Center for Environmental Sciences & Engineering

University of Connecticut

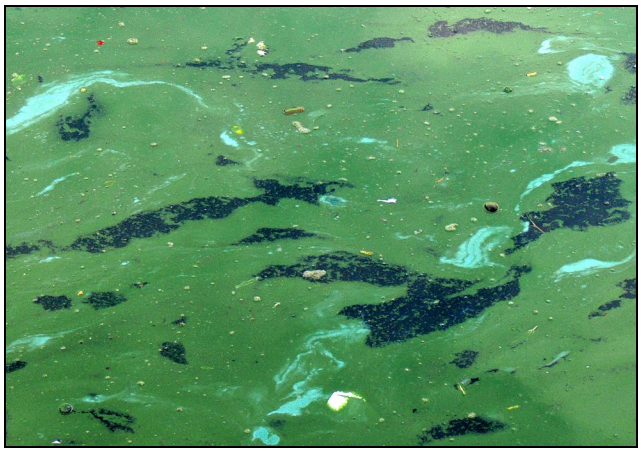
Environmental Chemistry Laboratories

Analysis of Freshwater and Marine Cyanotoxins

Environmental Context—Water quantity and quality play a critical role in determining vital characteristics of marine, freshwater, and terrestrial ecosystems, and contribute significantly to human well-being. However, human activities such as urbanization, industrial development, agricultural practices, mining, and fuel use significantly alter many characteristics of water, resulting in changes in quality and utility. For example, aquatic environments that receive inputs of nitrogen due to human land use practices (e.g., crop fertilization, waste disposal) often become eutrophic and support high concentrations of Cyanobacteria. Many of the common species of Cyanobacteria produce toxic metabolites that can be lethal to wildlife, livestock and humans, consequently endangering the ecosystem and human health.
There are increasing human health concerns related to the presence of these cyanotoxins in municipal drinking water. Treatment technologies mainly remove cyanobacteria cells and are not always very effective in removing cyanotoxins, thereby potentially endangering health during cyanobacterial bloom events.

Resources and Instrumentation—CESE has extensive analytical expertise and advanced instrumentation in the quantification of algae, cyanobacteria and their toxins in fresh and marine waters. Instrumentation includes:

- Ultra performance liquid chromatograph/ tandem mass spectrometer (UPLC/MS/MS)
- Ultra performance liquid chromatograph/ quadrupole time-of-flight spectrometer (UPLC/QToF)
- ELISA plate reader
- Liquid chromatograph/ fluorescence and ultraviolet detectors (LC/FL/UV)
- Nikon stereo microscopes
- Fluorometer



Research Capabilities—CESE has considerable capacity to support a diversity of research projects related to cyanotoxin research and analysis by providing quantitative assessments of a wide array of water quality parameters, cyanotoxins and their isomers in water and biological tissues.

Examples of projects that CESE can support include:

- Quantification of nutrient species in fresh and saline systems, with detection limits of as low as 1ppb.
- Quantification of cyanobacterial toxins, including individual microcystin analogs.
- Detection and quantitation of marine algal toxins in fish, shellfish, and marine mammals.
- Development and validation of novel methods to detect toxins and their individual analogs at extremely trace levels.
- Conduct exploratory analysis for marine toxins and their metabolites in biological tissue.
- Quantify the association between environmental characteristics, densities of species of algae and cyanobacteria, and concentration of various cyanotoxins.

Phone: 860-486-4015
Email: environment@uconn.edu
https://environmental-sciences-engineering.center.uconn.edu/

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