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Consumption of water containing a high concentration of molecular hydrogen reduces oxidative stress and disease activity in patients with rheumatoid arthritis: an open-label pilot study

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Abstract

Background: Rheumatoid arthritis (RA) is a chronic inflammatory disease characterized by the destruction of bone and cartilage. Although its etiology is unknown, the hydroxyl radical has been suggested to be involved in the pathogenesis of RA. Recently, molecular hydrogen (H_2) was demonstrated to be a selective scavenger for the hydroxyl radical. Also, the method to prepare water containing extremely high concentration of H_2 has been developed. We hypothesized that H_2 in the water could complement conventional therapy by reducing the oxidative stress in RA.

Methods: Twenty patients with rheumatoid arthritis (RA) drank 530 ml of water containing 4 to 5 ppm molecular hydrogen (high H_2 water) every day for 4 weeks. After a 4-week wash-out period, the patients drank the high H_2 water for another 4 weeks. Urinary 8-hydroxydeoxyguanine (8-OHdG) and disease activity (DAS28, using C-reactive protein [CRP] levels) was estimated at the end of each 4-week period.

Results: Drinking high H_2 water seems to raise the concentration of H_2 more than the H_2 saturated (1.6 ppm) water in vivo. Urinary 8-OHdG was significantly reduced by 14.3% ($p < 0.01$) on average. DAS28 also decreased from 3.83 to 3.02 ($p < 0.01$) during the same period. After the wash-out period, both the urinary 8-OHdG and the mean DAS28 decreased, compared to the end of the drinking period. During the second drinking period, the mean DAS28 was reduced from 2.83 to 2.26 ($p < 0.01$). Urinary 8-OHdG was not further reduced but remained below the baseline value. All the 5 patients with early RA (duration < 12 months) who did not show antibodies against cyclic citrullinated peptides (ACPAs) achieved remission, and 4 of them became symptom-free at the end of the study.

Conclusions: The results suggest that the hydroxyl radical scavenger H_2 effectively reduces oxidative stress in patients with this condition. The symptoms of RA were significantly improved with high H_2 water.

Keywords: Arthritis, Rheumatoid, Oxidative stress, Reactive oxygen species, Molecular hydrogen, 8-hydroxylguanine, Hydroxyl radical: DNA repair, Error protein

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