Effect of ozonation on the removal of cyanobacterial toxins during drinking water treatment.

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Abstract

Water treatment plants faced with toxic cyanobacteria have to be able to remove cyanotoxins from raw water. In this study we investigated the efficacy of ozonation coupled with various filtration steps under different cyanobacterial bloom conditions. Cyanobacteria were ozonated in a laboratory-scale batch reactor modeled on a system used by a modern waterworks, with subsequent activated carbon and sand filtration steps. The presence of cyanobacterial toxins (microcystins) was determined using the protein phosphatase inhibition assay. We found that ozone concentrations of at least 1.5 mg/L were required to provide enough oxidation potential to destroy the toxin present in 5 X 10(5)Microcystis aeruginosa cells/mL [total organic carbon (TOC), 1.56 mg/L]. High raw water TOC was shown to reduce the efficiency of free toxin oxidation and destruction. In addition, ozonation of raw waters containing high cyanobacteria cell densities will result in cell lysis and liberation of intracellular toxins. Thus, we emphasize that only regular and simultaneous monitoring of TOC/dissolved organic carbon and cyanobacterial cell densities, in conjunction with online residual O(3) concentration determination and efficient filtration steps, can ensure the provision of safe drinking water from surface waters contaminated with toxic cyanobacterial blooms.

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