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CORRELATION ANALYSIS BETWEEN PLASMA PARAMETERS AND MOOD STATES OF CREW
MEMBERS DURING 520 DAYS ISOLATION**Abstract**

Purpose: Psychological changes as well as physiological conditions are essentially vital to the success of future's more prolonged space flight missions. This study aims to study the changes of six different mood states and explore their correlation with the plasma parameters of six crew members in Mars500, a ground-based 520-day isolation and confinement experiment in Moscow. Methodology: During the 520 days isolation and confinement, six mood states from POMS (profile of mood state) were tested consecutively in all six crew members, including tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia and confusion-bewilderment. Peripheral blood was collected with interval

of approximate sixty days, and plasma parameters were assayed for the dynamic changes of stress, oxidative stress, nutrition-metabolism and immunity. Statistical difference for the analysis of mood state and plasma parameters changes were analyzed by general linear model repeated measure analysis of variance. Correlation between different mood states and variety of plasma parameters was analyzed using Pearson correlation analysis. Results: Each of the six mood states showed consecutive fluctuation during 520 days among all six crew members. Although there were no significant changes between each sampling time points, a novel combinational index for profile of mood state was introduced and could demonstrate the direct dynamics of the group's mood state. Moreover, correlation analysis revealed those susceptible plasma parameters correlated with different mood states. Two antioxidase (glutathione peroxidase and peroxidase catalase) and two hormones (thyroid-stimulating hormone and 5-hydroxyindole acetic acid) were negatively correlated with tension-anxiety. The endocrine hormone free liothyronine was negatively correlated with depression-dejection. For anger-hostility, the thyroxine showed positive correlation. Intriguingly, for vigor-activity, which was the only positive mood state among profile of mood states, adiponectin and free liothyronine was negatively and positively correlated separately. Besides, the quantity of natural killer cell was negatively correlated with fatigue-inertia. Furthermore, deep exploration of the correlation between combinational index of mood state and plasma parameters identified candidate functional pathway. Conclusions: Among over forty plasma parameters, candidate functional plasma parameters were identified to be correlated with different mood states, mainly including antioxidase and metabolic parameters. Candidate functional pathways correlated with mood states changes may possibly decipher the underlying molecular mechanisms of the stage-specific mood state dynamic changes under long duration isolation. Acknowledgments: This study was supported by the National Basic Research Program of China (Grant NO. 2011CB707704 and 2011CB711000), and the Foundation of State Key Laboratory of Space Medicine Fundamentals and Application (Grant NO. SMFA13B02, SMFA09A06 and SMFA12B05).