The New Antioxidant

Hydrogen rich water for the prevention and treatment of a variety of diseases—particularly those associated with ROS (reactive oxygen species) and inflammation—has certainly become a hot research subject.

400+ reports in peer-reviewed scientific and medical journals, including in vitro and animal studies, plus some clinical trials in humans, have already been published.

Diseases that may be beneficially affected by hydrogen therapy include, (to name a few), atherosclerosis, ischemia-reperfusion injury (as occurs in heart attacks and strokes), diabetes, stress-induced cognitive impairments, Parkinson's disease (as shown in animal models), and various aspects of the metabolic syndrome (e.g., insulin sensitivity, glucose tolerance, and endothelial function).

As reported in an excellent review on the "recent progress toward hydrogen medicine," the author describes various methods being used in published animal and human studies to administer hydrogen: inhalation of hydrogen gas, oral ingestion by drinking hydrogen water, hydrogen baths (because hydrogen easily penetrates the skin and distributes throughout the body via blood flow), injection of hydrogen saline, direct absorption of hydrogen (as in hydrogen containing eye drops), and increased production of hydrogen by gut bacteria.

One reason for the use of hydrogen water and hydrogen saline is that it is possible to reliably control the dose administered to experimental animals, which is important in determining results such as dose-response relationships. In the case of gut bacteria-provided hydrogen, it is less easy to determine the hydrogen "dose," although one way to at least partially overcome this problem is to measure the hydrogen gas excreted by the lungs.

The conclusion of the Studies: Hydrogen Is a Selective Antioxidant, Scavenging Dangerous Radicals
But Not Radicals Important as Physiological Signaling Molecules

Hydrogen and carbon dioxide, as well as (in some people) methane, are gases released by colonic bacteria in the fermentation by the bacteria of carbohydrates that reach the lower digestive tract. Hydrogen has been known to have antioxidant properties for a long time, but its recognition as having some advantages over conventional antioxidants and its potential use as a therapeutic agent have only recently been explored.

One of the most interesting findings concerning hydrogen as an antioxidant is the discovery that it is a novel antioxidant because it scavenges the toxic hydroxyl radical (the strongest of the oxidant species) and the potent oxidant peroxynitrite (formed by the reaction of superoxide and nitric oxide), but is far less effective in scavenging physiological radicals such as superoxide and nitric oxide, important (at low concentrations) as signaling molecules.

Moreover, hydrogen is able to diffuse extremely rapidly into tissue and "effectively reaches the nucleus and mitochondria,"1suggesting "preventive effects on lifestyle-related diseases, cancer, and the aging process." Hydrogen also passes through the blood-brain barrier, although most antioxidant compounds cannot do this.

References

1. Ohta. Recent progress toward hydrogen medicine: potential of molecular hydrogen for preventive and therapeutic applications. Curr Pharm Des 17:2241-52 (2011).
2. Hong et al. Hydrogen as a selective antioxidant: a review of clinical and experimental studies. J Int Med Res 38:1893-1903 (2010).
2a. Kaur et al. In vitro batch fecal fermentation comparison of gas and short-chain fatty acid production using "slowly fermentable" dietary fibers. J Food Sci 76(5):H137-42 (2011).
2b. Ito et al. Degree of polymerization of inulin-type fructans differentially affects number of lactic acid bacteria, intestinal immune functions, and immunoglobulin A secretion in the rat cecum. J Agric Food Chem 59:5771-8 (2011).
2c. Ohsawa et al. Hydrogen acts as a therapeutic antioxidant by selectively reducing cytotoxic oxygen radicals, Nat Med 13(6):688-94 (2007).