



SESSION 9

INTERACTIONS BETWEEN CHABS AND OTHER ORGANISMS (PHYCOSPHERE, TROPHIC INTERACTIONS, PRO-EUK INTERACTIONS, VIRUSES, FUNGI, ETC)

New dimensions of *Microcystis* diversity: the phycosphere



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Interactions between bacteria and phytoplankton shape biological processes from cellular to ecosystem scales, including the development of harmful algal blooms. However, the nature of bacterial interactions with toxic cyanobacteria, and their influence on toxicity of cyanobacterial blooms, remains unclear. *Microcystis*, which forms blooms and threatens freshwater systems worldwide, provides an interesting case study for bacterial interactions. It is a single-celled organism that forms macroscopic colonies with a diverse bacterial community embedded in mucilage, thus making a well-defined microbiome and phycosphere. Analysis of individual colonies across a time series in Lake Erie shows that *Microcystis* microbiomes are distinct from whole water communities, lack 'core' taxa found across all colonies, and correlate with sampling date and *Microcystis* strain. Metagenomic and metatranscriptomic data suggest metabolic interactions in which bacteria use cyanobacterial products and exudates including organic acids, amino acids, peptides, and cobalamins. In return, they likely regenerate nitrogen for *Microcystis*. Finally, the heterotrophic bacteria dominate catalase expression in *Microcystis* blooms, suggesting that they protect *Microcystis* from oxidative stress, though susceptibility to H₂O₂ is strain-specific and independent of microcystin production. Overall, these results suggest that intimate mutualistic interactions between *Microcystis* and its microbiome likely modulate stressors, nutrient availability, and phenotypic diversity of *Microcystis*.