AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003

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How Hot Springs are Colonized by Thermophilic Bacteria

The Mammoth Hot Springs complex at the northern boundary of Yellowstone National Park is composed of a complex ecosystem of interacting microbes, geochemistry, and mineralogy. The rapid precipitation of travertine by the springs (up to 5mm/day) results in the periodic sealing-off of some springs while new spring vents emerge in other locations. When a new spring erupts at the surface, thermophilic bacteria rapidly colonize the flow path. The source of the microbes living in the springs, and the means by which they colonize new springs, has been tested. A surprising number and variety of bacteria were detected in the subterranean plumbing, indicating that these populations may serve as the major source to establish populations at the surface. Although the water in the subsurface plumbing is greater than 72oC, bacterial sequences affiliated with temperatures ranging from 25o to 72o C were found. The diversity of the sequences isolated from the plumbing also provides clues as to how the subterranean populations are organized with respect to the conduits. These populations may have an impact on the secondary alteration of previously deposited travertine. Steam was also analyzed as a transport mechanism, but only a limited number of thermophilic bacterial sequences were detected. Total cell counts appear to be very low, suggesting that the contribution of this delivery mechanism to spring colonization is minimal. However, this delivery mechanism has the potential to transport thermophilic bacteria over great distances. Sequence data demonstrates that the Mammoth Hot Springs shares related microorganisms with thermal locations from many continents.