body are worth considering. Therefore, a good product that can be used safely and safely should not produce additional harmful substances, and the molecular hydrogen yield and concentration should be high.

#### 4. Existing molecular hydrogen products on the market

A variety of molecular hydrogen-related products have emerged on the market, including portable drinking cups that automatically generate molecular hydrogen, household drinking fountains, drinking cans, bagged or canned hydrogen-rich water, hydrogen-absorbing machines or therapeutic machines, and bathing feet. Hydrogen water equipment, chemical hydrogen-producing capsules or foams, molecular hydrogen cosmetic masks, molecular hydrogen eye masks, etc., can be described as varied and varied.

In recent years, our laboratory has detected and analyzed some products at home and abroad and found that existing products on the market are of different quality and quality. There are a lot of excellent products, and they are also full of fake and inferior products. Some businesses even over-promote their misleading consumption. The phenomenon. The price difference is also very large, with the most common molecular hydrogen electrolysis cups currently used, online prices ranging from two to three hundred to three to four thousand dollars, it is difficult for ordinary people to identify the quality of the product, resulting in many consumers would rather buy Thousands of foreign counterparts have spent a lot of money. In fact, the quality of molecular hydrogen products produced by many domestic manufacturers has reached or even surpassed that of similar foreign products. Here, we remind consumers that they must choose the products that meet the basic requirements set out in Article 3 of this Chapter when purchasing them. Don't just buy cheap products. Some inferior products do not necessarily pursue the so-called "tall" to purchase similar products whose quality is equal but whose price is several times higher. A good product will surely contribute to your physical health, whereas a poor product will not be effective or even harmful.



## Conclusion

The effect of molecular hydrogen on disease prevention and control has been widely recognized by a large number of medical research at home and abroad, and it has many real benefits to the human body. Compared to other existing health care methods, molecular hydrogen is non-toxic, harmless, easy to use, and health-care Unique role in Japan, South Korea and other countries began to spread. We believe that through the constant efforts of us and many medical scientists at home and abroad, there will be more and more people familiar with and understanding the magical biological activity of molecular hydrogen, enhancing physical fitness, preventing diseases, prolonging life, and ushering in the molecular hydrogen era of health care!

