2019 International Hydrogen Molecular Medicine Summit

International Hydrogen Molecular Medicine Summit (IHMS) was firstly held in Shenzhen, China on April 13, 2019 (**Figure 1**). The meeting was co-organized by Health Science Center of Shenzhen University, China and Hydrogen Medicine Health Industry Society of National Association of Health Industry and Enterprise Management under guidance of China Association for Science and Technology and Shenzhen Pingshan District Science and Technology Innovation Bureau and with the support of Cancer Rehabilitation Society of Chinese Anti-Cancer Association, Shenzhen Science and Technology Society, Guangdong Cancer Rehabilitation Society and Shenzhen Health Industry Development Promotion Association, and sponsored by Shenzhen Kelieng Hydrogen Molecular Biomedicine Institute, China.

Professor Qian-Jun He from Shenzhen University, China and Professor Xue-Jun Sun from Naval Medical University, China served as the chairman and vice-chairman of the conference, respectively. Professor Yi-Hai Cao (an academician of European Academy of Sciences and Arts) from Karolinska Institute, Professor Jia-Zuan Ni (an academician of Chinese Academy of Sciences) from Shenzhen University, and Professor Lian-Meng Zhang (an academician of Chinese Academy of Engineering) from Wuhan University of Technology, China served as advisors of the conference. The conference invited more than 300 guests, including famous scholars, experienced doctors and representative enterprisers in the hydrogen medicine-related fields.

Professor Qian-Jun He (the chairman of the conference), Yue-Quan Lu (the director of the China International Science and Technology Exchange Center), and An-Li Shi (the president of Cancer Rehabilitation Society of Chinese Anti-Cancer Association, gave wonderful opening speeches in turn, acknowledging great contribution of hydrogen medicine to healthcare and cancer rehabilitation and expressing their expectation for vigorous development of hydrogen medicine by effective interlinkage of industry, education, research and utilization at a Shenzhen speed.

Professor Shigeo Ohta from Juntendo University, Japan, an international leading scientist in the field of hydrogen medicine, gave a speech entitled “Mechanisms of hydrogen therapies on cancer and dementia.” He proposed that molecular hydrogen is an effective antioxidant, which has anti-oxidative, anti-inflammatory and anti-allergic multifunction, and can be used for treatment of many major diseases including cancer and Alzheimer’s disease. Professor Ohta also discussed the similarities in the mechanisms of hydrogen treatment of cancer and Alzheimer’s disease from the angle of gene expression/signal transduction, providing an important inspiration for researching the mechanisms of hydrogen medicine.

Professor Xue-Jun Sun, a leading scientist of gas medicine from Naval Medical University, China systematically reviewed “Problems and countermeasures of hydrogen medicine.” Professor Sun introduced the history of hydrogen medicine, the academic and industrial achievement in hydrogen medicine, and current issues. He expressed an optimistic and conservative attitude as he believes that hydrogen medicine has a great bioapplication potential and a broad bioapplication range but is not almighty to overcome all diseases. Especially, Professor Sun indicated that there are many serious problems in the field of hydrogen medicine, including proposal of too many loose hypotheses confusing researchers, lack of attention to popular science propaganda from academic community, emergence of exaggerative even false advertisement from minor enterprises, tendency of circumventing real academic issues, *etc.* He emphasized that hydrogen medical research should return to real issues involving molecular mechanisms and clinical evidences of hydrogen medicine, and meanwhile proposed a series of valuable strategies including isotope labeling technique for tracing the metabolism of hydrogen molecule, various omics techniques for screening target molecules, research on potential reactive centers such as Fe-S clusters, and seek of potential hydrogen regulation molecules by combination of bioinformatics and structural biology, which provides important enlightenment and points out the direction for future hydrogen medical research. Professor Yi-Hai Cao, a distinguished professor from Karolinska Institute, Sweden, delivered a presentation entitled “Targeting air supply in the tumor microenvironment for cancer therapy.” Professor Cao made a lot of pioneering contributions in the field of angiogenesis and developed many antiangiogenic drugs. In this lecture, he presented their most updated findings on under-

Figure 1: International Hydrogen Molecular Medicine Summit (IHMS) was firstly held in Shenzhen, China.

