

IAF SPACE EXPLORATION SYMPOSIUM (A3)
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LEIA: NASA'S FIRST BIOLOGICAL MISSION ON THE LUNAR SURFACE SINCE 1972

Abstract

The Lunar Explorer Instrument for space biology Applications (LEIA) mission was awarded in 2022 by NASA to investigate the effects of the lunar environment (partial gravity and space radiation) on biological organisms, particularly the effects on different DNA repair and stress response mechanisms and on synthetic bio production of antioxidants. LEIA will launch no earlier than 2026 as a payload on a commercial lunar lander.

LEIA consists of a science suite of three instruments: a microfluidic-based system or BioSensor with life support capabilities, a charged particle detector (LET spectrometer), and a mini fast neutron detector (mini-FND). The BioSensor instrument has high heritage from NASA's BioSentinel CubeSat mission, which was launched to a heliocentric orbit onboard the Artemis I rocket in late 2022 (currently at 50 million kms from the Earth). A similar payload performed experiments on the International Space Station (ISS) in 2022. The BioSensor instrument contains a complex fluidic system that delivers nutrients to desiccated yeast cells in fluidic cards. Growth and metabolic activity are then monitored via optical measurements, which allows for detection of changes caused by cellular or DNA damage after exposure to the lunar surface environment, as well as bio production of antioxidants as a potential countermeasure for future manned missions to the Moon. The LET spectrometer and mini-FND instruments will quantify and characterize the lunar surface radiation environment. Lessons learned from BioSentinel have been implemented in the design and development of LEIA.

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