

Enhanced Stratigraphic Correlations in Shales Sequences Using Extract DNA from Endolithic Microorganisms, Quebec, Canada

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Abstract

In this project, we use molecular tools to extract DNA from endolithic microorganisms dwelling in rock samples collected during drilling of exploratory wells. In order to check for a correlation between the geological formations and the diversity of the microbial communities, the rock samples were recovered from different formations, and different aquifer systems. Subsurface microbes can be found living in either the aquatic fraction of aquifers (motile microbes), or in the immobile fraction of aquifers colonizing rock matrices (endolithic microbes). Endolithic microbes have developed biochemical strategies to scavenge limiting nutrients like phosphorus contained in feldspar minerals. These "rock-eating" microbes can destroy minerals through dissolution or weathering of the rock, by producing strong acids such as ferric iron or sulfuric acid. New evidence suggests that the endolithic fraction could be even more abundant and active than the motile organisms in the terrestrial subsurface. Because the number of microbial genera in one sample can range from 50 to 400, specific communities or populations could be linked to distinct geological formations. Therefore, analysis of the endolithic microbial diversity in rock samples recovered from one exploratory drilling could help pinpoint areas of interest, thus limiting environmental damages, cost overruns and improved geological understanding of productive reservoir units. In this paper, the authors present the key points of the microorganism DNA extraction methodology, the pitfalls to be considered and the most promising uses for geoscience.