

Lunar Challenges: Exploring Human Health Risks from Lunar Dust Exposure and Lunar Gravity in Moon Missions

Moon expeditions present astronauts with distinct health risks due to exposure to lunar dust and the physiological impacts of lunar gravity. On the Moon, lunar dust (LDS) exposure is a major concern for long-duration space missions, setting up of a colony on the Moon, in missions where lunar dust might stow away on garments or cargo that were exposed to the lunar surface. LDS exposure may cause several changes in immunity and inflammation in the body. While Mars expeditions are being planned, the Moon is a natural staging point for future interplanetary missions. The Deep Space Gateway could be the first platform from which human exploration of the Solar System could set forth. Moreover, it would provide the crew with new access and a chance to explore and investigate the moon's surface. This study encompasses the ongoing research effort using an Earth-based Differential Gravity Analog Random Positioning Machine (RPM) to explore these hazards under simulated lunar conditions. This study will explore and explain the effects of lunar simulant on skin fibroblasts, immune cells, and lung epithelial cells. Preliminary results show evidence of mutagenesis in the lung cells, increase in inflammatory mediators in immune cells and dysregulation of focal adhesion kinases in the fibroblasts. In depth analysis and signaling mechanisms affected will be presented in this study.

Key Words: Lunar dust, Lunar gravity, Random positioning machine, Moon mission.