AMERICAN WATER

WE KEEP LIFE FLOWING™

CYANOTOXINS

Providing safe and reliable water is American Water's business. We are recognized as an industry leader and work cooperatively with the U.S. Environmental Protection Agency so that implementation of existing drinking water standards and development of new regulations will produce benefits for our customers.

WHAT ARE CYANOTOXINS AND HOW DO THEY OCCUR?

"Cyanotoxin" is a generic term for a number of toxic compounds that are naturally produced by a group of microorganisms called cyanobacteria. Cyanobacteria are also known as blue-green algae. They are not actually algae, but their appearance in the environment is very similar to algae.

Concerns can arise if the concentration of cyanotoxin compounds reaches a high enough level where the compounds can harm fish, animals or even humans. High concentrations of cyanotoxins can occur when conditions—such as an abundance of nutrients and warm water—make it easy for cyanobacteria to thrive. When this occurs, they may form "harmful" algal blooms (HABs). HABs can have negative impacts on the ecosystem, human and animal health, recreational activities and the economy. Ingesting water or fish that contain elevated levels of cyanotoxin may pose a risk to the nervous system, kidneys, liver and other systems in the human body.

WHAT ARE THE ISSUES I MAY HAVE HEARD ABOUT?

HABs have increasingly received national attention because of risks to public health and the environment, including widespread fish kills or harm to wildlife, pets or people that have come into contact with or ingested water containing elevated levels of cyanotoxins. Recent events include:

> American Water is using the latest in ultrasonic technology to proactively manage algal blooms in lakes to prevent the development and release of cyanotoxins. We have plans in place to monitor, analyze and treat our water, as well as communications plans to inform our stakeholders.
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- **Toledo, Ohio**: In 2014, the cyanotoxin microcystin was detected and led to a Do Not Drink order affecting 400,000 drinking water customers.
- **Ohio River:** In 2015, there was a recreational public health advisory issued because microcystin was detected which affected Indiana, Kentucky, Ohio and West Virginia.
- **Florida**: In 2016, a widespread HAB occurred in Florida that affected rivers and beaches along Lake Okeechobee, the Caloosahatchee River, and St. Lucie Canal and dramatically decreased tourism.

LEADERSHIP

American Water has helped lead the water industry in several key areas related to

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HABs, including identifying and evaluating technologies to detect and control algal blooms, as well as technologies to remove cyanotoxins during water treatment. For example, American Water evaluated an innovative ultrasonic emmission device as an alternative to chemical control strategies for HABs in reservoirs. The research was published in the Journal of the American Water Works Association in a paper, entitled "Ultrasonic Treatment of Algae in a New Jersey Reservoir" (https://doi.org/10.5942/jawwa.2015.107.0149). American Water continues to use this technology in reservoirs in Pennsylvania and New Jersey.

American Water has also put in place Cyanotoxin Action Plans at each of its utilities that include:

- Triggers for performing monitoring that includes source water indicators and potential system effects of HAB occurrences
- Monitoring process frameworks and decision trees for screening water samples for cyanotoxins.
- Treatment strategies that cover best available technology specific to the site, which may include one or more of the following: Algicide permits for chemical treatment of reservoirs, sonic/ultrasound units, powdered activated carbon, peroxidation, granular activated carbon filter media, biologically active filtration, and dissolved air flotation.
- Communication strategies with the state regulatory agency and public notification.

EXPERTISE & ABILITY

Our Central Laboratory, located in Belleville, IL is an EPA accredited lab with high throughput, fast turnaround time, and expanded capability for Taste and Odor compounds and Cyanotoxins.

- Accredited to measure cyanotoxins through EPA methods 544, 545, and 546 from the Unregulated Contaminant Monitoring Rule 4 program.
- Can measure up to 100 samples per week for EPA methods 545 and 546 with a turnaround time of 5 days.
- Capability includes using enzyme-linked immunosorbent assay (ELISA) cyanotoxin screening through EPA method 546, and liquid chromatography tandem mass spectrometry methods (LC/MS/MS) for both direct injection (EPA 545) and extraction to speciate individual microcystins (EPA method 544).
- In-house microscopy and algal speciation capabilities.
- External collaborations for staying at the forefront of regulatory and monitoring strategies:
  - American Water staff are members of the technical advisory workgroup for SDWA Processes and New Contaminants of the American Water Works Association, which is charged with review and monitoring of Federal guidance on cyanotoxins and HABs.
  - Coordination with EPA monitoring studies at the state level.
  - Contracting limnologists and ecological toxicologists to understand and mitigate algae growth in our reservoirs.

HOW AMERICAN WATER HAS CONTRIBUTED TO THE BODY OF SCIENCE ON CYANOTOXINS

American Water scientists participated in the AWWA Technical Advisory Workgroup on cyanotoxins to update the Cyanotox tool available to utilities through the AWWA website. The tool predicts the effectiveness of cyanotoxin removal by selected preoxidants.

American Water partners with other academic and industry leaders to investigate remote sensing, monitoring and treatment techniques for HABs and Taste & Odor (T&O) events.

- Missouri American Water was one of four utilities that contributed to the Water Research Foundation project "Sources and Fate of Taste and Odor Causing Compounds in the Missouri River," which was focused on gathering knowledge on the T&O-causing compounds found in four water systems on the Lower Missouri River. The primary project deliverable is an early warning monitoring system that will help utilities in the region to:
  - predict the potential for an algal bloom;
  - prepare for T&O challenges; and
  - manage operations to mitigate these challenges.

  The project will also identify the necessary components of a regional communication network for watershed stakeholders to share information and data.
- American Water has partnered with other utilities and consulting agencies on the Water Research Foundation project entitled "Utility Responses to Cyanobacterial/Cyanotoxin Events; Case Studies and Lessons Learned." This project will provide much needed information to effectively manage HABs and cyanotoxin events by establishing streamlined recommendations for monitoring, treatment and communications between water utilities, customers and other stakeholders (e.g., public health and regulatory agencies).