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Detection of microbial Life in the Subsurface

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In recent years microbial communities were detected, which dwell in rocks, soil and caves deep below the surface of the Earth. This has led to a new view of the diversity of the terrestrial biosphere and of the physico-chemical boundaries for life. Two types of subterranean environments are Permo-Triassic salt sediments and thermal radioactive springs from igneous rocks in the Alps. Viable extremely halophilic archaea were isolated from ancient salt sediments which are estimated to be about 250 million years old (1). Chemotaxonomic and molecular characterization showed that they represent novel species, e. g. *Halococcus salifodinae*, *Hcc. dombrowskii* and *Halobacterium noricense*. Simulation experiments with artificial halite suggested that these microorganisms probably survived while embedded in fluid inclusions. In the thermal springs, evidence for numerous novel microorganisms was found by 16S rDNA sequencing and probing for some metabolic genes; in addition, scanning electron microscopy of biofilms on the rock surfaces revealed great diversity of morphotypes (2). These communities appear to be active and growing, although their energy and carbon sources are entirely unknown.

The characterization of subsurface inhabitants is of astrobiological relevance since extraterrestrial halite has been detected (3) and since microbial life on Mars, if existent, may have retreated into the subsurface. As a long-term goal, a thorough census of terrestrial microorganisms should be taken and their survival potential be determined in view of future missions for the search for extraterrestrial life, including planning precautions against possible forward contamination by space probes.

(1) Fendrihan, S., Legat, A., Gruber, C., Pfaffenhuemer, M., Weidler, G., Gerbl, F., Stan-Lotter, H. (2006) Extremely halophilic archaea and the issue of long term micro-

bial survival. Reviews in Environmental Science and Bio/technology 5, 1569-1605.

(2) Weidler, G.W., Dornmayr-Pfaffenhuemer, M., Gerbl, F.W., Heinen, W., Stan-Lotter, H. (2007) Communities of *Archaea* and *Bacteria* in a subsurface radioactive thermal spring in the Austrian Central Alps and evidence for ammonia oxidizing *Crenarchaeota*. Appl. Environ. Microbiol. 73, 259-270.

(3) Stan-Lotter, H., Radax, C., McGenity, T.J., Legat, A., Pfaffenhuemer, M., Wieland, H., Gruber, C., Denner, E.B.M. (2004) From Intraterrestrials to Extraterrestrials - Viable haloarchaea in ancient salt deposits. In: Halophilic Microorganisms. Ventosa A. (Ed.), Springer Verlag, Berlin, Heidelberg, New York, pp. 89-102.