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Hydrogen in drinking water reduces dopaminergic neuronal loss in the 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine mouse model of Parkinson's disease

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Abstract

It has been shown that molecular hydrogen (H₂) acts as a therapeutic antioxidant and suppresses brain injury by buffering the effects of oxidative stress. Chronic oxidative stress causes neurodegenerative diseases such as Parkinson's disease (PD). Here, we show that drinking H₂-containing water significantly reduced the loss of dopaminergic neurons in PD model mice using both acute and chronic administration of 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP). The concentration-dependency of H₂ showed that H₂ as low as 0.08 ppm had almost the same effect as saturated H₂ water (1.5 ppm). MPTP-induced accumulation of cellular 8-oxoguanine (8-oxoG), a marker of DNA damage, and 4-hydroxynonenal (4-HNE), a marker of lipid peroxidation were significantly decreased in the nigro-striatal dopaminergic pathway in mice drinking H₂-containing water, whereas production of superoxide (O₂^{•-}) detected by intravascular injection of dihydroethidium (DHE) was not reduced significantly. Our results indicated that low concentration of H₂ in drinking water can reduce oxidative stress in the brain. Thus, drinking H₂-containing water may be useful in daily life to prevent or minimize the risk of life style-related oxidative stress and neurodegeneration.

Figures

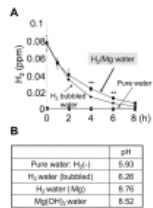


Figure 1. Time-dependent decrease of H₂...

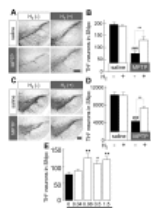


Figure 2. Drinking H₂ bubbled water...

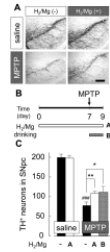


Figure 3. Drinking H₂ /Mg water...

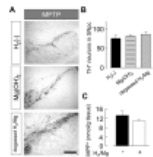


Figure 4. H₂, but not...

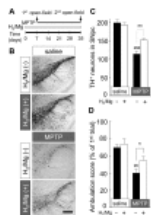


Figure 5. Drinking H₂ /Mg water...

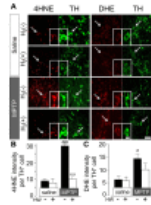


Figure 6. H₂ water reduced 4-HNE,...

All figures (7)

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