PRELIMINARY ASSESSMENT OF CYANOTOXIN OCCURRENCE IN THE UNITED STATES

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Public awareness and scrutiny of potential exposure to cyanotoxins in lakes and reservoirs used for drinking water supplies and recreation in the United States has increased over the last decade. Media reports of cyanobacterial blooms and human and animal poisonings to cyanotoxin exposure have occurred in at least 32 U.S. States. In 2007, the U.S. Geological Survey analyzed samples from about 1200 lakes, reservoirs, and ponds collected between May and October for microcystins by enzyme-linked immunosorbent assays (ELISA) with confirmation of a subset of samples by liquid chromatography tandem mass spectrometry (LC/MS/MS) in the U.S. Environmental Protection Agency's National Lake Assessment. Depth integrated water samples were collected from the photic zone at the deepest part of each water body. Preliminary results from this study show that microcystins were present in about 32 % of the samples with an average detection concentration of approximately 3 µg/L and median concentration of approximately 0.5 µg/L.

In a prior study in August 2006, the U.S. Geological Survey conducted a bloom-targeted Midwestern cyanotoxin reconnaissance in 23 U.S. lakes and reservoirs in parts of 4 states: Iowa, Kansas, Minnesota, and Missouri. Sample were analyzed by both LC/MS/MS and by ELISA where possible for microcystins, nodularins, cylindrospermopsins; anatoxin-a and lyngbyatoxin-a, and saxitoxins. Microcystins were detected in all water samples for this study where total concentrations ranged from less than 0.025 µg/L to greater than 17,000 µg/L. The 2nd most frequently detected cyanotoxin was anatoxin-a, being detected in about 30 % of the samples with a maximum concentration of 13 µg/L. The results of these two studies demonstrate the wide range in concentrations and spatial distribution, as well as the co-occurrence of multiple toxin classes and variants in US lakes and reservoirs. Furthermore, these studies demonstrate the utility of using LC/MS/MS and ELISA to provide multiple lines of evidence to confirm total cyanotoxin exposure.

KEYWORDS

Cyanotoxins, toxins, cyanobacteria, microcystins, anatoxin-a, ELISA, LC/MS/MS, lakes, reservoirs, ponds,