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Profiling molecular changes induced by hydrogen treatment of lung allografts prior to procurement

Yugo Tanaka [1], Norihisa Shigemura, Tomohiro Kawamura, Kentaro Noda, Kumiko Isse, Donna Beer Stolz, Timothy R Billiar, Yoshiya Toyoda, Christian A Bermudez, James Lyons-Weiler, Atsunori Nakao

Affiliations

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Abstract

Background: We previously demonstrated that donor treatment with inhaled hydrogen protects lung grafts from cold ischemia/reperfusion (I/R) injury during lung transplantation. To elucidate the mechanisms underlying hydrogen's protective effects, we conducted a gene array analysis to identify changes in gene expression associated with hydrogen treatment.

Methods: Donor rats were exposed to mechanical ventilation with 98% oxygen and 2% nitrogen or 2% hydrogen for 3 h before harvest; lung grafts were stored for 4h in cold Perfadex. Affymetrix gene array analysis of mRNA transcripts was performed on the lung tissue prior to implantation.

Results: Pretreatment of donor lungs with hydrogen altered the expression of 229 genes represented on the array (182 upregulated; 47 downregulated). Hydrogen treatment induced several lung surfactant-related genes, ATP synthase genes and stress-response genes. The intracellular surfactant pool, tissue adenosine triphosphate (ATP) levels and heat shock protein 70 (HSP70) expression increased in the hydrogen-treated grafts. Hydrogen treatment also induced the transcription factors C/EBPα and C/EBPβ, which are known regulators of surfactant-related genes.

Conclusion: Donor ventilation with hydrogen significantly increases expression of surfactant-related molecules, ATP synthases and stress-response molecules in lung grafts. The induction of these molecules may underlie hydrogen's protective effects against I/R injury during transplantation.

Figures

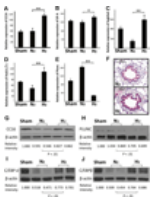

Fig. 1 Quantitative RT-PCR for (A) CC16,...

Fig. 2 Transmission electron microscopy of lung...

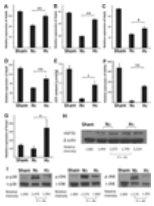

Fig. 3 Quantitative RT-PCR for (A) ATP5b,...

Comment in

Letter to the editor on "Profiling molecular changes induced by hydrogen treatment of lung allografts prior to procurement".

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