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Effects of hydrogen-rich saline on rats with acute carbon monoxide poisoning

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Abstract

Background: Studies have shown that inhalation of hydrogen gas, which acts as an antioxidant, can protect the brain against free radicals in rats with ischemia-reperfusion. The neuronal damage caused by acute carbon monoxide (CO) poisoning is partly free radical mediated. We hypothesize that hydrogen may prevent neurological damage from CO poisoning.

Objectives: This study is designed to test whether hydrogen (H₂)-rich saline will have a protective effect on rats with acute CO poisoning.

Methods: Male Sprague-Dawley rats were subjected to CO poisoning. H₂-rich saline was administered by peritoneal injection (6 mL/kg/24 h). We used the Morris water maze and the open field test to determine cognitive function. After cognitive function studies, rats were decapitated and the levels of trace elements copper (Cu), zinc (Zn), and iron (Fe) in serum and brain were assessed by flame atomic absorption spectrometry. Necrosis, apoptosis, and autophagy of neurons were assessed by H-E staining and immunohistochemical staining in another group of rats.

Results: H₂-rich saline treatment improved the cognitive deficits and reduced the degree of necrosis, apoptosis, and cell autophagy in rats. Additionally, H₂-rich saline decreased the content of Fe in serum and brain in these rats, and increased the content of serum Cu related to free radical metabolism.

Conclusions: H₂-rich saline may effectively protect the brain from injury after acute CO poisoning. The mechanism of this protection may be related to lessening oxidative damage by affecting trace elements in vivo.

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