

Impact of simulated Martian conditions (perchlorates, drought, radiation) on bacterial strains from different Mars analogue sites

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Presentation: Thursday 09:30-09:45

Session: VAAM/Space microbiological focus on environmental extremes

Abstract:

Five (facultative) anaerobic strains, namely *Buttiauxella* sp. MASE-IM-9, *Clostridium* sp. MASE-IM-4, *Halanaerobium* sp. MASE-BB-1, *Trichococcus* sp. MASE-IM-5, and *Yersinia intermedia* MASE-LG-1 from different extreme terrestrial environments were subjected to Mars relevant environmental stress factors (low water activity, oxidizing compounds, ionizing radiation) in the laboratory under controlled anoxic conditions.

The survival after addition of sodium perchlorate at different concentrations for dedicated time points was species specific. The inter comparison of the five microorganisms revealed that *Clostridium* sp. MASE-IM-4 was the most sensitive strain (D_{10} -value = 0.6 M). The most tolerant microorganism was *Trichococcus* sp. MASE-IM-5 with a D_{10} -value around 1.9 M after fifteen minutes treatment with sodium perchlorate. In parallel, the cultivation and growth of the strains in the presence of sodium perchlorate in Martian relevant concentrations (0.5 % / 1 % wt/vol) led mostly to agglomeration of the tested cells. Treatment with desiccation and ionizing radiation, applied one after the other, led to additive effects as well as an enhanced radiation tolerance in two strains. The combination of desiccation and Martian atmosphere led only to additive effects.

In conclusion, the tested microorganisms from Mars analogues sites showed that survival is hypothetical possible in deeper subsurface regions on planet Mars to some extent.