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Microbial life on Mars: The effect of the Martian environment on *Halobacterium salinarum* NRC-1

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Astrobiology is the study of life, its origin, evolution and distribution in the universe. Some of the best models for extraterrestrial life studies are found in extreme environments on Earth that are similar, in certain aspects to the terrains on Mars. Climate models show compatibility with transient, night-time liquid brines, shifting the focus to halophilic extremophiles. This project was designed to simulate the harsh climate of Mars and study how the archaeon *Halobacterium salinarum* sp. NRC-1 copes with radiation, temperature changes, desiccation and different brines compositions adapted from. Solar UV: 200-400 nm was emulated at the German Aerospace Center DLR, in Cologne, Germany and *Hbt. salinarum* was exposed in liquid Martian brine analogues (MBAs) as well as desiccated, and survival was determined. The effects of diurnal-nocturnal cycling were investigated for temperature alternations; 4, -20°C and -80°C. In the MBAs that supported survival of *Hbt. salinarum*, desiccation was the most harmful of the tested Martian conditions. However the desiccated samples had an increase in relative survival of diurnal-nocturnal cycling compared to liquid MBAs. The survival following irradiance was dependent on the brines with F10, (200-400 nm)-values ranging from 14-360 kJ·m-2 and some of the MBAs displayed protective qualities. Adding yeast extract, as organic nutrient to the brines also proved to be harmful to the organism. *Hbt. salinarum* is unlikely to thrive on Mars, as simulated in this project, but their long-term survival is not unimaginable. Halophiles are robust and should be considered both in questions of colonization- and unwanted contamination of Mars.

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