

# HABs/Cyanotoxins and Drinking Water Management/Treatment

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# Harmful Algal Blooms

- Harmful Algal Blooms (HABs) are the excessive growth of naturally occurring cyanobacteria which occur under suitable conditions.
- Some cyanobacteria can produce highly potent toxins known as cyanotoxins which can have adverse health effects.
  - Intracellular
  - Extracellular
- HABs are increasing
- HABs are not new



# Department HAB/Cyanotoxin Drinking Water Initiatives

- In August 2020, notified systems that any detections of cyanotoxins, in the finished water must be reported to DEP in accordance with N.J.A.C. 7:10-2.4(b).
- In September 2020, developed a HAB surface water system stakeholder workgroup.
- With stakeholder input, developed materials found on our website:  
[www.state.nj.us/dep/watersupply/hab.html](http://www.state.nj.us/dep/watersupply/hab.html).
- In September 2020, requested that all surface water systems develop a Cyanotoxin Management Plan (CMP).



## CyanoHABs & Drinking Water Fact Sheet

### Cyanobacteria and cyanoHABs

Cyanobacteria are a type of bacteria capable of photosynthesis. Although they are not true algae, they are formerly known as "blue-green algae." Cyanobacteria frequently impart off-tastes and odors to the water in which they grow, and sometimes excessive growth can produce toxins which can be harmful to the health of humans and other animals.

A cyanoHAB is the name given to the excessive growth, or "bloom", of cyanobacteria, which can produce one or more types of potentially harmful toxins (cyanotoxins) at very high concentrations. CyanoHABs can occur under suitable environmental conditions of light, temperature, nutrients (e.g., phosphorus) and calm water. These "blooms" may result in a thick coating or "mat" on the surface of a waterbody, often in late-summer or early fall.

### Cyanotoxins

Some cyanoHABs can potentially be harmful to humans and other animals through the release of toxins (called cyanotoxins) into the surrounding water. Cyanotoxins are usually contained within cyanobacterial cells and toxins can be released during cell death or cell rupture. However, some cyanobacteria species are capable of releasing toxins into the water without cell rupture or death. The most commonly found cyanotoxins in the United States are microcystins, cylindrospermopsin, anatoxin and saxitoxins.

### Health Impacts of Cyanotoxins

Depending on the cyanobacteria species and the type of toxins being produced, the ingestion of cyanotoxins through drinking water can have a variety of adverse health effects. Due to these health concerns, many water systems are taking action to reduce the likelihood and risks of cyanotoxin contamination. These methods can include adjusting treatment and monitoring for cyanotoxins.

### Can Cyanotoxins Impact Drinking Water?

Some drinking water sources such as rivers, lakes, and reservoirs, can be impacted by a cyanoHAB. However, water systems are aware of the occurrence of cyanoHABs and monitor for signs of a bloom. Some systems have the ability to also take preventative measures to reduce the likelihood of a bloom from occurring in their water source area(s).



Should cyanotoxins enter a water treatment plant despite preventative and control measures, most water systems with conventional treatment have the ability to treat cyanotoxins effectively at the water treatment plant. Based on sampling during UCRM

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(<https://www.epa.gov/sites/production/files/2018-10/documents/ucmr4-data-summary.pdf>), it appears that exposure from treated drinking water is rare. If a water system experiences cyanotoxins above the EPA health advisories, your water provider will notify you as soon as possible.

### Exposure from Drinking Water

If you received a Cyanotoxin Drinking Water Advisory from your water purveyor, you should not drink the water until the Advisory is lifted. Exposure can occur by drinking the water or using it to make beverages and foods such as tea, coffee, baby formula, or to prepare foods that contain water (e.g., oatmeal, soup). Also, boiling the water will not remove the toxins, and may inadvertently increase the cyanotoxin concentration. Significant exposure is not known to occur when using the tap water for showering, bathing, washing hands, washing dishes, flushing toilets, cleaning and doing laundry. Infants, young children under the age of six, and pets should be supervised while bathing and during other tap water-related activities to prevent accidental ingestion of water.



