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# Inhaled hydrogen gas therapy for prevention of noise-induced hearing loss through reducing reactive oxygen species

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## Abstract

Reactive oxygen species (ROS) that form in the inner ear play an important role in noise-induced hearing loss (NIHL). Recent studies have revealed that molecular hydrogen (H<sub>2</sub>) has great potential for reducing ROS. In this study, we examined the potential of hydrogen gas to protect against NIHL. We tested this hypothesis in guinea pigs with 0.5%, 1.0% and 1.5% H<sub>2</sub> inhalation in air for 5h a day after noise exposure, for five consecutive days. All animals underwent measurements for auditory brainstem response after the noise exposure; the results revealed that there was a better improvement in the threshold shift for the 1.0% and 1.5% H<sub>2</sub>-treated groups than the non-treated group. Furthermore, outer hair cell (OHC) loss was examined 7 days after noise exposure. A significantly higher survival rate of OHCs was observed in the 1.0% and 1.5% H<sub>2</sub>-treated group as compared to that of the non-treated group in the basal turn. Immunohistochemical analyses for 8-hydroxy-2'-deoxyguanosine (8-OHdG) were performed to examine the amount of oxidative DNA damage. While strong immunoreactivities against 8-OHdG were observed of the non-treated group, the H<sub>2</sub>-treated group showed decreased immunoreactivity for 8-OHdG. These findings strongly suggest that inhaled hydrogen gas protects against NIHL.

**Keywords:** Hydrogen; Noise-induced hearing loss (NIHL); Reactive oxygen species (ROS).

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