SPACE LIFE SCIENCES SYMPOSIUM (A1)
Radiation Fields, Effects and Risks in Human Space Missions (4)

Author: Prof.Dr. Guangming Zhou
Chinese Academy of Sciences, China

Dr. Hailong Pei
China
Dr. Nan Ding
China
Dr. Jinpeng He
China
Dr. Yoshiya Furusawa
National Institute of Radiological Sciences (NIRS), Japan
Dr. Ryoichi Hirayama
Japan
Dr. Yoshitaka Matsumoto
Japan
Dr. Cuihua Liu
Japan
Mr. He Li
China
Dr. Wentao Hu
CAS, China
Prof. Jufang Wang
China
Prof. Yinghui Li
China Astronaut Research and Training Center, China
Dr. Tetsuya Kawata
Japan

GROUND-BASED RISK ASSESSMENT OF SPACE RADIATION WITH QUIESCENT CELLS.

Abstract

Accurate risk assessment of space radiation is essential for long-term manned space exploration. Most of the cells in human body are quiescent (in G0 phase) and may remain in this stage for days or even years before resuming cell division, for instance, muscle cells and nerve cells stay in G0 phase permanently. In this study, we set up a standard protocol for establishing 2D cultured G0 cells by culturing cells for 8 days with one medium refreshment on day 4, 2D cultured G1 cells obtained by subculturing G0 cells for 6 h, and exponentially growing cells by culturing one quarter of the G0 cells in the same size flask for 24 h. We demonstrated that G1 cells were the same radiosensitive as exponentially growing cells but less radioresistant than G0 cells. These results imply that the risk assessment of space radiation with exponentially growing cells might overestimate the risk. Therefore, we studied the biological effects of various space HZE particles with the G0 cells and found that even though G0 cells were more resistant than G1 cells to all kind of ionizing radiation used in this study, the RBE of G0 cells was very similar

to G1 cells. The induction of DNA double strand breaks visualized by 53BP1 foci was dependent on the LET and the fluence of particles, however, the repair ability of both kinds of cells was dependent on the Z number of the beams, implying the different complexity of the DNA damages induced by different particles. In summary, quiescent cells might be an appropriate cell model for the risk assessment of space radiation which might be overestimated before. It is exciting for manned space exploration. Mechanism underlying the radioresistance of quiescent cells will be further demonstrated.