Dissolved Iron as a Driving Factor of Cyanobacterial Harmful Algal Blooms

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Freshwater harmful algal blooms in Iowa's lakes are dominated by cyanobacteria (CyanoHABs). Somce of these HAB-forming cyanobacteria produce a well characterized hepatotoxin called microcystin, which compromise water quality in Iowa's lakes. Due to their evolutionary attributes, cyanobacteria generally have higher Fe requirements than eukaryotic algae, and so CyanoHABs could be dependent on Fe. When hypoxic conditions develop during blooms, it is hypothesized that Fe minerals in sediments are reductively dissolved, and can then fertilize CyanoHABs from the bottom up [1].

For this study, we investigated the role of Fe for CyanoHABs occurring in East and West Okoboji Lakes. We monitored five sites across in the lakes over a period of six months. *In vivo* chlorophyll measurements using a fluorometer showed that the shallower eastern lake (max depth: 6 m) was more prone to cyanoHABs, where microcystin concentrations ranged from 5 to > 50 µg L^{-1}. Fe concentrations throughout the water column were uniformuly around 16 µM in May, but dropped to < 1 µM as cyanobacteria proliferated until October. However, sedimentary Fe release did not seem to contribute to the lake Fe reservoir. Voltammetric microelectrode profiles of sediment cores revealed intermittent aqueous Fe(II) in porewaters. Therefore sedimentary Fe release cannot explain cyanoHAB occurrences in these lakes. We are now interested in investigating whether iron limitation, present during the CyanoHABs might promote toxin release. Such a relationship has been hypothesize from laboratory experiments [2], but remains to be tested in natural systems.

[1] Molot et al., (2014). *Freshwater Biology* 59,1323-40.
[2] Sevilla et al., (2008). *Environmental Microbiology* 10, 2476-83