Survival and viability of cells from iron depositing bacterial strains in pretests for the EXPOSE-R2-Experiment

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Five environmental isolates (*Pseudomonas* sp. BS1, *Hyphomonas* sp. BS2, *Tetrasphaera* sp. FL1, *Pedomicrobium* sp. FL6 and *Leptothrix* sp. OT_B_406) were chosen for EXPOSE-R2 including pretests (EVT1/2, SVT) due to their ability to form Fe(III)-oxyhydroxide-containing biofilms as observed for natural communities of iron depositing bacteria.

Samples were produced by drying iron-containing cell aggregates on Mars regolith simulant mixtures (S-/P-MRS) (Böttger et al., 2012). Different Mars- and Space-relevant treatments were applied during EVT1/2 and SVT: artificial atmosphere, vacuum, UV-C irradiation and temperatures from -25 °C to 60 °C. Viability of cells was determined afterwards by recultivation and Fluorescence in-situ hybridization (FISH). In order to estimate membrane integrity, cell staining was applied as standalone-method and in combination with subsequent qPCR (PMA-qPCR) (Nocker et al., 2008).

Strains FL1 and FL6 were found to be recultivable from most of the samples. FISH-positive cells were detected in all sample types. PMA-qPCR was found to be superior to classic LIVE-DEAD staining due to being more sensitive. Culture independent techniques like FISH and qPCR can help to make more precise estimates about survival of microorganisms by detecting viable but not culturable cells.

Böttger et al. (2012), Planet Space Sci, 60: 356 – 362

Nocker et al. (2006), J Microbiol Methods, 67: 310 - 320