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Simulated Microgravity Inhibits L-Type Calcium Channel Currents by Up-Regulation of miR-103 in Osteoblasts

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Abstract : In osteoblasts, L-type voltage sensitive calcium channels (LTCCs), especially the Cav1.2 LTCCs, play fundamental roles in cellular responses to external stimuli including both mechanical forces and hormonal signals. Several lines of evidence have revealed that the density of bone is increased and the resorption of bone is decreased when these calcium channels in osteoblasts are activated. And numerous studies have shown that mechanical loading promotes bone formation in the modeling skeleton, whereas removal of this stimulus in microgravity results in a reduction in bone mass. However, the effect of microgravity on LTCCs in osteoblasts is still unknown. The aim of this study was to determine whether microgravity exerts influence on LTCCs in osteoblasts and the possible mechanisms underlying. In this study, we demonstrate that simulated microgravity substantially inhibits LTCCs in osteoblast by suppressing the expression of Cav1.2. Then we show that the up-regulation of miR-103 is involved in the down-regulation of Cav1.2 expression and inhibition of LTCCs by simulated microgravity in osteoblasts. Our study provides a novel mechanism of simulated microgravity-induced adverse effects on osteoblasts, offering a new avenue to further investigate the bone loss caused by microgravity.

Keywords : L-type voltage sensitive calcium channels, Cav1.2, osteoblasts, microgravity
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