

HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
Human Mars Exploration (2)

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520-DAY ISOLATION AND CONFINEMENT SIMULATING A FLIGHT TO MARS REVEALS
ELEVATED IMMUNE RESPONSES AND ALTERATIONS OF LEUKOCYTE PHENOTYPE (COSI
STUDY)

Abstract

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BACKGROUND During interplanetary exploration, isolation and confinement are among the major concerns of physical and psychological health of space travelers. Collective evidences have indicated prolonged isolation and confinement condition can influence human immune functions, which may potentially lead to a variety of health problems. However, it is still largely unknown about the detailed information of the effect of long-term isolation and confinement on human immune performance. A simulated 520-Day Mars mission (MARS500), by definition with strong focus on isolation and confinement, provided an extraordinary chance to specifically study the effect of prolonged isolation and confinement.

METHOD & RESULTS Six healthy males participated in the mission of MARS500. We were able to achieve saliva, urine and blood samples from all participants on chosen time points before, repeatedly during and after the confinement, and their “live” neuroendocrine and immune conditions were studied with an interdisciplinary approach. Several neuroendocrine parameters were measured, such as stress hormone cortisol in their morning salvia samples. Their immune systems were monitored through enumerative and percental leukocyte phenotype subset analysis. Immune function was evaluated through characterization of innate and adaptive immune functional test using cytokine profiles in response to antigen infection simulation. With this study we have shown long-lasting high level cortisol on the MARS500 subjects indicating the existence of chronic stress induced by prolonged isolation and confinement condition. The results of this study have revealed several aspects of immune dysfunction, including increased lymphocyte concentration, heightened antiviral immune responses, and up-regulated anti-inflammatory signaling.

CONCLUSIONS Isolation and confinement acting as chronic stressors are able to trigger a significant change of leukocyte phenotype and a number of dysfunctional immune responses.

ACKNOWLEDGEMENTS Supported by the German Space Agency (DLR. BMWi 50WB0919), the European Space Agency (ESA, ELIPS 4 programme) and the Institute for Biomedical Problems (IBMP). Our highest appreciation goes to the MARS500 crews who have realized the study with outstanding professionalism.