# Department HAB/Cyanotoxin Drinking Water Initiatives

## **A CMP should include:**

- **Source Water Assessment**
- **Monitoring**
- **Treatment Adjustments**
- **Public Communication**



# Managing/Treating HABs/Cyanotoxins

## Recommendations:

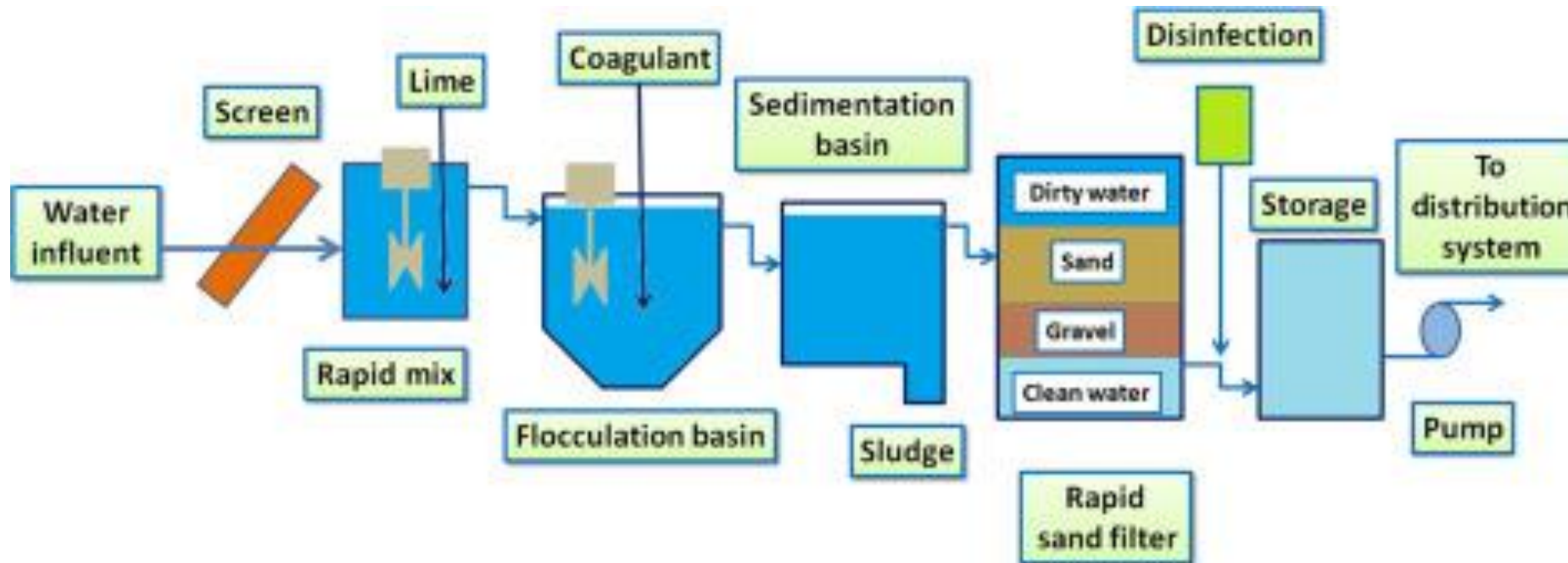
- Source Water Monitoring and HAB Prevention (Within the source – reservoir/river)
- Source Water Treatment
- Use alternative sources
- Adjust and optimize treatment as appropriate
- Multi-barrier approach





# Drinking Water Treatment

- There is no “one size fits all” approach
- Conventional Treatment
- Multi-barrier Approach/Treatment Plant Optimization



# Treating Cyanotoxins from Drinking Water

Table 3-1. General effectiveness of cyanotoxin oxidation with common water treatment oxidants<sup>13</sup>

Oxidant	Anatoxin-a	Cylindrospermopsin	Microcystins	Saxitoxin
Chlorine	Not effective	Effective (at low pH)	Effective*	Somewhat effective
Chloramine	Not effective	Not effective	Not effective at normal doses	Inadequate information
Chlorine dioxide	Not effective at normal doses	Not effective	Not effective at normal doses	Inadequate information
Potassium permanganate	Effective	Data ranges from not effective to possibly effective	Effective*	Not effective
Ozone	Effective	Effective	Very effective	Not effective
UV / advanced oxidation	Effective	Effective	Effective at high UV doses*	Inadequate information

