



EANA 2020

Abstract EANA2020-36

MARSBOx: microbes in a box, in a balloon, exposed to Mars-like conditions

Marta Cortesao (1), Katharina Siems (1), Stella Koch (1), David J Smith (2) and Ralf Moeller (1)

Medicine, German Aerospace Center (DLR), Cologne, Germany (2) Aerobiology Laboratory, Space Biosciences

The ability of terrestrial life to survive in Martian environment is of particular interest for both planetary protection measures and for future colonization endeavors. To understand microbial survival potential in Mars-like conditions, fungal and bacteria were launched on a large NASA scientific balloon flight to the middle stratosphere (~ 38 km altitude) where radiation levels resembled values at the Mars surface equator. Fungal spores of *Aspergillus niger* and bacterial cells of *Salinisphaera shabanensis*, *Staphylococcus capitis* subsp. *capitis*, and *Buttiauxella* sp. MASE-IM-9 were launched inside the MARSBOx (Microbes in Atmosphere for Radiation, Survival, and Biological Outcomes Experiment) payload filled with an artificial Martian atmosphere, kept at 5-10 mbar throughout the mission profile. The microbes were dried on quartz discs, and were exposed in two different layers: bottom layer (UV-shielded) and top layer (UV-exposed; total UV dose = 1148 kJ/m²). After the 5-hour stratospheric exposure, samples were assayed for survival and metabolic changes. Spores from the fungus *A. niger* and cells from the Gram(-) bacteria *S. shabanensis* were the most resistant microorganisms with a 2- and 4-log reduction, respectively. Exposed *Buttiauxella* sp. MASE-IM-9 were completely inactivated (with and without UV exposure) and *S. capitis* subsp. *capitis* only survived the UV-shielded experimental condition (3-log reduction). Our results underscore a wide variation in survival phenotypes of spacecraft associated microorganisms and suggest that pigmented fungi may be resistant to the martian surface if inadvertently delivered by spacecraft missions.