



EPA Drinking Water Health Advisories for Cyanotoxins and Potential Actions Public Water Systems and States Can Take to Prepare for and Respond to Cyanotoxin Health Risks in Drinking Water

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May 13, 2015



Setting the Stage: Definitions

(For purpose of this presentation)

- Source water – water from lakes, reservoirs, rivers, or streams that is used as a drinking water source
- Raw water – water that enters the drinking water intake, but has not yet received any treatment
- Finished water – “water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system. . . .” (40 CFR 141.2)



EPA Health Advisory Recap

- Joint effort between Health Canada and EPA initiated in 2012
- Health advisories are non-regulatory concentrations at which adverse health effects are not anticipated to occur over specific exposure durations: one-day, ten-day, and lifetime
- 10-day Health Advisory recommended concentrations for total microcystins are:
 - 0.3 µg/L for children younger than school age
 - 1.6 µg/L for all other age groups
- 10-day Health Advisory recommended concentrations for cylindrospermopsin are:
 - 0.7 µg/L for children younger than school age
 - 3.0 µg/L for all other age groups



Microcystin Methods Overview

Summary Options	ELISA-Field (Tube/Strips)	ELISA-Lab	HPLC-UV (PDA)	HPLC-MS/MS
Specificity	Total Microcystins	Total Microcystins	Total Microcystins– limited specificity	6 Specific Microcystin congeners (EPA method 544)
Approx. Limit of Quantification (LOQ)	~0.5 – 1 ug/L	~ 0.3 µg/L	~ 0.3 µg/L	~ 0.02 µg/L
Time to result	10 – 60 minutes	4 hours or less	~ 1 day	~ 1 day
Estimated Cost per Analysis	\$30-100	\$50-150	\$150-250	\$200-350



Treatment Overview

- Conventional treatment is effective in removing cyanobacterial cells (containing intracellular cyanotoxins)
- Activated Carbon is effective in removing cyanotoxins
- Ozone is effective in oxidizing dissolved cyanotoxins
- Chlorine is effective in oxidizing dissolved microcystins and cylindrospermopsin
- Chloramines do not appear effective in oxidizing cyanotoxins
- Potassium permanganate appears effective in oxidizing dissolved microcystins



A Preliminary Approach for Discussion

- Step-wise approach for systems to reduce risks from cyanotoxins in drinking water
- Includes a “traffic light” approach to guide communication and other actions in response to elevated concentrations of cyanotoxins in finished drinking water



Preliminary Approach to Determine Whether Cyanotoxins are Present in Drinking Water

Step 1: Conduct System Specific Evaluation

Source water vulnerable

Source water not vulnerable

Step 2: Preparation and Observation

YES, evidence indicates cyanotoxin occurrence

NO, continue to assess evidence during vulnerable period

Step 3: Monitor for Cyanotoxins in Raw Water and Treatment Adjustments

YES, toxins detected

NO toxin detected

Step 4: Monitor for Toxins in Raw and Finished Water and Treatment Adjustments

Toxins detected in raw only, continue raw and finished water monitoring

Toxins detected in finished water

NO toxins detected in raw or finished water

Continue monitoring if bloom is visible. If bloom no longer visible continue to evaluate evidence for cyanotoxin occurrence

Step 5: Monitor for Toxins in Finished Water, Treatment Adjustments/Additions, and Public Communications

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Low Level

Microcystins: ≤ 0.3



Medium Level

Microcystins: $> 0.3 \mu\text{g/L} \leq 1.6 \mu\text{g/L}$



High Level

Microcystins: $> 1.6 \mu\text{g/L}$



Communication

Continue communication with State primacy agency and local health officials on monitoring results.

Notify local public health agency, primacy agency and the public. Recommend use of alternative sources for children younger than school-age.

Notify local public health agency, primacy agency and the public. Recommend 'Do Not Drink/ Do Not Boil Water' advisory for all consumers.

Treatment Actions

Modify treatment as necessary to keep cyanotoxins below HA values.

Adjust existing treatment to reduce the concentration to below $0.3 \mu\text{g/L}$ (MC) as soon as possible. Modify or amend treatment as necessary.

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Monitoring

Continue sampling raw and finished water at least 2-3 times per week until levels are below quantification in at least 2-3 consecutive samples in raw water, then return to Step 3.

Continue sampling raw and finished water daily until finished water levels are below quantification in at least 2-3 consecutive samples.

Continue sampling raw and finished water at least daily until finished water levels are below quantification in at least 2-3 consecutive samples.



Questions

- Questions?
- For additional information please contact Hannah Holsinger at holsinger.hannah@epa.gov