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Impact of molecular hydrogen treatments on the innate immune activity and survival of zebrafish (*Danio rerio*) challenged with *Aeromonas hydrophila*

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Abstract

Recently, molecular hydrogen has been reported to have a suppressive effect on inflammation in human and rodent models. The aim of this study was to evaluate the preventive effects of hydrogen-rich water (HRW) on zebrafish challenged by *A. hydrophila*. We have found an increased survival rate of bacteria-challenged zebrafish subjected to the HRW immersion treatment. Furthermore, we have revealed that HRW was able to block multiplication of *A. hydrophila* in zebrafish. In addition, treatment of zebrafish infected by *A. hydrophila* with effective concentrations of HRW strongly affected the expression of genes mediating pro-inflammatory and anti-inflammatory cytokines. There were down-regulation of selected pro-inflammatory immune response genes (IL-1 β , IL-6, and NF- κ B), and up-regulation of the anti-inflammatory cytokine gene (IL-10) in the spleen, kidney, and liver. This study is the first one to investigate the effects of HRW on fish infected with bacteria, and might shed new light on hydrogen's antimicrobial effects and further application in aquaculture fish species.

Keywords: *Aeromonas hydrophila*; *Danio rerio*; Immunomodulators; Molecular hydrogen.

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