Cardiovasc Res. 2012 Apr 1;94(1):144-53. doi: 10.1093/cvr/cvs024. Epub 2012 Jan 27.

Oral intake of hydrogen-rich water inhibits intimal hyperplasia in arterialized vein grafts in rats

Qiang Sun [1], Tomohiro Kawamura, Kosuke Masutani, Ximei Peng, Qing Sun, Donna B Stolz, John P Pribis, Timothy R Billiar, Xuejun Sun, Christian A Bermudez, Yoshiya Toyoda, Atsunori Nakao

Affiliations

PMID: 22287575 PMCID: PMC3307379 DOI: 10.1093/cvr/cvs024

Free PMC article

Abstract

Aims: Arterialized vein grafts often fail due to intimal hyperplasia. Hydrogen potently protects organs and cells from many insults via its anti-inflammatory and antioxidant properties. We investigated the efficacy of oral administration of hydrogen-rich water (HW) for prevention of intimal hyperplasia.

Methods and results: The inferior vena cava was excised, stored in cold Ringer solution for 2 h, and placed as an interposition graft in the abdominal aorta of syngeneic Lewis rats. HW was generated by immersing a magnesium stick in tap water (Mg + 2H(2)O → Mg (OH)(2) + H(2)). Beginning on the day of graft implantation, recipients were given tap water [regular water (RW)], HW or HW that had been subsequently degassed water (DW). Six weeks after grafting, the grafts in the rats given RW or DW had developed intimal hyperplasia, accompanied by increased oxidative injury. HW significantly suppressed intimal hyperplasia. One week after grafting, the grafts in HW-treated rats exhibited improved endothelial integrity with less platelet and white blood cell aggregation. Up-regulation of the mRNAs for intracellular adhesion molecules was attenuated in the vein grafts of the rats receiving HW. Activation of p38 mitogen-activated protein kinase, matrix metalloproteinase (MMP)-2, and MMP-9 was also significantly inhibited in grafts receiving HW. In rat smooth muscle cell (A7r5) cultures, hydrogen treatment for 24 h reduced smooth muscle cell migration.

Conclusion: Drinking HW significantly reduced neointima formation after vein grafting in rats. Drinking HW may have therapeutic value as a novel therapy for intimal hyperplasia and could easily be incorporated into daily life.

Figures

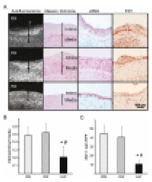

Figure 1 (*A*) Morphological assessment...

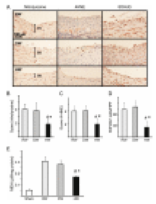

Figure 2 Evaluation of oxidative injury in...

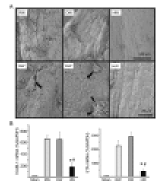

Figure 3 (*A*) SEM of...

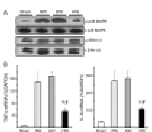

Figure 4 (*A*) Western blots...

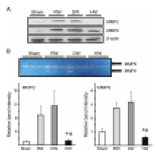

Figure 5 (*A*) Western blots...

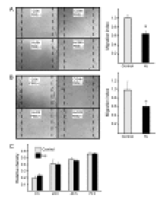

Figure 6 The wound migration assay (...

Related information

MedGen
PubChem Compound (MeSH Keyword)

LinkOut - more resources

Full Text Sources

Europe PubMed Central
Ovid Technologies, Inc.
PubMed Central
Silverchair Information Systems

Other Literature Sources

The Lens - Patent Citations

Miscellaneous

NCI CPTAC Assay Portal