Quantifying Microcystin Concentrations in Lake Erie Walleye and Implications for Public Health

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Lake Erie's cultural and economic resources, which are enjoyed by millions of people, are now threatened by cyanobacterial harmful algal blooms (HABs). Microcystis, the most common cyanobacteria in these HABs, produces microcystin, a toxin that causes gastrointestinal illness, damages the liver, and is capable of promoting tumors or animal death. While the most common pathways of human exposure are through consumption of contaminated drinking water and absorption through skin while swimming, the possibility of exposure via fish consumption is not as well studied. To address this gap in knowledge, this study analyzed potential public health risks due to the consumption of Lake Erie Walleye living in waters with HABs. Microcystin concentrations in walleye muscle were measured and compared to public health thresholds established by the World Health Organization. Data was also compared between pre- and post-bloom as well as between 2013 and 2014 to further assess the trends in levels and forms of microcystin. Walleye samples collected between July and October 2014 were processed through three rounds of extraction with 75% methanol and analyzed for microcystin using an ELISA. Microcystin concentrations were below the detection limits in all July and August samples. However, microcystin was detected in a majority of the October samples, possibly due to the fact that blooms peak in late summer. Two samples had concentrations above the recommended public health thresholds. The present data differs from the 2013 data where only 3 of 40 samples were below the detection limit, but the 2013 bloom was larger than that of 2014. The 2014 data suggests there is not an obvious public health risk due to fish consumption, but it is necessary to obtain water quality and HAB data to assess the trend between 2013 and 2014, and continue fish-tissue analysis in the future to evaluate yearly variation.