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Combined early fluid resuscitation and hydrogen inhalation attenuates lung and intestine injury

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Abstract

Aim: To study the effects of combined early fluid resuscitation and hydrogen inhalation on septic shock-induced lung and intestine injuries.

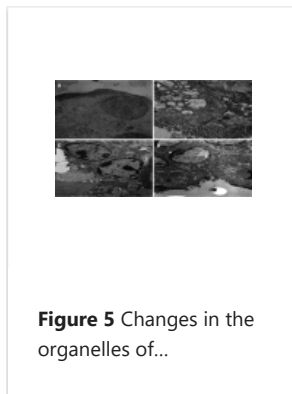
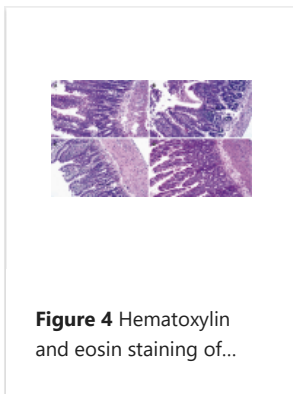
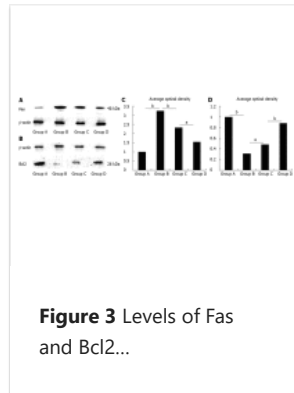
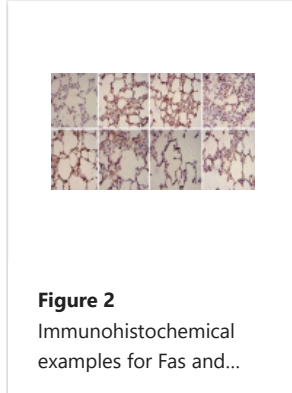
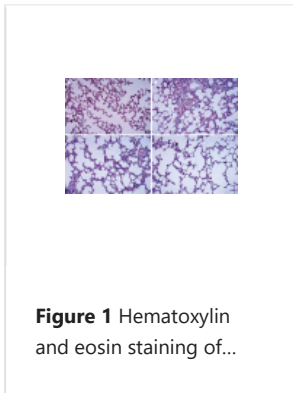
Methods: Wistar male rats were randomly divided into four groups: control group (Group A, n = 15); septic shock group (Group B, n = 15); early fluid resuscitation-treated septic shock group (Group C, n = 15); and early fluid resuscitation and inhalation of 2% hydrogen-treated septic shock group (Group D, n = 15). The activity of hydroxyl radicals, myeloperoxidase (MPO), superoxide dismutase (SOD), diamine oxidase (DAO), and the concentration of malonaldehyde (MDA) in the lung and intestinal tissue were assessed according to the corresponding kits. Hematoxylin and eosin staining was carried out to detect the pathology of the lung and intestine. The expression levels of interleukin (IL)-6, IL-8, and tumor necrosis factor (TNF)- α in lung and intestine tissue were detected by enzyme-linked immunosorbent assay method. The expression levels of Fas and Bcl2 in lung tissues were determined by immunohistochemistry and Western blotting.

Results: Septic shock elicited a significant increase in the levels of MDA (10.17 ± 1.12 nmol/mg protein vs 2.98 ± 0.64 nmol/mg protein) and MPO (6.79 ± 1.02 U/g wet tissue vs 1.69 ± 0.14 U/g wet tissue) in lung tissues. These effects were not significantly decreased by Group C pretreatment, but were significantly reduced by Group D pretreatment (MDA: 4.45 ± 1.13 nmol/mg protein vs 9.56 ± 1.37 nmol/mg protein; MPO: 2.58 ± 0.21 U/g wet tissue vs 6.02 ± 1.16 U/g wet tissue). The activity of SOD (250.32 ± 8.56 U/mg protein vs 365.78 ± 10.26 U/mg protein) in lung tissues was decreased after septic shock, and was not significantly increased by Group C pretreatment, but was significantly enhanced by Group D pretreatment (331.15 ± 9.64 U/mg protein vs 262.98 ± 5.47 U/mg protein). Histological evidence of lung hemorrhage, neutrophil infiltration and overexpression of IL-6, IL-8, and TNF- α was observed in lung tissues, all of which were attenuated by Group C and further alleviated by Group D pretreatment. Septic shock also elicited a significant increase in the levels of MDA, MPO and DAO (6.54 ± 0.68 kU/L vs 4.32 ± 0.33 kU/L) in intestinal tissues, all of which were further increased by Group C, but significantly reduced by Group D pretreatment. Increased Chiu scoring and overexpression of IL-6, IL-8 and TNF- α were observed in intestinal tissues, all of which were attenuated by Group C and further attenuated by Group D pretreatment.

Conclusion: Combined early fluid resuscitation and hydrogen inhalation may protect the lung and intestine of the septic shock rats from the damage induced by oxidative stress and the inflammatory reaction.

Keywords: Early fluid resuscitation; Inhalation of hydrogen gas; Intestine; Lung; Oxidative damage; Septic shock.

Figures



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