MICROBIAL COMMUNITY COMPOSITION AND FUNCTION TO MORPHOLOGY: IMPLICATIONS FOR INTERPRETING THE ROCK RECORD. C.G. Schuler[1], J.R. Havig[2], T.L. Hamilton[3], [1]Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221, USA, schulecg@mail.uc.edu, [2]Department of Geology, University of Cincinnati, Cincinnati, OH 45221, USA, jeffhavig@gmail.com, [3]Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221, USA, trinity.hamilton@uc.edu.

Introduction: Microbial communities in hydrothermal systems exhibit a range of morphologies, including stromatolites, mats, and filaments, all of which have been documented in the rock record dating back to the Archean [1,2,3]. These structures are often interpreted using isotopic signatures and overall morphology. However, the relationship of microbial community composition and productivity to morphology and geochemistry remain poorly constrained. To begin to address this gap, we collected samples from a range of geochemically distinct thermal features from a single hydrothermal area that are host to distinct microbial community morphologies. The close proximity of samples at this location allows for rapid dispersion of microbial community members across the site, limiting the influence of geographic isolation. Samples for 16S and 18S rRNA gene sequencing were collected from sites where we also conducted *in situ* microcosm carbon uptake experiments to quantify phototrophic and chemotrophic carbon fixation rates. Based on 16S rRNA gene sequencing, our data suggests a correlation between photoautotrophy and stromatolites and mats, but not so for filaments.

Results: The Greater Obsidian Pool Area of the Mud Volcano Area, Yellowstone National Park, WY is host to a number of geothermal features in close proximity that vary in temperature and pH, and contain a range of microbial community morphologies including stromatolites, mats, and filaments [4]. We performed *in situ* microcosm studies across this geochemical space to characterize the contribution of chlorophotoautrophy and chemolithoautotrophy to primary productivity. Our sites varied in pH from 3 to 8 and in temperature from 29°C to 72 °C. Our data show differences in carbon uptake rates between photoautotrophic and chemoautotrophic communities, and suggest a role for both oxygenic and anoxygenic photosynthesis. Natural abundances of biomass from each morphology δ^{13}C values are similar to those found in the rock record are consistent with those observed in other hydrothermal ecosytems [4].

We observed distinct microbial populations across this range of pH, temperature, and morphology. Our 16S and 18S rRNA gene sequencing data are consistent with the presence of both photoautotrohic algae and chlorophotoautotrophs in sites with significant light-dependent primary productivity. We also observed abundant sequences affiliated with bacterial and archaeal chemolithoautotrophs.

Implications: Our data indicate that the formation of stromatolites and mats in hydrothermal systems may be linked to the presence of photoautotrophs, whereas filaments were not correlated with the presence of photoautotrophs.

References:

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