Envirnomental genomics of Fervidibacteria, a "microbial coelacanth" from a hot, primitive Earth?

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Fervidibacteria (OctSpA1-106) is a candidate phylum of Bacteria that appears to be found exclusively in terrestrial geothermal systems. Fervidibacteria are found in North America and Asia and may be discovered on other continents with continued exploration. However, they are only abundant in a small number of circumneutral, 70-80°C hot springs and comprise a high degree of phylogenetic coherence, possibly comprising only a single genus including "Candidatus Fervidibacter" and close relatives. Here, we report near-complete genomes representing several species-level groups of Fervidibacteria from springs in the USA and China. Phylogenomic analysis support the distinctness of Fervidibacteria from other phyla and the phylogenetic coherence of Fervidibacteria into a single genus. Gene content suggests a heterotrophic lifestyle, including metabolic capacity to degrade cellulose and other polysaccharides, and a facultatively aerobic metabolism, with species-specific capacity for respiration of nitrogen oxides. The phylogenetic distinctness of Fervidibacteria, along with their patchy distribution in geothermal systems and phylogenetic coherence, suggest the extant genus "Candidatus Fervidibacter" may be an evolutionary relict of a previously diverse microbial lineage that may have been more abundant and widely distributed on a hot, primitive Earth.