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Molecular Hydrogen Prevents Social Deficits and Depression-Like Behaviors Induced by Low-Intensity Blast in Mice

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Abstract

Detonation of explosive devices creates blast waves, which can injure brains even in the absence of external injuries. Among these, blast-induced mild traumatic brain injury (bmTBI) is increasing in military populations, such as in the wars in Afghanistan, Iraq, and Syria. Although the clinical presentation of bmTBI is not precisely defined, it is frequently associated with psycho-neurological deficits and usually manifests in the form of poly-trauma including psychiatric morbidity and cognitive disruption. Although the underlying mechanisms of bmTBI are largely unknown, some studies suggested that bmTBI is associated with blood-brain barrier disruption, oxidative stress, and edema in the brain. The present study investigated the effects of novel antioxidant, molecular hydrogen gas, on bmTBI using a laboratory-scale shock tube model in mice. Hydrogen gas has a strong prospect for clinical use due to easy preparation, low-cost, and no side effects. The administration of hydrogen gas significantly attenuated the behavioral deficits observed in our bmTBI model, suggesting that hydrogen application might be a strong therapeutic method for treatment of bmTBI.

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