**DIAGENETIC CHANGES IN COMMON HOT SPRING MICROFACIES.** N. W. Hinman[1], T. A. Kendall[2], L. M. MacKenzie[3], and S. L. Cady[4], [1]Department of Geosciences, University of Montana, Missoula, Montana, 59812; treavor.kendall@gmail.com; lindsay.mackenzie1105@gmail.com, [3]Department of Geosciences, University of Montana, Missoula, Montana, 59812; sherrycady@gmail.com, Environmental and Molecular Science Laboratory, Pacific Northwest National Laboratory, Richland, WA 99354.

**Introduction:** Evidence of biogenicity can be preserved in sinter deposits because of high mineralization rates. Rapid entombment of microbial structures is well documented in modern day systems [1-8]. However, the porous, friable nature of these sinter deposits makes them susceptible to mechanical weathering. Significant diagenesis, including secondary mineralization, replacement, and pore filling, must occur for these rocks to persist in the geologic record. Work on lithification of siliceous sinters has focused on the initial generation of biogenic and abiogenic fabrics [3, 8-12]. It is, however, a more resistant chalcedonic/quartz-style permineralization that characterizes ancient fossil examples of spring deposits [13-17]. Modern sinter samples were collected from two outcrops in Yellowstone National Park, WY, USA to assess early diagenetic processes in thermal spring deposits, with an emphasis on the pathway by which microbial evidence is preserved.

The Excelsior Geyser Crater (EGC, Midway Geyser Basin) section comprised 2.2 m of siliceous sinter. The Potts Cliff section (PB, Potts Hot Spring Basin) comprised 1.1 m siliceous sinters deposited on hydrothermally altered, silica-cemented, lacustrine sand and gravel. Two microfacies, sinter breccia and sinter with palisade fabric, were identified at each site. Images of thin sections were used to determine porosity and estimate permeability of these and mixed microfacies.

**EGC:** Porosity and permeability of EGC samples were not depth dependent ($p=0.523$; $p=0.888$ respectively). However, trends emerged between texture and porosity ($p=0.002$) at Excelsior; palisade fabrics have significantly lower porosities than sinter breccias ($p=0.004$) and sinter breccias with palisade subtextures ($p=0.022$). Similar trends are identified in permeability values where palisade permeabilities are significantly lower than permeabilities in breccias with palisade fabric ($p =0.003$).

**PB:** Site-wide porosities and permeabilities were lower but more variable at Potts' Basin compared to Excelsior ($p=0.000$, $p=0.002$). Similar to EGC, there appears to be a textural control on the two parameters. Upon establishing a general, significant relationship between texture and porosity (p-value=0.000), multiple comparison procedures indicated the sinter breccias with palisade subtexture have lower porosity and permeability than palisade sinters ($p=0.000$, $p=0.005$) and than sinter breccias, although no significant difference was detected between the porosities of the palisade and the sinter breccias.

The porous nature of the breccias led to an initial sequence that was more permeable and less resistant in outcrop. Conversely, sinters with palisade fabric were initially more resistant but less porous than the breccias. The EGC sequence represented these initial conditions with palisade layers protruding from the outcrop and the more saturated breccia layers receding into the crater wall. As early diagenesis proceeded, variations in the hydraulic properties of each microfacies appeared to control consolidation. Although the palisade fabric possessed a greater initial structural coherence, the increased flow through the more transmissive breccias led to advanced consolidation such that the breccias surpassed the palisade sinters as the more resistant layer. The result was a PB-type deposit, which presumably represented a later stage in the same diagenetic sequence. Here the breccia layers were massive, had undergone marked textural degradation and increased pore filling, and appeared more resistant than the palisade layers. The textural degradation and clast dissolution that also resulted from the increased flow may explain the lack of brecciated textures in ancient spring deposits in spite of their ubiquity in modern systems.

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