Investigating the polysaccharide-degrading proteins of novel hyperthermophile *Ca.* Fervidibacter sacchari PD1

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Candidatus Fervidibacter sacchari represents the only pure-culture member of a largely undescribed bacterial phylum, *Ca.* Fervidibacteria, found exclusively in terrestrial hot springs. In addition to encoding the most putative carbohydrate-active enzymes (CAZymes) and glycoside hydrolases (GHs) among known thermophiles, it is the only hyperthermophilic bacterium to do so under both aerobic and fermentative conditions, the former being far more energetically efficient. However, the majority of these CAZymes and GHs, involved in breaking down complex sugars, have no annotated function in *Ca.* F. sacchari. To investigate the activities of these predominantly uncharacterized proteins, we screened 30 substrates for use as a sole carbon and energy source, measured *Ca.* F. sacchari cell growth in each condition at multiple time points, and performed differential proteomics using five different polysaccharides to link protein expression to substrate. We found that *Ca.* F. sacchari preferentially grows on plant and bacterial polysaccharides. Preliminary proteomics data show 100/114 GHs were expressed in all conditions and 56 GHs differentially expressed in at least one condition, though substrate correlation to global expression patterns have yet to be thoroughly explored. More detailed proteomics analysis, as well as complementary transcriptomics work, will unveil underlying regulatory networks involved in high-temperature polysaccharide degradation by *Ca.* F. sacchari. These data will serve as beginning steps to elucidating protein function and will further our knowledge of heterotrophic metabolism in terrestrial geothermal systems, an environment proposed by some to be the origin of the first cells on Earth. Additionally, it probes novel biological function of a major, yet understudied, branch on the tree of life. Increasing our understanding of how this extremophile survives on Earth will aid the Science Mission Directorate's quest "to search for life elsewhere."