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June 2018
NSGLC-18-06-02c

Harmful Algal Blooms and Water Quality

This fact sheet was prepared by the National Sea Grant Law Center as part of the Agricultural and Food Law Consortium.

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USDA United States Department of Agriculture
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This material is based upon work supported by the National Agricultural Library, Agricultural Research Service, U.S. Department of Agriculture.

While nitrogen and phosphorus are nutrients that naturally occur in aquatic ecosystems, the presence of these nutrients in excessive quantities causes risks to human health and results in substantial economic and environmental harms. Nutrient pollution is primarily caused by several human activities, and agriculture is a significant contributor to nutrient pollution.

Photo of Algal Bloom at Stone Lab, courtesy of Matthew Forte.

One of the ways nutrient pollution is detrimental to water quality is that the presence of large amounts of these nutrients stimulate rapid algal growth. While algal communities are a part of healthy ecosystems, when the population of algae rapidly increases, or "blooms," the toxins produced can significantly impact surrounding ecosystems. For instance, cyanobacteria, commonly called blue-green algae, are commonly found in freshwater, but certain freshwater cyanobacterial can bloom and produce cyanotoxins.

While much is still unknown about what causes an algal bloom to turn toxic, these events, known as harmful algal blooms (HABs), have many detrimental effects, including threatening human and animal health. Children, the elderly, people with compromised liver function, and pets are especially vulnerable to the toxins present in HABs.

HABs have numerous negative health effects. Just coming into contact with contaminated water could cause skin rashes or burns. HABs are also poisonous if consumed. They can cause diarrhea, vomiting, nausea, numbness, and dizziness. Some health effects can be more severe.

For instance, two cyanotoxins, microcystins and cylindrospermospin, can cause liver and kidney toxicity, respectively. The U.S EPA (EPA) has issued Drinking Water Health Advisories and Draft Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for these two cyanotoxins, which are detailed on the second page of this fact sheet.

Federal Legislative Efforts to Address HABs

1998 Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA)

Established a task force that assesses and prepares reports on HABs and hypoxia. Currently, the HABHRCA authorizes NOAA to maintain a national program that focuses on marine waters and authorizes the EPA to lead freshwater parts of the program.

2015 Amendments to the Safe Drinking Water Act

Requires the EPA to develop a strategic plan targeted at managing the risks of algal toxins in drinking water supplies.

2015 EPA Drinking Water Health Advisories (HA) for Microcystins and Cylindrospermospin

* The HA levels released by EPA are informal technical guidance and not regulatory values *

Contaminant	*Pre-school age and younger (<6 years)*	*School-aged children through adults*
Microcystins	<= 0.3 micrograms/liter	<= 1.6 micrograms/liter
Cylindrospermospin	<= 0.7 micrograms/liter	<= 3.0 micrograms/liter

2016 Water Infrastructure Improvements for the Nation (WIIN) Act

Requires the EPA to designate a HAB coordinator in the Great Lakes.

2016 Draft Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin

In 2016, EPA released Draft Human Health Recreational Ambient Water Quality Criteria (AWQC) for microcystins and cylindrospermopsin that aim to prevent the human health risks associated with swimming and other recreational activities in waters containing microcystins and cylindrospermopsin. At this time, the EPA has yet to finalize these draft levels.

What are AWQC?

The Clean Water Act (CWA) requires the EPA to develop AWQC that reflect the current scientific knowledge of pollutants and their impacts on the environment and human health. The EPA's AWQC is then used by a state as it establishes or revises its Water Quality Standards (WQSs). The CWA requires states to establish WQSs, which is a two-step process:

1) First, the state designates a specific use for the water, which becomes the goal use to be attained for the waterbody. For instance, the use of the waterbody could be designated for drinking water, wildlife habitat, swimming, or fishing.

2) Using the EPA's AWQC as guidance, the state then sets its own water quality criteria that, if met, will protect the designated use of the waterbody.

What are the Draft Human Health Recreational AWQC for microcystins and cylindrospermopsin based on?

EPA picked values based on the noncancer health effects to children. Children are more susceptible to HABs than adults, and typically injest more water and spend more time in the water when swimming. While HABs can pose health risks to pets, the levels are meant to be protective of human health. EPA used the information that was collected and evaluated for its 2015 Drinking Water Health Advisories for these cyanotoxins, which are listed on the previous page of this fact sheet.

What are the recommend values?

The EPA's Draft Human Health Recreational AWQC for microcystins and cylindrospermopsin are as follows:

- *Microcystins:* 4 micrograms/liter
- *Cylindrospermopsin:* 8 micrograms/liter

How can the values be used by states?

The EPA indicates that states could use these recommended values for either swimming advisories at beaches or for adoption into new or revised WQSs. For use as a swimming advisory, the waterbody should not exceed the recommended values on any single day. For use as a WQS, the EPA recommends that the values should not be exceeded by more than 10% of the days in each year's recreational season. States could also use the recommended values for both swimming advisories and as a WQS.

Are the values intended only for freshwater water bodies?

No, the values can apply in either fresh or marine recreational waters. Although HABs form in freshwater, that freshwater can enter estuarine and marine waters if the water containing the HABs moves downstream.

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