Am J Physiol Heart Circ Physiol. 2011 Sep;301(3):H1062-9. doi: 10.1152/ajpheart.00150.2011.
Epub 2011 Jun 3.

Inhalation of hydrogen gas attenuates left ventricular remodeling induced by intermittent hypoxia in mice

Tetsuya Hayashi [1], Toshitaka Yoshioka, Kenichi Hasegawa, Masatoshi Miyamura, Tatsuhiko Mori, Akira Ukimura, Yasuo Matsumura, Nobukazu Ishizaka

Affiliations

PMID: 21642501 DOI: 10.1152/ajpheart.00150.2011

Free article

Abstract

Sleep apnea syndrome increases the risk of cardiovascular morbidity and mortality. We previously reported that intermittent hypoxia increases superoxide production in a manner dependent on nicotinamide adenine dinucleotide phosphate and accelerates adverse left ventricular (LV) remodeling. Recent studies have suggested that hydrogen (H(2)) may have an antioxidant effect by reducing hydroxyl radicals. In this study, we investigated the effects of H(2) gas inhalation on lipid metabolism and LV remodeling induced by intermittent hypoxia in mice. Male C57BL/6J mice (n = 62) were exposed to intermittent hypoxia (repetitive cycle of 1-min periods of 5 and 21% oxygen for 8 h during daytime) for 7 days. H(2) gas (1.3 vol/100 vol) was given either at the time of reoxygenation, during hypoxic conditions, or throughout the experimental period. Mice kept under normoxic conditions served as controls (n = 13). Intermittent hypoxia significantly increased plasma levels of low- and very low-density cholesterol and the amount of 4-hydroxy-2-nonenal-modified protein adducts in the LV myocardium. It also upregulated mRNA expression of tissue necrosis factor-α, interleukin-6, and brain natriuretic peptide, increased production of superoxide, and induced cardiomyocyte hypertrophy, nuclear deformity, mitochondrial degeneration, and interstitial fibrosis. H(2) gas inhalation significantly suppressed these changes induced by intermittent hypoxia. In particular, H(2) gas inhaled at the timing of reoxygenation or throughout the experiment was effective in preventing dyslipidemia and suppressing superoxide production in the LV myocardium. These results suggest that inhalation of H(2) gas was effective for reducing oxidative stress and preventing LV remodeling induced by intermittent hypoxia relevant to sleep apnea.

Related information

MedGen
PubChem Compound
PubChem Compound (MeSH Keyword)
PubChem Substance

LinkOut - more resources

Full Text Sources

Atypon

Other Literature Sources

The Lens - Patent Citations

Medical

MedlinePlus Health Information

Miscellaneous

NCI CPTAC Assay Portal