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Protective effect of hydrogen gas therapy after germinal matrix hemorrhage in neonatal rats

Tim Lekic¹, Anatol Manaenko, William Rolland, Nancy Fathali, Mathew Peterson, Jiping Tang, John H Zhang

Affiliations

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Abstract

Background: Germinal matrix hemorrhage (GMH) is a neurological disease of very low birth weight premature infants leading to post-hemorrhagic hydrocephalus, cerebral palsy, and mental retardation. Hydrogen (H₂) is a potent antioxidant shown to selectively reverse cytotoxic oxygen-radical injury in the brain. This study investigated the therapeutic effect of hydrogen gas after neonatal GMH injury.

Methods: Neonatal rats underwent stereotaxic infusion of clostridial collagenase into the right germinal matrix brain region. Cognitive function was assessed at 3 weeks, and then sensorimotor function, cerebral, cardiac and splenic growths were measured 1 week thereafter.

Results: Hydrogen gas inhalation markedly suppressed mental retardation and cerebral palsy outcomes in rats at the juvenile developmental stage. The administration of H₂ gas, early after neonatal GMH, also normalized the brain atrophy, splenomegaly and cardiac hypertrophy 1 month after injury.

Conclusion: This study supports the role of cytotoxic oxygen-radical injury in early neonatal GMH. Hydrogen gas inhalation is an effective strategy to help protect the infant brain from the post-hemorrhagic consequences of brain atrophy, mental retardation and cerebral palsy. Further studies are necessary to determine the mechanistic basis of these protective effects.

Figures

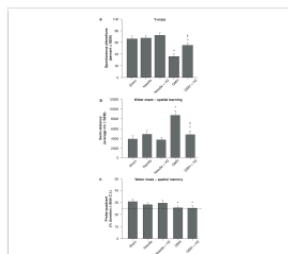


Fig. 1 Cognitive function normalization in juvenile...

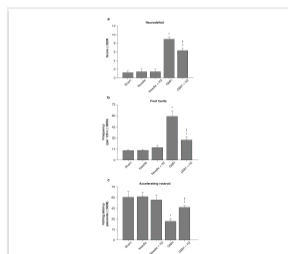


Fig. 2 Sensorimotor function normalization in juvenile...

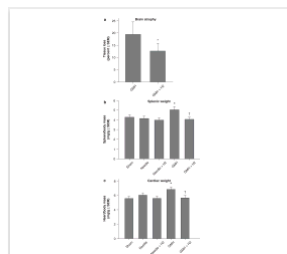


Fig. 3 Cerebral and somatic growth normalization...

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