Defining the boarders of extreme life: The study of microbial communities and their settings gives insights into Mars analogue life within the MASE project

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The search for life beyond Earth is challenging and requires, as a prerequisite, intensive research on microbial life in similar, extreme environments on Earth. Mars analogue sites are characterised by e.g. anoxic conditions, organic compound limitation, low temperatures, high salinity or presence of oxidising compounds, and consequently represent the chemical and physical borders of life as we know it. The analysis of microorganisms withstanding such conditions is embedded in the European Commission-funded MASE (Mars Analogues for Space Exploration; (http://mase.esf.org/) project. Combining a broad spectrum of interdisciplinary expertise, the European project members aim at a better understanding of habitability, microbial lifestyles and biomarker preservation in Mars analogues. For the first time, the selected sites (e.g. salt mine, sulfidic springs) have undergone a profound analysis of their microbial communities on various levels, including vast cultivation of anaerobic microorganisms and molecular screening. In this work, we applied propidium monoazide in order to distinguish between cells with intact membrane (considered as viable) and dead cells on molecular stage, followed by DNA extraction, and amplicon-sequencing of the archaeal and bacterial 16S rRNA genes. The geochemistry of the sites was comprehensively investigated (i.e. elemental analysis, amino acid chirality, minerology), to determine triggers for microbial community composition. We aim to set up a model of potential metabolism reactions based on the different setting conditions and compare it with microbiome data. Consequently, we will obtain insights into the prerequisites of possible extra-terrestrial life forms and into their lifestyles, which may enable them to thrive under most extreme conditions.

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