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Hydrogen-rich saline reverses oxidative stress, cognitive impairment, and mortality in rats submitted to sepsis by cecal ligation and puncture

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Abstract

Background: Sepsis is associated with high morbidity and mortality, and survivors can present with cognitive dysfunction. The present study was performed to investigate the effects of hydrogen-rich saline (HRS) on oxidative stress in the brain, cognitive dysfunction, and mortality in a rat model of sepsis.

Methods: A rat model of sepsis was induced by cecal ligation and puncture. Physiologic saline or HRS was administered intraperitoneally (2.5 mL/kg or 10 mL/kg) 10 min before the operation. The survival rate was recorded, and cognitive function was tested using the Morris water maze. The reactive oxygen species and malondialdehyde levels and superoxide dismutase activity in the hippocampus were observed to evaluate the oxidative stress levels. The caspase 3 levels were measured to detect apoptosis. The histopathologic changes in the hippocampus were evaluated by hematoxylin-eosin staining and the terminal deoxynucleotidyl transferase-mediated deoxyuridine triphosphate nick end labeling assay.

Results: Cecal ligation and puncture resulted in a poor survival rate, evidence of brain injury, and cognitive dysfunction. The hippocampal reactive oxygen species and malondialdehyde levels increased significantly, and superoxide dismutase activity decreased significantly. HRS reversed these changes in a dose-dependent manner.

Conclusions: These findings indicate that HRS could attenuate the consequences of sepsis induced by cecal ligation and puncture in rats, at least in part, by the inhibition of oxidative stress.

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