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Hydrogen-rich saline attenuated neuropathic pain by reducing oxidative stress

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Abstract

Background: Reactive oxygen species (ROS) are often associated with persistent pains such as neuropathic and inflammatory pain. Hydrogen gas can reduce ROS and alleviate cerebral, myocardial, and hepatic ischemia/reperfusion injuries. In the present study, we aim to investigate whether hydrogen-rich saline can reduce neuropathic pain in a rat model of chronic constriction injury (CCI).

Methods: Thirty SD rats were randomly divided into three groups: sham group was administered sodium chloride by intrathecal injection (n=10); control groups underwent CCI surgery and were administered sodium chloride by intrathecal injection (n=10); vehicle group underwent CCI surgery and was administered hydrogen-rich saline by intrathecal injection (n=10). Drugs were administered in the dose of 100 ul/kg once a day at 0.5 hours before and 1-7 day after CCI surgery. The mechanical thresholds were tested at one day before and 3-14 day after CCI surgery.

Results: We found that hydrogen-rich saline significantly elevated the mechanical thresholds of neuropathic pain compared to vehicle (physiologic saline) control in CCI rats ($p<0.05$); it also decreased the levels of myeloperoxidase, maleic dialdehyde, and protein carbonyl in spinal cord by 7 days post-chronic constriction injury($p<0.05$). In addition, hydrogen-rich saline also suppressed the expression of p38-mitogen-activated protein kinase (p38MAPK) and brain-derived neurotrophic factor (BDNF) in the spinal cord by 7 days post-chronic constriction injury ($p<0.01$, $p<0.01$, respectively), but had no effect on P2X4R ($p>0.05$), an ATP receptor.

Conclusion: Intrathecal injection of hydrogen-rich saline can decrease oxidative stress and the expression of p38MAPK and BDNF that may contribute to the elevated threshold of neuropathic pain in rat CCI model.

Le salin riche en hydrogène atténue la douleur névropathique en réduisant le stress oxydatif.

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