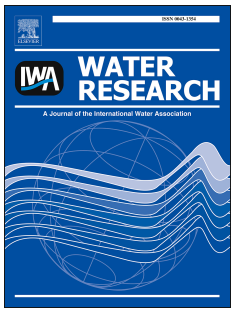
Accepted Manuscript



Effect of chlorination on the protein phosphatase inhibition activity for several microcystins

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PII: S0043-1354(16)30151-8

DOI: 10.1016/j.watres.2016.03.024

Reference: WR 11908

To appear in: *Water Research*

Received Date: 20 October 2015

Revised Date: 8 March 2016

Accepted Date: 9 March 2016

Please cite this article as: Mash, H., Wittkorn, A., Effect of chlorination on the protein phosphatase inhibition activity for several microcystins, *Water Research* (2016), doi: 10.1016/j.watres.2016.03.024.

Effect of chlorination on the protein phosphatase inhibition activity for several microcystins

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Keywords: Algaltoxin; Microcystin, Protein phosphatase inhibition, Chlorination

ABSTRACT

Microcystins are of particular concern due to their toxicity to both humans and animals and may be the most prominent cyanotoxin observed in freshwater. Although a number of studies have investigated the fate of microcystins and other algal toxins through drinking water treatment facilities, measurement of their potential for toxic activity after chlorination, a popular form of treatment in the United States, has not been investigated. In this study, six microcystin variants are subjected to chlorine oxidation. The degradation of each microcystin variant is measured by liquid chromatography/mass spectrometry simultaneously with protein phosphatase inhibition (PPI) response over reaction time with chlorine. Results show that inhibition is dependent on the incorporated amino acid residues, their placement within the microcystin structure, as well as pH. This pH dependence may have practical implications to such activities such as drinking water treatment when the pH is usually adjusted to around 8. Namely, at this pH, even with chlorine addition for disinfection, PPI activity may not be totally eliminated even when the initial MYCs are eliminated.

1. Introduction

Eutrophication of water bodies from increases in nutrient influx and warming water temperatures have contributed to a decline in water quality (Cousino, et al., 2015; Vasconcelos, 2015). The occurrence of algal blooms, which have become a source of concern for both recreational and drinking water use, can thrive under such conditions. In addition to causing aesthetic or operational