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The potential of marine bacteria to grow in Mars-relevant brines

Nina Feyh, Ulrike Reichelt, and Ulrich Szewzyk

TU Berlin, Institute of Environmental Technology, Environmental Microbiology, Berlin, Germany (nina.feyh@tu-berlin.de, ulrich.szewzyk@tu-berlin.de)

Background: Recent publications hypothesize the existence of cryobrines on the Martian surface which might form by deliquescence [1] of hygroscopic salts [2]. Brines of chlorides, sulfates and perchlorates could be at least temporarily stable on Mars [3] and thus provide a potential habitat for microbial life [4].

Methods: Marine bacterial isolates from north atlantic sediment samples taken from depths between 300 m and 1400 m were screened for growth in media containing 20 wt% of NaCl, $CaCl_2$, $MgCl_2$, $MgSO_4$, $NaClO_4$, $Mg(ClO_4)_2$, $FeCl_3$ or $FeSO_4$. Growth curves were obtained by nephelometric measurements over 3 days.

Results: Nephelometric data showed an increase of turbidity in several samples containing NaCl, $CaCl_2$, $MgCl_2$, $MgSO_4$, $NaClO_4$ and $Mg(ClO_4)_2$ indicating bacterial growth. Measurements of strains in $FeCl_3$ and $FeSO_4$ brines showed no indication of growth.

Discussion, conclusions and ongoing work: The absence of growth in $FeCl_3$ and $FeSO_4$ brines points to a toxic effect of these salts on the investigated strains, which has to be discriminated from the effect of osmotic pressure in further experiments. To obtain reliable growth curves from nephelometry in highly concentrated salt solutions, multiple measurements have to be done to exclude a possible effect of precipitating salts on turbidity. Nonetheless, some of the examined straines proved to be promising candidates for further experiments in Mars-relevant brines. In current experiments the CTC and resazurin assays are applied to test for respiration in salt containing media at -20 °C.

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[3] D. Möhlmann and K. Thomsen. Properties of cryobrines on Mars. Icarus, 2010. in press.

[4] N.O. Rennó, H. Stan-Lotter, E. Szathmáry, and D. Möhlmann. To Search for Life on Mars: Follow the Brines (Abstract #5182). Astrobiology Science Conference 2010, April 26-29, League City, Texas, USA.