



# Blue-Green Algae/Cyanobacteria Harmful Algal Bloom (HABs) Physician Reference

## The Public Health Issue:

In the summer of 2010 Ohio's local health departments, local physician offices, Poison Control Centers and the state health department received reports of illness from people who had contact with HAB-contaminated waters. In August of 2014 the City of Toledo, Ohio issued a "Do Not Drink" advisory after city officials detected unsafe levels of microcystin in the finished drinking water servicing some 500,00 residents.

Several of Ohio's inland lakes have experienced cyanobacteria blue-green algae blooms, commonly referred to as Harmful Algal Blooms (HABs). Depending on the causative organism, water conditions, and other environmental factors, neurotoxins, hepatotoxins, cytotoxins, dermatotoxins and gastrointestinal toxins can be produced by cyanobacteria. These toxins are released to the water as the bacteria die and their cells lyse.

Water samples from various Ohio lakes have detected the presence of microcystin, anatoxin-a, cylindrospermopsin and saxitoxin. Both humans and animals can experience illness from exposure to these toxins through their drinking water, and during recreational activities and other water uses.



## Exposure and Clinical Presentation:

Route of Exposure	Symptoms/Signs	Time to symptom onset*	Differential Diagnosis
Swallowing water contaminated with cyanobacteria or toxins	<b>Hepatotoxins</b> (microcystins, cylindrospermopsin) Elevated AST/ALT, GGT Gastroenteritis Acute hepatitis Kidney damage Malaise Headache Anorexia	Minutes to hours	Other hepatotoxin poisoning, other microbial infections/toxins  Viral hepatitis  Viral Gastroenteritis  Hepatotoxic drug ingestion (acetaminophen)
Swallowing water contaminated with cyanobacteria or toxins	<b>Neurotoxins</b> (anatoxin-a, anatoxin-a[s], saxitoxin) Paresthesia Tremor Fasciculations Hypersalivation Diarrhea Ataxia Motor weakness Respiratory and muscular paralysis	Minutes to hours	Pesticide poisoning, other toxin poisoning
Skin contact with water contaminated with cyanobacteria or toxins or contact with animals contaminated with cyanobacteria	<b>Dermal toxins</b> (Lyngbyatoxins, lipopolysaccharide endotoxins) Rash, hives Skin blistering Allergic reactions	Minutes to hours	Other dermal allergens. non-allergic urticaria, photosensitivity reactions
Inhaling aerosolized droplets contaminated with cyanobacteria or toxins	Upper respiratory irritation Rhinitis Possible allergic reaction	Unknown, but likely an acute reaction	Other airborne allergens, upper respiratory infection, flu

\* Symptom onset times are primarily extrapolations from laboratory animal data and events.

## Diagnosis and Lab Testing:

Approach a potential HAB illness as a diagnosis of exclusion, ruling out other more likely differential diagnoses. Currently there is no laboratory diagnostic testing which can confirm the presence of cyanotoxins in human clinical specimens. In the absence of laboratory confirmation, presumptive diagnosis can be made based upon exposure history, clinical signs and symptoms, and ruling out other diagnoses. In cases where exposure to hepatotoxins is suspected, a standard liver panel is recommended (AST (SGOT), ALT, ALP, GGT, albumin and bilirubin). Tests for ruling out other diagnoses should also be performed.

## Case Definition:

**CDC case definition summary for selected toxins** (for complete description see CDC *Proposed Case Definitions for Algal Toxin-related Diseases*)

- Suspect Case Exposure to water with a confirmed algal bloom AND onset of associated signs and symptoms within a reasonable time after exposure AND without identification of another cause of illness.
- Probable Case Meets criteria for Suspect Case AND there is laboratory documentation of a HAB toxin(s) in the water.
- Confirmed Case Meets criteria for a Probable Case combined with professional judgment based on medical review.

Freshwater Cyanotoxins	Type of Toxin	Causative organism	Vector
Anatoxin-a	Neurotoxin	<i>Anabaena</i> spp. <i>Aphanizomenon</i> spp. <i>Planktothrix</i> spp.	Contaminated fresh water
Anatoxin-a(s)	Neurotoxin	<i>Anabaena flos-aquae</i>	Contaminated fresh water
Cylindrospermopsis	Hepatotoxin	<i>Cylindrospermopsis raciborskii</i> , <i>Aphanizomenon ovalisporum</i>	Contaminated fresh water and possibly fish
Aplysiatoxin	Dermal toxin	<i>Lyngbya</i> spp. <i>Planktothrix</i> spp.	Contaminated fresh or marine waters
Microcystins	Hepatotoxin	<i>M. aeruginosa</i> <i>Anabaena</i> spp. <i>Planktothrix</i> spp.	Contaminated fresh water
Saxitoxins	Neurotoxin	<i>Anabaena circinalis</i> <i>Lyngbya wollei</i> <i>Aphanizomenon flos-aquae</i> <i>Cylindrospermopsis raciborskii</i> <i>Planktothrix</i> spp.	Contaminated fresh water

## Treatment and Patient Management:

Symptomatic, supportive care. There are currently no known antidotes for exposures to the group of toxins associated with cyanobacteria. Follow-up laboratory testing as indicated.



