

**A YEAR IN THE LIFE OF A THROMBOLITE: METATRANSCRIPTOMIC ANALYSIS OVER DIEL AND SEASONAL CYCLES.** A.S. Louyakis, J.S. Foster, G. Casaburi, A. Duscher, R. Bonjawo, Department of Microbiology and Cell Science, University of Florida, Space Life Science Lab, Merritt Island, FL; [jfoster@ufl.edu](mailto:jfoster@ufl.edu)

Thrombolites are organosedimentary structures formed through the metabolic activities of benthic microbial mats. The processes by which these unlaminated lithifying microbial ecosystems coordinate their activities at the molecular level to form these structures are poorly understood. In this study, we used comparative metatranscriptomic analyses to characterize the changes in gene expression that occur within an actively accreting thrombolite over diel and seasonal scales. Thrombolite samples were collected in triplicate at four time points throughout the day (6:00, 12:00, 18:00 and 24:00), over three seasons (Spring, Summer, and Fall), and placed immediately in RNAlater until processed. Total RNA was extracted and sequenced using the Illumina NextSeq500 platform and sequences were processed with a Trinity-based pipeline. The functional genes were compared over the different time periods and the relative abundance of transcripts associated with key dominant metabolisms within the thrombolites, such as photosynthesis, nitrogen metabolism, and methanogenesis, were compared. The results showed pronounced diel cycling of the metabolisms, with photosynthesis peaking during the day, whereas nitrogen fixation and methanogenesis peaked at night. Additionally, comparative metatranscriptomics analyses showed distinctive changes in genes expression associated with seasons suggesting the thrombolitic mats are actively responding to their environment. This study provides the most in depth analysis on the metatranscriptome of a lithifying microbialite and provides important insight into how the microbes coordinate their metabolisms to form thrombolites.