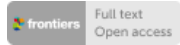


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[Front Pharmacol.](#) 2017 Aug 29;8:587. doi: 10.3389/fphar.2017.00587. eCollection 2017.

# The Comparative Efficiency of Intraperitoneal and Intravitreal Injection of Hydrogen Rich Saline against *N*-Methyl- *N*-Nitrosourea Induced Retinal Degeneration: A Topographic Study

Ye Tao <sup>1</sup>, Tao Chen <sup>2</sup>, Wei Fang <sup>3</sup>, Zhongjun Yan <sup>3</sup>, Qinghua Yang <sup>1</sup>, Yifei Huang <sup>1</sup>, Linjun Yu <sup>4</sup>, Lingling Fan <sup>5</sup>

Affiliations

PMID: 28900397 PMID: [PMC5581914](#) DOI: [10.3389/fphar.2017.00587](#)

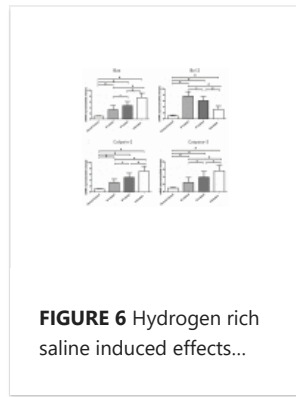
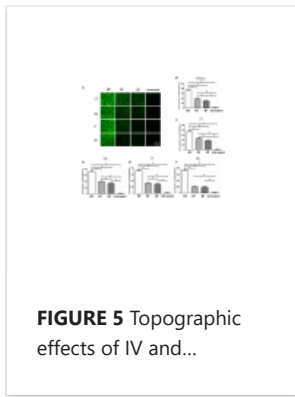
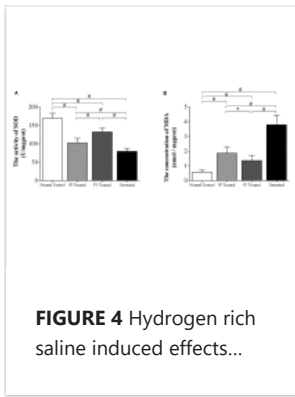
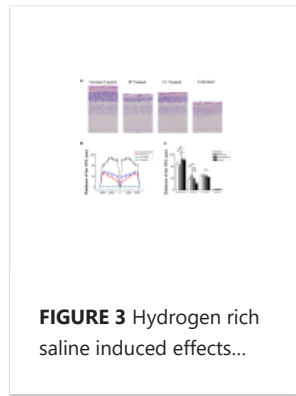
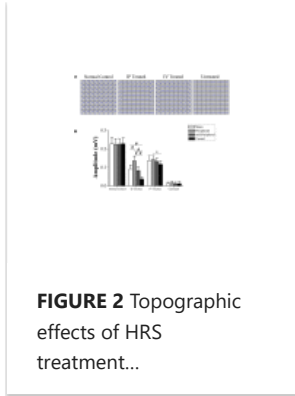
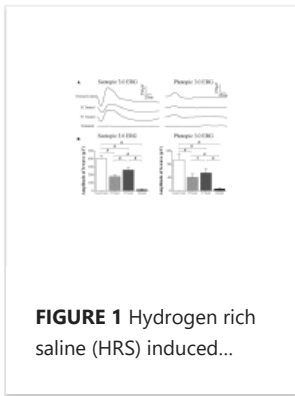
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## Abstract

Retinitis pigmentosa (RP) comprises a heterogeneous group of inherited retinal diseases leading to blindness. The present study explored the protective effects of hydrogen rich saline (HRS) against the photoreceptor degeneration in the *N*-Methyl-*N*-nitrosourea (MNU) administrated rat, a pharmacologically induced RP model. The therapeutic effects of intraperitoneal (IP) and intravitreal (IV) injections of HRS on regional retina was quantified via topographic measurements. The MNU administrated rats received IV or IP injections of HRS, and then they were subjected to electroretinography, multi electrode array, histological and immunohistochemistry examinations. The concentrations of the retinal malondialdehyde (MDA), superoxide dismutase (SOD), as well as the mRNA levels of apoptotic-associated genes were quantified. The IP and IV delivery pathways of HRS were both effective to ameliorate MNU induced photoreceptor degeneration. Moreover, the IV acted as a more efficient delivery method than the IP in terms of therapeutic effects. Particularly, the topographic measurements suggested that the IV delivery of HRS could alleviate MNU induced photoreceptor degeneration in the posterior retina. The immunostaining experiments also verified the comparative efficiency between IV and IP delivery of HRS on regional cone photoreceptors. Focal cone photoreceptors showed different susceptibilities to HRS and exhibited as a distinct spatial disequilibrium: cone photoreceptors in the ST quadrant were preferentially rescued; meanwhile, HRS induced protection was feeblest in the IN quadrant. Furthermore, the HRS treatment increased the level of retinal SOD, while reduce the level of retinal MDA in MNU administered rats. The expression levels of sever apoptotic -associated genes were significantly altered by HRS treatment. Collectively, these findings suggest that the IV space is an excellent target for HRS delivery. The IV delivery of HRS can efficiently alleviate the photoreceptors (especially these locate at the posterior retina) from MNU toxicity and act as a candidate treatment for RP.

**Keywords:** delivery efficiency; hydrogen; photoreceptor degeneration; retina; therapy.

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