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Life detection in ancient subsurface salt sediments and in radioactive thermal springs in the central alps.

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The detection of microbial communities, which dwell in rocks, sediments and caves deep below the surface of the Earth, has led to a new view of the diversity of the biosphere and of the physico-chemical boundaries for life. We are investigating subterranean Permo-Triassic salt sediments and thermal radioactive springs from igneous rocks in the Alps. Viable extremely halophilic archaea were isolated from the ancient salt deposits, which are believed to be about 250 million years of age, and found to represent novel species, such as Halococcus salifodinae DSM8989, Hcc. dombrowskii DSM 14522 and Halobacterium noricense DSM 15987 (1). Simulation experiments with haloarchaeal cells embedded in artificial halite suggested that these microorganisms possibly survived while enclosed in fluid inclusions (2).
In the thermal springs, evidence for numerous novel microorganisms was found by 16S rDNA sequencing, probing for several genes of the nitrogen metabolism (3) and fluorescence in situ hybridisation (FISH). In addition, scanning electron microscopy of biofilms on the rock surfaces revealed great diversity of morphotypes (3). These communities appear to be active and growing, although their energy and carbon sources are so far unknown.
The characterization of subsurface inhabitants, including development of appropriate methods, is of astrobiological relevance, since extraterrestrial halite has been detected and since microbial life on Mars, if existent, may have retreated into the subsurface.

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