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EFFECTS OF SIMULATED MICROGRAVITY ON CELL CYCLE IN HUMAN ENDOTHELIAL CELLS

Abstract

Endothelial cells play a crucial role in the pathogenesis of many diseases and are highly sensitive to low gravity conditions. In this study, we examined cell cycle analysis after exposure to simulated microgravity using 3D-clinostat (Dutch Space, Astrium Company, NL) on the endothelial-like EAhy926 cells. EA.hy926 cells were seeded in OptiCell cell culture system, mounted in a 3D-clinostat, and cultured at 37 C in a humidified atmosphere of 95% air and 5% CO2. The cell cycle distribution of EA.hy926 cells was analyzed by propidium iodide staining of cellular DNA content and flow cytometry FACSCalibur. The percentages of cell population in G0/G1, S or G2 phases were calculated from histograms by using the Cell Quest software. Cell cycles indicated by flow cytometry showed that cell percentage in G0/G1 phase after 24 and 96 h of clinorotation were significantly increased compared to control group, however, after 120 h and 168 h of clinorotation, the difference was not significant. The cell percentage of G0/G1 phase was 64.5%, 70.3% and 76.3%, 81.4 at 24, 96 and 120, 168 h, respectively, under normal conditions, whereas it was 76.6%, 87.2% and 74.1%, 80.6 after 24, 96 h and 120, 168 h of clinorotation, respectively. The cell percentage in S phase significantly decreased from 25.5% to 15.0% and from 22.0% to 7.9% after 24 and 96 h. The cell percentage in S phase after 120 h and 168 h of clinorotation, the difference was not significant. Thus, we showed that simulated microgravity inhibits cell cycle progression of human EA.hy926 cells from G0/G1 into S phase. We observed the effect of a hibernation-like state when cells in the clinorotation group grow slowly, but do not arrest. Our results confirm experiments that showed cells are able to adapt to changes in the gravitational field. However, our data also show that endothelial EAhy926 cells were less resistant to stress compared with human neuroblastoma cells SHSY-5Y that we examined in a previous study. Our experiments support the conclusion that the adverse effects of simulated microgravity have

various effects on different kinds of cells.