



Effects of mild hyperbaric oxygen on osteoporosis induced by hindlimb unloading in rats

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Abstract

Introduction: Disuse-induced bone loss is caused by a suppression of osteoblastic bone formation and an increase in osteoclastic bone resorption. There are few data available for the effects of environmental conditions, i.e., atmospheric pressure and/or oxygen concentration, on osteoporosis. This study examined the effects of mild hyperbaric oxygen at 1317 hPa with 40% oxygen on unloading-induced osteoporosis.

Materials and methods: Eighteen 8-week old male Wistar rats were randomly divided into three groups: the control for 21 days without unloading and mild hyperbaric oxygen (NOR, n = 6), the unloading for 21 days and recovery for 10 days without mild hyperbaric oxygen (HU + NOR, n = 6), and the unloading for 21 days and recovery for 10 days with mild hyperbaric oxygen (HU + MHO, n = 6).

Results: The cortical thickness and trabecular bone surface area were decreased in the HU + NOR group compared to the NOR group. There were no differences between the NOR and HU + MHO groups. Osteoclast surface area and Sclerostin (Sost) mRNA expression levels were decreased in the HU + MHO group compared to the HU + NOR group. These results suggested that the loss of the cortical and trabecular bone is

inhibited by mild hyperbaric oxygen, because of an inhibition of osteoclasts and enhancement of bone formation with decreased Sost expression.

Conclusions: We conclude that exposure to mild hyperbaric oxygen partially protects from the osteoporosis induced by hindlimb unloading.

Keywords: Bone loss; Hindlimb unloading; Mild hyperbaric oxygen; Osteoporosis; Oxidative metabolism.