



Responses of hydrated biofilms of *Chroococcidiopsis* sp. 029 to simulated Martian surface conditions.

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The endurance of the desiccation-, radiation-tolerant cyanobacterium *Chroococcidiopsis* sp. 029 to Mars-like conditions, UV fluxes, and perchlorate was investigated with the Mars Simulation Chamber in the PASLAB at German Aerospace Center. Biofilms obtained from cells mixed with two different Martian regolith analogs and 2.4 mM of perchlorate ions on top of an agarized regolith-based medium were exposed to unprotected Mars-like conditions for 70 hours. The chlorophyll a fluorescence was followed during the exposure with the Mini-PAM analyzer integrated into the Martian simulation chamber and after the exposure with fluorescence microscopy as an indicator of the photosynthetic performance and cell viability. Carotenoid preservation was assessed by Raman spectroscopy, and colony-forming unit capacity was evaluated by drop assay after the exposure. Results revealed a decrease of about 40% in chl a fluorescence yield in UV-irradiated versus non-irradiated biofilms, without significant differences from the type of regolith used. Fluorescence microscopy analysis indicated a normal cell morphology in the biofilm community and the presence of cells with loss of photosynthetic pigment autofluorescence. Raman spectroscopy showed little changes in carotenoid signal between irradiated and non-irradiated samples. All samples were capable of CFU after exposure with a loss of the typical green color in exposed samples, especially in irradiated samples, over incubation time. Post-exposure proteomics analyses are ongoing in collaboration with Dr. Peter Lasch from the Robert Koch Institute, Berlin (Doellinger et al. 2020). Overall, this study will contribute to extending our appreciation of the limits of life as we know it, from the habitability of Mars to future management of Life Support and In-Situ Resource Utilization systems.