## **Patient Education:**

Community education outreach efforts are currently being pursued by the state agencies involved addressing Ohio HABs. Please refer to the following links for more information regarding Harmful Algal Blooms:

- Ohio Department of Health: Blue-Green Algae/Cyanobacteria Harmful Algal Blooms (HABs) fact sheet: <http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/eh/HABs/HABfactsheet.ashx>
- Ohio Department of Health: Photos of Algae Blooms fact sheet: <http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/eh/HABs/photosofalgaeblooms.pdf>
- Ohio Department of Health: Odors and Your Health fact sheet: <http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/eh/HAS/odors.ashx>
- Ohio Environmental Protection Agency Harmful Algal Bloom Website: <http://epa.ohio.gov/habalgae.aspx>
- Centers for Disease Control and Prevention, Environmental Hazards & Health Effects, Harmful Algal Blooms HABs <http://www.cdc.gov/nceh/hsb/hab/default.htm#Cyanobacteria>

## **HAB Case Reporting Requirements:**

Pursuant to Ohio Administrative Code (OAC) Chapter 3701-3-02 and the ODH Infectious Disease Control Manual ([www.odh.ohio.gov/pdf/idcm/intro1.pdf](http://www.odh.ohio.gov/pdf/idcm/intro1.pdf)) **healthcare providers are required to submit reports of human illness related to exposure to HABs** to the local health district where the ill individual resides. Reports are to be made under Class C - "waterborne disease outbreaks; report single cases of toxin poisoning associated with exposure to water with a confirmed algal bloom by the end of the next business day to the local public health department where the patient resides."

**WHO** must report? Healthcare providers (physicians, hospitals, infection control professionals, local public health providers) with knowledge of a case or suspect case of HAB exposure and illness are required to report.

**WHAT** must be reported? Healthcare providers must submit the HAB-related human illness form to the local health district where the ill individual resides.

**WHEN** must a report be made? Class C – must be sent by the end of the next business day to the local public health department.

**WHERE** must the report be made? Healthcare providers should send the case information to the local health jurisdiction where the patient resides. A listing of local health departments may be found at: <http://www.odh.ohio.gov/localhealthdistricts/localhealthdistricts.aspx>

ODH, with assistance from the Centers for Disease Control and Prevention, has developed case definitions and the following human illness reporting form for HAB-related illnesses:

HAB-related human illness report:

<http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/alert/beach%20monitoring/current/habhumanrelatedillnessreportform.ashx>

### **Animal Illness:**

Reports of suspected domestic animal illness associated with exposure to HAB should be reported to the Local Health District. Local health districts receiving reports from veterinarians should contact the ODH Zoonotic Disease Program (ZDP) at 614-752-1029, select option two (2). Completed animal illness report forms can be faxed to the ODH ZDP at 614-644-1057.



HAB-related animal illness report:

<http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/alert/beach%20monitoring/current/habrelatedanimalillnessreportform.ashx>

## **Where can I get more information?**

For a complete listing of the ODH-created public health documents, visit the ODH HAB webpage, Documents and Resources section at: <http://www.odh.ohio.gov/odhprograms/eh/HABs/HABDocumentsResources.aspx>

Ohio Department of Health  
Bureau of Environmental Health  
246 N. High Street  
Columbus, Ohio 43215  
Phone: (614) 466-1390  
Fax: (614) 466-4556

To view a listing of current advisories or sampling data, report a potential algal bloom, or learn more about Ohio's HAB response strategy visit Ohio EPA's [www.Ohioalgaefinfo.com](http://www.Ohioalgaefinfo.com) for more information.

## **Additional Resources:**

### **Centers for Disease Control and Prevention (CDC)**

<http://www.cdc.gov/nceh/hsb/hab/default.htm>

### **Ohio EPA**

Ohio EPA Harmful Algal Bloom Advisories website: Ohio Algae Information for Recreational Waters

<http://epa.ohio.gov/habalgae.aspx>

State of Ohio Harmful Algal Bloom Response Strategy For Recreational Waters (June, 2015)

<http://epa.ohio.gov/portals/35/hab/HABResponseStrategy.pdf>

### **U.S. EPA**

Nutrient Policy and Data: Cyanobacteria/Cyanotoxins

<http://www2.epa.gov/nutrient-policy-data/cyanobacteriacyanotoxins>

Toxicological Reviews of Cyanobacterial Toxins: Microcystins LR, RR, YR and LA (External Review Draft)

<http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=160548>

### **World Health Organization**

Toxic cyanobacteria in water: A guide to their public health consequences, monitoring and management

[http://www.who.int/water\\_sanitation\\_health/resourcesquality/toxiccyanbact/en/index.html](http://www.who.int/water_sanitation_health/resourcesquality/toxiccyanbact/en/index.html)

Cyanobacteria and cyanotoxins in drinking-water

[http://www.who.int/water\\_sanitation\\_health/dwq/cyanobactox/en/index.html](http://www.who.int/water_sanitation_health/dwq/cyanobactox/en/index.html)

### **State Guidance**

Vermont

[http://healthvermont.gov/enviro/bg\\_algae/bgalgae.aspx](http://healthvermont.gov/enviro/bg_algae/bgalgae.aspx)

Wisconsin Department of Health Services, Blue-Green Algae

[www.dhs.wisconsin.gov/eh/bluegreenalgae/](http://www.dhs.wisconsin.gov/eh/bluegreenalgae/)