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EFFECTS OF HYPERGRAVITY ON OSTEOPONTIN EXPRESSION IN OSTEOBLASTS

Abstract

Introduction: Mechanical loading is important in regulating bone remodeling and bone resorption. Osteopontin, a major bone matrix glycoprotein, is one of the proteins, which are involved in mechanotransduction. (Gross, 2004; Fujihara, 2006) In bone cells, osteopontin can be produced by osteoblasts, osteoclasts and osteocytes. Osteopontin is reported to affect osteoclasts adhesion and activity. (Staines 2012) During space flight, bone cells suffer altered gravity, which can affect cell functions and differentiation. We therefore wonder if hypergravity change the expression of osteopontin in osteoblasts and then try to find the signal pathway by which hypergravity affect osteopontin expression.

Methods: Low-speed centrifuge offers 24 h 20g hypergravity stimulation to MC3T3-E1 osteoblast cells. Osteopontin is detected on protein and mRNA level by the methods of western blotting and realtime PCR. Runx2, p-ERK, ERK, p-FAK, FAK expression are also measured. Immunofluorescence staining is used to show the location and expression of osteopontin and runx2 in cells.

Results: We confirmed that 20g hypergravity can increase osteopontin expression in osteoblasts on both mRNA and protein level after 24 h. Meanwhile, we observed a similar upregulation in Runx2 expression under hypergravity. We also found that p-ERK and p-FAK were affected by hypergravity.

Discussion and conclusion: These results demonstrate that hypergravity can increase osteopontin expression in osteoblasts; and FAK, ERK and Runx2 may be involved in this process. Since osteopontin can influence cell adhesion by binding with integrin or CD44, especially mediate the attachment of osteoclasts to bone, we would like to study the effects of hypergravity on osteoclasts or mesenchymal stem cells in the future.

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