

FULL TEXT LINKS



Acta Pharmacol Sin. 2012 Apr;33(4):445-51. doi: 10.1038/aps.2011.190. Epub 2012 Mar 5.

Inhalation of hydrogen gas attenuates ouabain-induced auditory neuropathy in gerbils

Juan Qu ¹, Yun-na Gan, Ke-liang Xie, Wen-bo Liu, Ya-fei Wang, Ren-yi Hei, Wen-juan Mi, Jian-hua Qiu

Affiliations

PMID: 22388074 PMID: [PMC4003360](#) DOI: [10.1038/aps.2011.190](#)

[Free PMC article](#)

Abstract

Aim: Auditory neuropathy (AN) is a hearing disorder characterized by abnormal auditory nerve function with preservation of normal cochlear hair cells. This study was designed to investigate whether treatment with molecular hydrogen (H₂), which can remedy damage in various organs via reducing oxidative stress, inflammation and apoptosis, is beneficial to ouabain-induced AN in gerbils.

Methods: AN model was made by local application of ouabain (1 mmol/L, 20 mL) to the round window membrane in male Mongolian gerbils. H₂ treatment was given twice by exposing the animals to H₂ (1%, 2%, and 4%) for 60 min at 1 h and 6 h after ouabain application. Before and 7 d after ouabain application, the hearing status of the animals was evaluated using the auditory brainstem response (ABR) approach, the hear cell function was evaluated with distortion product otoacoustic emissions (DPOAE). Seven days after ouabain application, the changes in the cochleae, especially the spiral ganglion neurons (SGNs), were morphologically studied. TUNEL staining and immunofluorescent staining for activated caspase-3 were used to assess the apoptosis of SGNs.

Results: Treatment with H₂ (2% and 4%) markedly attenuated the click and tone burst-evoked ABR threshold shift at 4, 8, and 16 kHz in ouabain-exposed animals. Neither local ouabain application, nor H₂ treatment changed the amplitude of DPOAE at 4, 8, and 16 kHz. Morphological study showed that treatment with H₂ (2%) significantly alleviated SGN damage and attenuated the loss of SGN density for each turn of cochlea in ouabain-exposed animals. Furthermore, ouabain caused significantly higher numbers of apoptotic SGNs in the cochlea, which was significantly attenuated by the H₂ treatment. However, ouabain did not change the morphology of cochlear hair cells.

Conclusion: The results demonstrate that H₂ treatment is beneficial to ouabain-induced AN via reducing apoptosis. Thus, H₂ might be a potential agent for treating hearing impairment in AN patients.

Figures

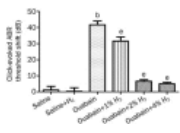


Figure 1 H₂ treatment attenuated ouabain-induced...

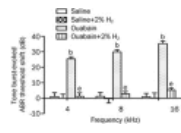


Figure 2 H₂ treatment attenuated ouabain-induced...

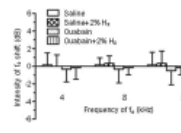


Figure 3 Distortion product otoacoustic emissions (DPOAE)...

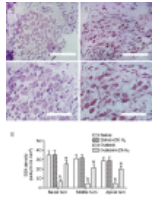


Figure 4 H₂ treatment attenuated ouabain-induced...

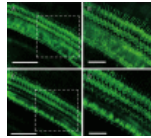


Figure 5 Morphology of cochlear hair cells...

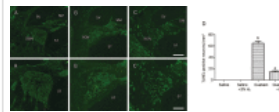


Figure 6 H₂ treatment reduced the...

All figures (7)

Supplementary concepts

[Auditory neuropathy](#)

Related information

[MedGen](#)

[PubChem Compound \(MeSH Keyword\)](#)

LinkOut - more resources

Full Text Sources

[Europe PubMed Central](#)

[Nature Publishing Group](#)

[PubMed Central](#)

Research Materials

[NCI CPTC Antibody Characterization Program](#)