Monitoring for Cyanobacteria in Vermont

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Lake Champlain - Missisquoi Bay, August 2006

Shelburne Pond, July 2006

Lake Champlain

•Toxins first documented in 1999 with the death of 2 dogs over Memorial Day weekend.

•Routine monitoring began 2001.

•Current monitoring program is coordinated by UVM researchers utilizing citizen monitors, staff from the VT DEC and university staff.

•Cells counts and toxin data distributed weekly to officials in VT, NY and QE. VT Dept. of Health maintains a webpage documenting current status on the lake.

•Public health advisories and press releases are made by health officials as needed.

Tiered Monitoring and Alert Protocol (Watzin, Brines, Shambaugh and Kreider 2006)

Alert Level	Frequency	Samples collected for	Trigger to Next Level	Public Action
Initial	2/month	Algal identification	Identification of toxin-producing cyanobacteria	None
Quantitative	2/month	Algal enumeration, chlorophyll a	>2000 cyanobacteria cells/mL in net plankton or lay monitor samples	None
Vigilance	1/week	Algal enumeration, chlorophyll a	>4000 cyanobacteria cells/mL in net plankton or lay monitor samples	Notify public health officials that cyanobacteria are abundant and blooms could form
Alert Level 1	1/week	Algal enumeration, chlorophyll a, toxin analysis	> 1µg microcystin/L in whole water samples	Notify public health officials of potential risks to humans and animals
Alert Level 2	1/week	Algal enumeration, chlorophyll a, toxin analysis		Notify public health officials that significant risk to humans and animals exists. Public health advisories should be issued by appropriate health agencies.

Weekly status report available on the web

What have we learned from monitoring on Lake Champlain?

•High algal densities are present in some areas of the lake each year from July through September.

•Low levels of microcystin are found in many areas. Anatoxin is not routinely detected.

•Microcystin levels posing significant risk to humans have been found only in dense algal masses.

•Cell density and toxin concentration can vary over several orders of magnitude in the same general area. Cell density can change in a matter of minutes as wind and weather change.

Monitoring Drawbacks

•Toxin monitoring analysis is specific to one toxin (e.g. microcystin or anatoxin) while blooms potentially contain multiple toxins.

•Not all cyanobacteria produce toxins and the genes for toxin production are not always active in species known to produce toxins.

•It is not possible to visually tell the difference between a toxic and a non-toxic bloom.

•Toxin analysis is costly and cell counts are time-consuming.

•Toxin and cell count data potentially are outdated before samples even reach the laboratory due to changing wind and water conditions.

•Vermont cannot afford to monitor all lakes with potentially toxic blooms to the same extent that we monitor Lake Champlain.

Alternatives to intensive lakewide monitoring

•Permanent signage at all accesses on lakes that routinely have high cyanobacteria densities.

•Public beaches and drinking water intakes have their own monitoring system, supervised by the Health Department.

•Local governments or lake associations are provided with the materials and support to conduct basic surveillance of their own lake.

•Public service announcements and educational programs raise awareness among the general public.

Lake Champlain – Malletts Bay, November 2006

Public education is vital

•Cyanobacteria are common in many lakes around the Northeast.

•Cell density and toxin concentration can vary widely in a single lake, and can change in a matter of hours.

•It is not possible to tell if a bloom is toxic by looking at it.

•It is possible to recognize and avoid algal blooms that are dense enough to be potentially hazardous.

People often visit unfamiliar lakes or spend hours on the water. We need to provide them with the knowledge to recognize and avoid potentially toxic algae.

References and materials of interest

Application of the WHO Alert Level Framework to Cyanobacterial Monitoring of Lake Champlain, Vermont. Mary Watzin, Emily Brines, Angela Shambaugh and Meghan Kreider. 2006. Environ. Toxicol. 21:278 – 288.

Lake Champlain Cyanobacteria monitoring page: www.healthvermont.gov/enviro/bg_algae/bgalgae.aspx

Pictoral guide to cyanobacteria in Quebec, the Quebec Ministerium for the Environment: www.mddep.gouv.qc.ca/eau/eco_aqua/cyanobacteries/guide-identif.pdf