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Human Physiology in Space (2)

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PECULIARITIES OF CELL-TO-CELL INTERACTION BETWEEN MSCS AND ADAPTIVE AND NATURAL IMMUNITY CELLS UNDER “DRY” IMMERSION

Abstract

Space flight (SF) factors adversely affect the immune system and lead to the elevation of inflammatory and allergic reactions. The one of the promising tool to maintain stability of immune system may be multipotent mesenchymal stromal cells (MSCs), which have proven themselves in treatment of autoimmune and acute inflammatory processes. The aim of this work was to investigate influence of microgravity simulation in “dry” immersion (DI) on the susceptibility of NK and T cells to MSC immunomodulation. Healthy male volunteers (n=8), participated in the 21-day DI experiments. Blood sampling was performed one day before the DI (basal), on the 7th and 21st day of DI, and on 7th day after (readaptation). NK (CD56+) and T cells (CD3+) were isolated by magnetic separation, stimulated by phytohemagglutinin and IL-2, IL-15 respectively, and cocultured with MSCs for 72 hours. It was found an increase of T cell late activation marker (HLA-DR) and decrease of proliferative activity under DI. The paracrine activity of T cells increased on 7th day of DI. All of parameters, except proliferative activity, returned to basal values. The ability of NK cell to respond to stimuli decreased under DI including expression of activation markers (CD314, CD226) and paracrine activity. Not one of the parameters had time to return to basal values during readaptation period. MSCs showed pronounced immunosuppressive properties to immunocytes collected at basal point, suppressing proliferative response of T cells, activation and main proinflammatory cytokines production of both types of immune cells. MSC immunosuppression to immunocytes collected at the 7th and 21th days DI depended on cell activation. Immunosuppression did not occur when the ability of immunocytes to activate was very low under DI. MSC production of GRO, G-CSF, FGF-2, Eotaxin and VEGF increased in coculture with immunocytes collected at basal. Changes in paracrine activity depended on DI duration. The level of these factors in coculture increased at 7th and decreased at 21th days of DI. The interaction of MSCs with NK cells revealed similar changes, except for GRO and G-CSF. Thus, under DI both the susceptibility of immune cells to activation and MSC response (including their paracrine profile) have changed. These data can clarify the mechanisms of mutual regulation of cells interaction under SF factors and look for the new treatment of immune dysregulation during long-term space missions. The work was supported by Basic Research Program of Institute of Biomedical Problems of RAS, project 65.3.