Species-Specific Quantification of Endospores in a Deep Subsurface Aquifer

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It is estimated that between 12 and 20 percent of Earth's biomass is microbial and in the terrestrial subsurface. The subsurface can present challenges for life due to isolation from surface-derived nutrients and high temperatures. One life strategy in response to these conditions is a shift to a lower metabolism known as dormancy. A nearly universal trend in this ecosystem is the prevalence of Firmicutes, a group of bacteria particularly adept at living “life in the slow lane” through the formation of bacterial endospores, also known as spores. The ability to become dormant until more favorable conditions arise is particularly useful in extreme environments, such as the subsurface, allowing an individual spore to remain viable for potentially millions of years. Previous studies on the abundance of spores in the subsurface focus on marine sediments but in the continental subsurface water the abundance of spores is largely unknown. DNA extractions and subsequent microbial community analysis on total DNA extracts (spore and vegetative cells) indicates 54 % of the cells in this environment are Firmicutes. In this work we aim to adapt a spore-specific extraction technique to filtered samples collected from BLM-1, a deep subsurface aquifer. Our current method of spore-specific DNA extraction results in less than one order of magnitude reduction in recovered spores when compared to non-treatment controls. In future work we will do a spore-specific DNA extraction on BLM-1 samples and conduct 16S rRNA gene sequencing and qPCR absolute abundance on the resulting extract. This study will provide data on the abundance and identity of spores compared to vegetative cells in a quality deep subsurface site, which will improve our understanding of the ecological and evolutionary role spores may hold in the deep subsurface biome.