

THERAPEUTIC EFFECT OF MOLECULAR HYDROGEN ON RADIATION-INDUCED OVERPRODUCTION OF FREE RADICALS IN MYOCARDIUM

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Overproduction of free radicals and subsequent formation of oxidative stress is a common denominator of many cardiovascular diseases. Ionizing radiation (IR) is widely used in medicine, mostly in radiotherapy or various imaging technics. The radiation induces cells damage mostly through the formation of aggressive hydroxyl radicals. In the last 15 years, many researchers paid attention to molecular hydrogen (H₂) as an effective and selective scavenger of free radicals, and as potentially therapeutic substance in many diseases.

The main goal of this study was to examine a potential therapeutic effect of H₂ against free radicals produced by IR directly applied to the mediastinum area of rats. The study also aimed to compare the effectiveness of two different methods of H₂ administration – hydrogen-rich water (HRW) and inhalation. Rats (male, 3 months old) were irradiated with a single dose of 10 Gy. These were treated by HRW (2 mg/L) or inhalation (30 min. of 4% H₂ gas) daily three times for two and nine days.

The inhalation of H₂ and HRW administration significantly improved all measured blood biochemical parameters (lactate dehydrogenase, alanine aminotransferase, uric acid, etc) where inhalation proved more effective. Also, irradiation-induced increased levels of selected markers of oxidative stress (superoxide dismutase, catalase, malondialdehyde) and inflammation (TNF- α and NF- κ B) were significantly downregulated after H₂ treatment, while inhalation was more effective here as well.

Based on these results, it could be concluded that hydrogen is a protective therapeutic substance against irradiation-induced heart damage and that inhalation is more effective than drinking hydrogen-rich water.

Keywords: heart, inhalation, irradiation, molecular hydrogen, oxidative stress

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