Paper ID: 3226
student

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Fundamental Gravitational Biology (7)

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T-CELL IMMUNITY AND CYTOKINE PRODUCTION IN COSMONAUTS AFTER LONG-DURATION SPACE FLIGHTS

Abstract

Immune system plays a leading role in the maintenance of homeostasis and makes relationship between complex systems of human body. Its function depends on the informational signaling of cytokines. The purpose of this research was to study effects of space flights on parameters of cytokine network and to estimate relation between cytokine profile and T-cell immunity of cosmonauts. Methods: The study material was formed by venous blood from 6 long-duration International Space Stations (ISS) Russian crewmembers. Blood samples were collected using standard venipuncture techniques 60 days before launch and 1-7 days after landing. It was investigated: cell-surface antigenic markers on lymphocytes; expression of the earliest and mid-activation markers (CD69 and CD25) on unstimulated and stimulated T-lymphocytes; T-lymphocytes proliferation; plasma cytokine levels (IFNγ, IL1, IL2, IL4, IL5, IL6, IL8, IL10, IL12, TNFα, TNFβ) and cytokine production profiles in stimulated and unstimulated cell cultures. Results: Studies of cosmonauts after long-duration ISS missions demonstrated that significant changes in the percentage of T cells subsets (CD4 and CD8) were not observed. At the same time in some cosmonauts T cell activation was elevated; however T cell function was decreased. For ISS crewmembers, individual varieties of cytokine levels (IFNγ, IL1, IL2, IL4, IL5, IL6, IL8, IL10, IL12, TNFα, TNFβ) was observed both in serum and in supernatant of stimulated and unstimulated PBMC in vitro after space flights, but an increase in the quantity of IFN- and IL-10 was revealed for the majority of cosmonauts. The ratios of secreted IFN-γ/IL-10 following T cell stimulation were reduced compared to preflight data that possibly indicate Th2 cytokine bias shift. The analysis of studied data has appeared the existence of positive correlations between cytokine production and T-cell activation (CD25+, CD38+, HLA-DR+), and with it there were negative correlations between cytokine production and number of bulk' memory CD4+ T cells (CD45RO+). Conclusion: These data permit to make an assumption that imbalance in cytokine production is one of the mechanisms that induce functional immune dysregulation in cosmonauts after long-duration spaceflight. The investigation was supported by President Grant 3402.2008.4