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# Exploration of genome diversity in Antarctic Dry Valley soils

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The McMurdo Dry Valleys of South Victoria Land, Antarctica contain some of the most extreme biotopes on earth; extreme to the extent they have long been considered valid Martian analogues. Life within Dry Valley mineral soils, where water contents range from 0.2-5.0% w/w and mean annual temperatures fall below $<$-20ºC, must further contend with desiccating winds, diurnal freeze-thaw cycles, and high seasonal UV radiation. Little or no visible evidence of life exists within these soils, and our knowledge to date of the microbiology of this biotope has been restricted to cultivation studies. However, as it is estimated that only 0.1-10% of microorganisms in soil can be cultivated *in vitro*, other approaches are necessary to examine these communities.

This study sought to investigate microbial diversity in Antarctic Dry Valley soils using both cultivation and cultivation-independent techniques. Phylogenetically-informative ribosomal RNA gene libraries were generated from *Archaea*-, *Bacteria*- and *Eukarya*-specific PCR products amplified directly from DNA extracted from Dry Valley soils. This approach permits a more representative assessment of microbial diversity, as it circumvents the need for cultivation.

Dry Valley soils were found to support a high diversity of bacterial species based upon the analysis of 16S rDNA clone sequences, the majority of which showed little similarity to previously cultivated bacteria. The diversity of *Archaea* and eukaryotes was

reduced in comparison, and included members of the non-thermophilic *Crenarchaeota* and species of fungi respectively. To complement these molecular analyses, bacteria were also cultivated *in vitro* from Dry Valley soils.

Additionally, functional gene diversity was investigated in these soils focusing on the integron platform. Integrons permit gene acquisition and expression through the capture of mobile gene cassettes, and are well recognized for their role in the dissemination of antibiotic resistance among Gram-negative bacteria. Using a PCR-based strategy, evidence was obtained for the presence of class 1 integrons in Antarctic soils. Furthermore, a unique *aadA* gene cassette encoding a streptomycin/spectinomycin adenyltransferase was recovered in this study.