Paper ID: 88140
oral
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Radiation Fields, Effects and Risks in Human Space Missions (5)

Author: Mr. Aaron Rosenstein
University of Toronto, Canada, aaron.rosenstein@mail.utoronto.ca

Ms. Lucy Ma
University of Toronto, Canada, lucyxinyu.ma@mail.utoronto.ca
Prof.Dr. Michael Garton
University of Toronto, Canada, michael.garton@utoronto.ca

ENGINEERING HUMAN CELL-BASED RADIORESISTANCE TO BOLSTER ASTRONAUT HEALTH ON LONG-TERM SPACE MISSIONS

Abstract

Embarking on the frontier of long-term space expeditions such as the Lunar Gateway/Artemis ventures and proposed missions to Mars, crew-members will be exposed to high-dose ionizing radiation (IR). This space-associated stressor exerts both differential and widespread effects on human tissues encompassing genotoxicity and apoptotic initiation. While spacecraft shielding can effectively protect crew members from some forms of IR, the most insidious ionized particles (high-mass/high-charge) have high penetrance. As such, these problems are more biological in nature than mechanical-engineering-based, which requires innovative solutions in-kind to ensure the viability of long-term space missions. Herein we engineer human cells to over-express rationally selected endogenous proteins to confer resistance against mutagenic agents and gamma-irradiation. It was determined that overexpression of proteins involved in reactive-oxygen species scavenging and DNA repair were able to reduce both induction of double-strand breaks (H2AX) and cell-cycle arrest (p53-promoter induction) by 60