IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Biology in Space (8)

Author: Dr. Alisa Sokolovskaya
Research Institute of General Pathology and Pathophysiology / Russian Academy of Medical Sciences, Russian Federation, alice.sokolovskaya@gmail.com

Dr. Moskovcev Aleksey
Research Institute of General Pathology and Pathophysiology, Russian Federation, bioinf@mail.ru
Mr. Dmitry Kolesov
Research Institute of General Pathology and Pathophysiology, Russian Federation, maedros@bk.ru
Ms. Ekaterina Korneeva
Mendeleev University of Chemical Technology, Russian Federation, katya96korn@mail.ru
Prof. Kubatiev Aslan
Research Institute of General Pathology and Pathophysiology / Russian Academy of Medical Sciences, Russian Federation, bioinf@mail.ru

THE SIMULATED MICROGRAVITY CHANGES SURFACE MARKER EXPRESSION AND INHIBITS CELL CYCLE PROGRESSION OF MEGAKARYOBLASTIC CELL LINE MEG-01

Abstract

Megakaryocytes are specialized cells responsible for the production of platelets. Recently, several cases of thrombocytopenia in astronauts after spaceflights has been reported, but the reason for the decrease in number of platelets is not known. One of the causes of thrombocytopenia can be decreased platelet production. For better understanding the mechanisms that may be involved in possible changes of thrombopoiesis in humans under microgravity conditions, we investigated the effects of simulated microgravity on megakaryoblastic cell line MEG-01 as a model system. Using a Desktop random positioning machine (RPM) we studied the cell cycle distribution of MEG-01 under simulated microgravity (24, 48, and 72 h and 1-week). MEG-01 cells with a density of 0.3 106 cells/mL were placed in 3.0 mL tubes. Next, the tubes were fixed onto the Desktop RPM at the center of the platform and cultured at 37oC in a humidified atmosphere of 95% air and 5% CO2. The cell cycle distribution of MEG-01 cells and expression of surface markers was analyzed by flow cytometry FACSCalibur. Flow cytometry analysis showed a significant increase in the percentage of cells in G0/G1 phase after week of RPM-simulated microgravity as compared to the static group (1g control). Immunophenotyping showed that MEG-01 cells were positive for specific surface markers CD13, CD19 and CD33 before the start of experiments. Under RPM-simulated microgravity the change of expression of the CD13, CD19 and CD33 was not significant as compared to the control group. However, after week of microgravity culture the expression of CD33 on cells was decreased by 15% in comparison with the control cells. Thus, we concluded that simulated microgravity inhibits cell cycle progression of MEG-01 cells from G0/G1 into S phase, decreases cell proliferation and changes the expression of surface markers. We guess that these changes in cell cycle progression in megakaryoblasts under conditions of microgravity with insufficient physiological compensation may lead to decreased platelets production. It should also be noted that the human cell line MEG-01 due to its possibility to generate platelet-like particles could be useful model for studying the effects of simulated microgravity on platelet production.