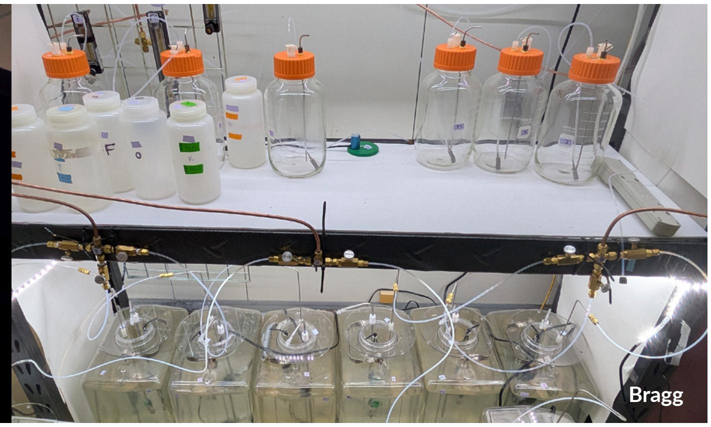
Synergistic effects of acidification and temperature on *Microcystis aeruginosa* toxicity in the Laurentian Great Lakes


Szczepanski


Bragg

Core Question: How are rising temperatures and lake acidification affecting toxin production in algae blooms?

Cyanobacterial harmful algal blooms, or cyanoHABs, are a significant ecological threat to the Great Lakes, where they block sunlight, deplete oxygen, and produce toxins that can contaminate drinking water. Changing temperatures are expected to worsen this situation by creating warmer waters and higher levels of dissolved inorganic carbon. While cyanobacteria like *Microcystis aeruginosa* thrive under these conditions, it remains unclear how the combination of rising heat and acidity will alter the actual toxicity of these blooms.

This research project will explore two ways that increased carbon might influence toxicity. First, it may change how individual cells produce toxins. The ratio of carbon to nitrogen within a cell dictates the amount and type of microcystin toxins produced. High carbon levels might actually decrease total toxin production but could trigger the creation of more potent chemical variants. Second, rising carbon levels may shift the "neighborhood" of the bloom by favoring specific strains of algae. Different strains have different carbon concentrating mechanisms, which are specialized proteins that help them harvest carbon.

By collecting water samples from Saginaw Bay and Western Lake Erie, researchers will simulate future climate scenarios in laboratory experiments. They will use advanced genetic sequencing to identify which strains become dominant and whether those dominant strains are the ones carrying toxin-producing genes.

Because these two regions have different water chemistry, the study will also reveal if certain lakes are more vulnerable to becoming toxic than others. Ultimately, identifying a link between carbon-harvesting genes and toxicity will help scientists better predict when blooms will turn dangerous, allowing for more effective protection of Great Lakes water resources.

Graduate Research Fellow

Colton Bragg, University of Michigan,
cjbragg@umich.edu

michiganseagrant.org/research

Michigan Sea Grant helps to foster economic growth and protect Michigan's coastal, Great Lakes resources through education, research, and outreach. A collaborative effort of the University of Michigan and Michigan State University and its MSU Extension, Michigan Sea Grant is part of the NOAA-National Sea Grant network of 34 university-based programs.