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Potential Application of Hydrogen in Traumatic Injury

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Hydrogen gas (H_2) was first practiced to prevent decompression sickness [1]. Fundamental researches showed that produced in electrolyzed-reduced water, hydrogen protects DNA from oxidative damage in 2007, Ohsawa et al. [2] showed that H_2 has therapeutic antioxidant activity and ameliorates cerebral ischemia/reperfusion (I/R) injury, by selectively reducing cytotoxic Reactive Oxygen Species (ROS), ONOO- and •OH [2]. Multiple studies on different models were then carried out, such as intestinal I/R injury [3] neonatal cerebral hypoxia-ischemia [4] pulmonary hypertension [5], liver injury [6] and lung injury [7], supporting the above hypothesis.

Trauma remains the leading to death in Americans [8]; yet few treatments are proven effective, especially on brain damage and overall system [9]. A growing number of studies proved that hydrogen also ameliorates trauma induced inflammation and apoptosis. For traumatic brain injury, Hou et al. [10] suggested that hydrogen-rich saline conveniently protects the brain on cognition and synaptic plasticity with significantly less brain edema, lesion size and neurological deficiencies than rats that did not inhale H_2, owing to its capability to across blood-brain barrier [10]. For acute spinal cord contusion injury, Chen et al. [11] stated that hydrogen reduced oxidative stress while elevating of BDNF. And in recent report, Ren et al. [12] found that against traumatic pancreatitis in a rats, H_2-rich saline produced a distinct protection, and enrolled endogenous antioxidants in pancreas, such as glutathione and superoxide dismutase [13].

Due to a characteristic of safety and abundance in the universe, hydrogen is believed to translate to clinical application in the near future. However, further mechanisms need to be predominantly investigated. Taken together, the potential of H_2-rich saline was highlighted as a novel therapeutic agent on trauma injury [14].

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