HEALTH & HUMAN SCIENCES

The Presence of Microcystin Toxin in the Northwest Indiana Watershed

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Cyanobacteria, single-celled autotrophs, are found naturally in all forms of water. Some have mutations in traits that control toxicity. The development of mutations is unpredictable; however, dissolved nutrients in the water connect to certain mutations. Chlorophyll a and microcystin toxin levels were used to determine a presence of cyanobacteria, and beneficial nutrients called nitrate and phosphate were measured. It was hypothesized that a correlation between chlorophyll a concentration, water nutrients, and the toxin would be seen since excessive nitrate and phosphate in the water would support algae growth and increase toxin. Ten samples were taken from the watershed of Lake Michigan in Lake County, Indiana. Results indicated toxin in three of the sample sites: Agricultural 117th Bridge, Cedar Lake, and Deep River. Agricultural 117th Bridge showed higher levels of phosphate, which could relate to runoff of fertilizers or excretions from animals. Cedar Lake, used recreationally, measured no presence of nutrients, but higher levels of toxin. This increased level could be attributed to a previous algal bloom as the sample was taken at the end of peak bloom season. Deep River test samples showed higher levels of all four, supporting the correlation hypothesis; however, the levels of toxin and chlorophyll a are slightly low, which is related to the fast-paced flow of the river. A future research direction is replicating data collection in the same area during different seasons to see if other factors contaminating waterways could affect water quality. An understanding of similarities and differences among algal blooms and their associated microflora in this watershed allows for monitoring and precautions.

Table 1. Cyanotoxin thresholds and analytical methods (Environmental Protection Agency, 2015).

Type of notice	Total microcystins
Do not drink: children under 6 and sensitive populations	0.3 ppb (EPA Health Advisory value)
Do not drink: children 6 and older, and adults	1.6 ppb (EPA Health Advisory value)
Do not use	20 ppb
Test strip monitoring	Abraxis dip strips
Toxin monitoring and repeat sampling	ELISA-ADDA and/or LC-MS/MS

Research advisor Ashley Cosme writes: "Cyanobacterial harmful algal blooms (cHABs) are not a new concept, but cHABs are studied more frequently as the incidence and toxicity increase, and as researchers gain a better understanding of the complexity cHABs have on the ecosystem. Breeann Mild's work provides understanding of the mechanisms of microcystis formation. This allows for better prediction and management of blooms in the Great Lakes and other aquatic environments."

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