SPACE LIFE SCIENCES SYMPOSIUM (A1)
Human Physiology in Space (2)

Author: Dr. Ming Yuan
1 Space Institute of Southern China(Shenzhen), 2 China Astronaut Research and Training Center, China

Mrs. Fang Du
Space Institute of Southern ChinaChina Astronaut Research and Training Center, China
Mrs. Feizhou Tong
China Astronaut Research and Training Center, China
Mrs. Jingyu Wang
State Key Laboratory of Space Medicine Fundamentals and Application, China Astronaut Research and Training Center, China
Ms. Xu Zi
Space Institute of Southern China(Shenzhen)China Astronaut Research and Training Center, China
Ms. Yuan Min
China Astronaut Research and Training Center, China
Dr. Ke Lv
China Astronaut Research and Training Center, China
Prof. Marc-Antoine Custaud
Université d'Angers, France
Prof. Yinghui Li
China Astronaut Research and Training Center, China

EVALUATION OF ENDOTHELIAL FUNCTION DURING SIMULATION OF INTERPLANETARY SPACEFLIGHT WITH MARS SOL IN 180D CELSS EXPERIMENT

Abstract

Spaceflight can induce cardiovascular dysfunction, affecting the vascular function including vascular endothelium. Recently, evidences showed that irradiation related with spaceflight induced sustained vascular endothelial cell dysfunction, and environment on board ISS also affected the function of endothelial cells by oxidative stress. Here we examined the hypothesis that the isolation environment in space cabin during simulation of interplanetary spaceflight would be enough to induce the dysfunction of vascular endothelium, and Mars sol would disturb the remodeling of vascular endothelial function. 4 volunteers lived in the closed cabin for 180 days to simulate the interplanetary spaceflight. After living for 71 days in the closed cabin, Mars sol was introduced into the simulation procedure, all volunteers lived in the cabin according to the new schedule designed based on the Mars sol period length for another 37 days, then recovered to the normal earth sol for the residual 72 days. In the pre-isolation, during 180d cabin-living and one week post the isolation, the reactive hyperemia index (RHI) based on the technique of endothelial peripheral arterial tonometry (EndoPAT) was used to evaluate the endothelial function of volunteers. The results showed that isolation in the closed cabin induced the obvious decline of endothelial function after 1st month, then the endothelial function has the tendency of slightly increasing during 2nd and 3rd months(in Mars sol), the decline tendency was appeared since 4th month, and was maintained until the beginning of outside the cabin. From the personalized data, we found that the volunteers have different response of endothelial function to Mars sol, which induced increasing of RHI in two volunteers and decreasing of RHI in other two volunteers. The different response of endothelial function to Mars

sol may be due to the different entrain ability of adjusting the biological rhythm in volunteers when the normal rhythm was disturbed by a prolonged environmental light-dark cycle and sleep-wake schedule. Based on the data of endothelial function, we conclude that isolation in space cabin for 1month is enough to induce the decreasing of endothelial function in human, and the endothelial function should be protected by some countermeasures during long-term interplanetary spaceflight. (Funded by Project GJHZ20150316101744427)