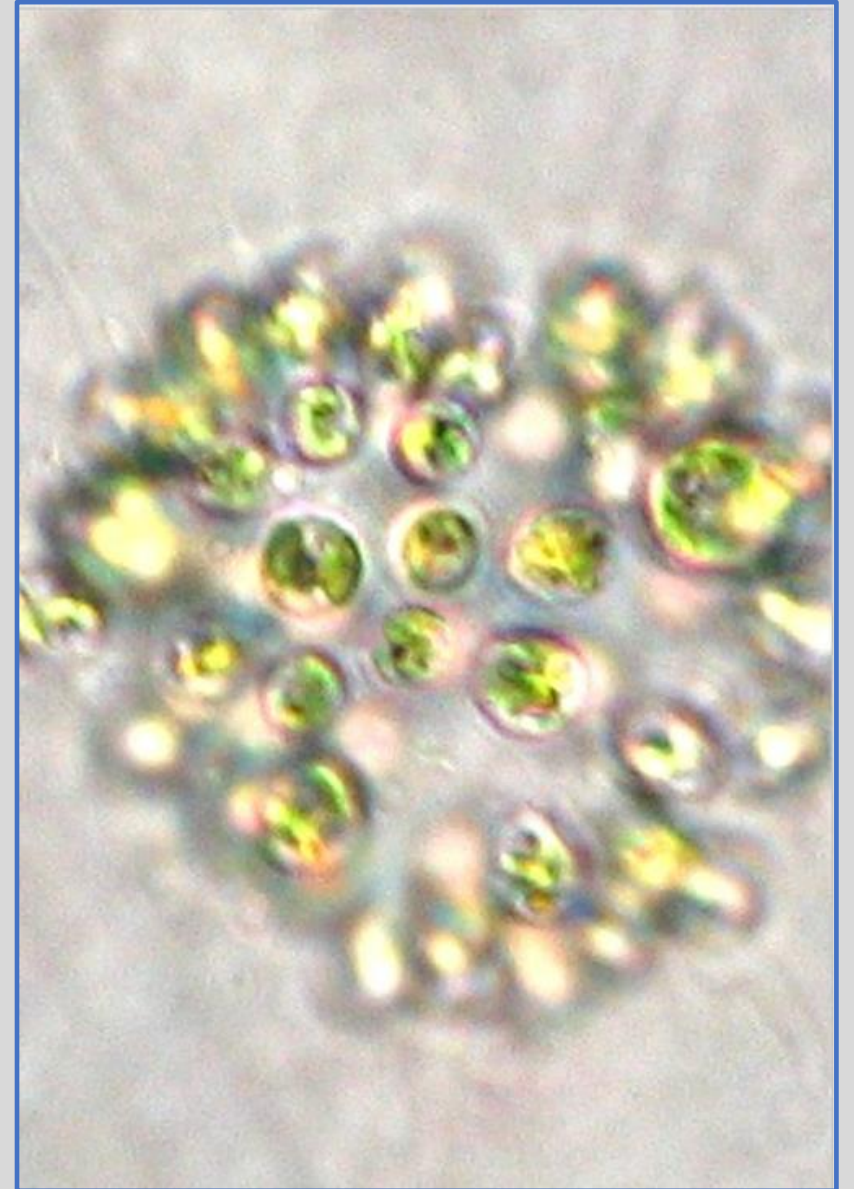
\* Dependent on initial cyanotoxin concentration, pH, temperature, and presence of NOM.

EPA Guidance: Water Treatment Optimization for Cyanotoxins provides a table of oxidation effectiveness for extracellular toxins

# MCL vs Treatment Technique

- Drinking water standards are set as MCLs or Treatment Techniques
- A **treatment technique** is an enforceable procedure or level of technological performance which public water systems must follow to ensure control of a contaminant.<sup>1</sup>
- Treatment techniques are often used when there is no reliable method that is economically and/or technically feasible to measure the level of a contaminant at necessary concentrations.<sup>1</sup>
- Failure to meet these treatment techniques and take appropriate action results in a Treatment Technique violation requiring public notification.

<sup>1</sup> <https://www.epa.gov/sdwa/how-epa-regulates-drinking-water-contaminants>





# Examples of Treatment Technique

- Examples of treatment techniques in the federal rule include:
  - Lead and Copper Rule (optimized corrosion control)
  - Surface Water Treatment Rule (disinfection and filtration)
- EPA's surface water treatment rules(SWTRs) apply to systems using surface water or ground water under the direct influence of surface water.
- SWTRs establish treatment technique requirements are intended to protect against the adverse health effects of exposure to Giardia lamblia, viruses, and Legionella, as well as many other pathogenic organisms.