MICROBIAL LIFE IN BLOOD FALLS: AN ANCIENT ANTARCTIC ECOSYSTEM.

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Blood Falls is a unique subglacial discharge at the terminus of Taylor Glacier in the McMurdo Dry Valleys of Antarctica. Ice penetrating radar data and geochemical analyses of Taylor's subglacial outflow strongly implicate the presence of ancient entrapped marine waters below the glacier [1]. These waters are thought to originate from the Pliocene Epoch (~5Mya) when the dry valleys were fjord-like. Blood Falls (*Figure 1*), an iron-rich salt cone, accumulates where subglacial flow meets the ice surface at the snout of Taylor Glacier. The episodic release of subglacial water provides a sample of potentially ancient seawater and of the subglacial ecosystem lying beneath Taylor Glacier. Biogeochemical measurements, culture-based techniques, and molecular analysis (based on 16S rDNA sequences), have been used to characterize microbes and chemistry associated with outflow waters. In the absence of direct samples from below Taylor Glacier, these data allow us to infer the composition of this microbial subglacial niche. Iron-reducing isolates, clone libraries dominated by 16S rDNA sequences with high identity to *Thiomicrospira sp.*, and increased ^{14}C-bicarbonate incorporation in samples amended with reduced sulfur provides evidence for lifestyles that derive energy from iron and sulfur compounds. Based on the prevalence of cold environments in our solar system, the search for extant extraterrestrial life will focus largely on icy habitats. The McMurdo Dry Valleys offer a legitimate earthly analog based on temperature, climate and moisture regime to our nearest exobiological candidate, Mars [2]. The value of this analogous environment was recognized at the time of the Viking Missions during soil experiment planning and data analysis [3]. Blood Falls, characterized by high iron and salt, provides a plausible ecosystem analog to Martian polar ice cap margins and other near surface ice features on the iron-rich planet. The ancient origin of Blood Falls suggests that subglacial life can remain viable for possibly millions of years [4]. This subglacial lake should be considered for exploration, as other identified subglacial lakes exist under thousands of meters of ice and therefore are technically more difficult to access. Data presented here on Blood Falls, will direct such future biological study of the waters below Taylor Glacier. An understanding of the ecology in earthly subglacial environments could provide the impetus to search for iron-sulfur based ecosystems on Mars.

Figure 1. **Blood Falls, Taylor Glacier, Antarctica. January, 2004.**

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