Note: (A) Opening ceremony of the 2019 IHMS. (B) Group photo of all the attendees.

standing of antiangiogenic drug beneficial mechanisms, drug resistance, biomarkers, timeline of therapy, and combination therapy. Meanwhile, Professor Cao provided new horizons for the research and application of gas therapy from the aspect of improving the tumor microenvironment and overcoming angiogenesis, and brought more enlightenment to the anticancer mechanism of hydrogen molecule.

Professor Kyu-Jae Lee, the director of Institute for Human Care Wellbeing at Yousei University, Korea and the president of Korea Water Society in Korea, shared the results of “Hydrogen and beauty.” Professor Lee explained the relationship between the antioxidant effect of hydrogen molecule and beauty, and introduced the current status of hydrogen application in Korea. Professor Lee also suggested that hydrogen molecule can prevent the aging process of human beings, and could also possibly prolong human life to a certain extent. In addition, he also indicated that the exaggerative advertisement from minor enterprises is severely impairing the whole field of hydrogen medicine in Korea including both industrial and academic communities, and appealed to everyone to keep objective and cool-headed for virtuous and stable development of hydrogen medicine.

Professor Shu-Cun Qin from Shandong First Medical University, China gave a research report entitled “Biomedical effects of hydrogen benefit prevention and treatment of cardiovascular & cerebrovascular diseases.” Professor Qin discovered that cardiovascular and cerebrovascular diseases are mainly related to abnormal dyslipoprotein function, and hydrogen can protect high-density lipoprotein and prevent the deposition of cholesterol and blood cells on the blood vessel wall after lipoprotein damage, thereby reducing the occurrence of cardiovascular and cerebrovascular diseases.

Professor Xue-Mei Ma from Beijing University of Technology, China gave a wonderful report on the influence of hydrogen inhalation on cancer stem cells. They found that hydrogen can effectively inhibit the differentiation, growth and invasion of both glioblastoma U87 cells and C6 cancer stem cells, remarkably prolonging the life time of tumor-loading mice. In addition, hydrogen gas also exhibits similar therapy outcomes against ovarian and cervical cancers, implying that hydrogen molecule could have anticancer universality against various cancer stem cells. These results provided a new clue for discovery of anticancer mechanisms of hydrogen molecule.

Professor Jian-Kang Liu from Xi'an Jiaotong University, China lectured on “Hydrogen biology and medicine: A new and potential area for physiology or medicine.” He introduced the relationship among of aging, mitochondrion, reactive oxygen species and hydrogen molecule, and proposed that hydrogen is a potential and promising mitochondrial nutrient. His research supported hydrogen molecule to be a mitochondrial/redox homeostasis regulator/normalizer, balance regulator/normalizer, sirtuin2 activator, antioxidant as well as free radical scavenger.

Professor Xiu-Bo Du from Shenzhen University, China reported the research on “Sustained release of bioactive hydrogen by Pd hydride nanoparticles overcomes Alzheimer’s disease.” Professor Du developed a kind of Pd hydride nanoparticles for local delivery of high bioreductive hydrogen to effectively scavenge cytotoxic •OH in Alzheimer’s disease brain in a self-catalysis

way, and discovered the mechanism of Pd hydride nanoparticles for treatment of Alzheimer’s disease. Bio-reductive hydrogen was discovered to be able to recover mitochondrial dysfunction, inhibit amyloid-beta generation and aggregation, block synaptic and neuronal apoptosis and promote neuronal energy metabolism by eliminating oxidative stress and activating the anti-oxidative pathway, consequently ameliorating the cognitive impairment in Alzheimer’s disease mice. The proposed hydrogen-releasing nanomedicine strategy would open a new window for the treatment of Alzheimer’s disease.

At last, the chairman Professor Qian-Jun He made a conclusion for the conference. He adequately acknowledged the wonderful speeches, confirmed recent achievements of academic research and also encouraged interdisciplinary communication and collaboration to facilitate the development of hydrogen medicine. He also appealed for stronger support of government for clinical trials with hydrogen molecule, and desired that hydrogen medicine could bring more benefit for the health of human being. Meanwhile, he also expressed his expectation to build efficient interlinkage of industry, education, research and utilization of hydrogen medicine by making the most of the advantage of Shenzhen.

In conclusion, 10 speakers presented the latest scientific research results in the field of hydrogen medicine, put forward current key issues in the development of hydrogen medicine, and also proposed some feasible solutions. The successful holding of this conference is of great significance for promoting the rapid development of hydrogen medical research and accelerating the transformation of scientific research results in the field of hydrogen medicine.

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