

Desert cyanobacteria under space and Martian conditions: Insight into the limit of life as we know it

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In hot and cold deserts, such as the Dry Valleys in Antarctica or the Atacama Desert in Chile, where life is pushed to its dry limit, cyanobacteria of the genus *Chroococcidiopsis* colonize the last refuges for life within porous rocks close or at the interface between stones and soil. By possessing an extraordinary resistance to prolonged desiccation and conditions exceeding those currently met nature, such as high doses of UV and ionizing radiations, desert strains of *Chroococcidiopsis* are proper model phototrophs for astrobiological research in low Earth orbit aimed at investigating the limits of life as we know it and the identification of biosignatures for searching life beyond Earth. These tasks are addressed in two ESA projects selected for the Expose-R2 missions, currently outside the International Space Station, namely, Biofilm Organisms Surfing Space (BOSS) and BIOlogy and Mars Experiment (BIOMEX), whereas the effects of cosmic radiation is tested in the frame of the STARLIFE project. Results inferred under space and Martian simulations further pointed out the endurance of these cyanobacteria under extreme conditions and contributed to characterize stability/degradation of biosignatures for searching life on Mars. The role of protection and repair mechanisms underlying the observed endurance will be discussed also in the frame of developing life support system to support human space.

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