Microbial community composition and respiratory potential of deep, subpermafrost brine in the Canadian Arctic

Susan Pfiffner, Amanda Smithgall, Andrew Parsons, Margaret Gan, D.C. White
Indiana-Princeton-Tennessee Astrobiology Institute (IPTAI), Center for Biomarker Analyses, Univ. of Tennessee, Knoxville, TN 37932-2575

T.C. Onstott
IPTAI, Dept. of Geosciences, Princeton University, Princeton, NJ 08544

Lisa Pratt
IPTAI, Dept. of Geological Sciences, Indiana University, Bloomington, IN 47405-1405

Saline fracture waters were collected at depths between 800 and 1200 meters from the Lupin gold mine. Microbial community composition was measured by phospholipid fatty acid analysis. Biomass estimates were from less than 0.1 to 22 pmol/L which converts to 1,700 to 545,000 cells/L. Phospholipid compositions reveal large proportions (24 to 60 mole percent) of monounsatruates, which points to a predominance of Gram negative bacteria. Terminally branched and mid-branched saturates, which indicate Gram positive bacteria, were present at 5-19 mole percent and 0 to 7 mole percent, respectively. The cyclopropyl to monounsaturated fatty acid ratios indicate that the bacterial communities are physiologically stressed. Respiratory potential was estimated by examining the ubiquinone and menaquinone compositions of the water samples. Menaquinone 7 was the most prominent followed by menaquinone 6. Together these two quinones represented 88 to 96 percent of the quinone profile. Ubiquinone 6 represented 0.4 to 11 percent of the quinone profile. The ratio of ubiquinone to menaquinone ranged from 0.003 to 0.066 which indicates that these waters have been exposed to anoxic conditions for a long time.