



Harmful Algal Blooms and Their Health-Related Effects on Animals



Cyanobacteria, also known as blue-green algae, are thought to be the oldest photosynthetic organisms on earth. They occur naturally in lakes and ponds, streams, and the oceans, but can also be found in hot springs, rice paddies, soils, and the arctic tundra. They are found in all marine and freshwater habitats.

Cyanobacteria are true bacteria, but they function similarly to algae in that they both carry out photosynthesis and produce oxygen in the process. However, some cyanobacteria produce toxins. These toxins can be held within cells or released into the water when the organism dies and can affect human and animal health, particularly if the cells or the contaminated water is ingested. On a worldwide basis, the frequency and intensity of toxic blooms of cyanobacteria are increasing; however, the effects of cyanotoxins on wild and domestic animals are not a recent occurrence. The first reported case of livestock poisoning caused by cyanobacteria occurred in 1878 in Australia¹.

Cyanobacteria can thrive in multiple habitats, but in fresh water, many prefer warm temperatures, high nutrients—particularly phosphorus and nitrogen—and calm conditions. These factors often contribute to mid- to late-summer algal blooms in the North Central region, turning lakes and ponds from clear to green, blue-green, brown, yellow, or even red. These cyanobacterial blooms can look like thick paint slicks in the water, grass-like clippings, or scum floating in the water. Other cyanobacteria are bottom dwelling and form mats in clear water and low to moderate nutrient conditions. These species often appear as mats on the bottom of a water body. They sometimes produce foul odors. Outside of a few species that can appear as dark-colored, hair-like filaments, most cyanobacteria are not generally stringy and cannot easily be picked up from the water, like some of the filamentous green algae.

As with algae, when cyanobacteria die, they decompose, which results in a loss of dissolved oxygen. Reduced oxygen concentrations can have negative effects on fish, invertebrates, and other organisms. However, the production of toxins by cyanobacteria can result in additional negative effects. Not all cyanobacteria produce toxins, nor are toxins produced all the time by those species that can produce them².

When toxins are produced, these harmful algal blooms, or HABs, threaten animal and human health and have economic impacts on property, cause a loss of fishing income, and result in clean-up and treatment costs. Harmful algal blooms can also interfere with recreational activities.

The major toxins produced by cyanobacteria can be classified as hepatotoxins, affecting the liver; neurotoxins, affecting the nervous system; and dermatotoxins or irritants, affecting the skin and sometimes causing photosensitivity in animals^{1,3}. Different cyanobacteria can produce one or more toxins (Table 1).

It's important to note that you cannot tell if a toxin is present just by observing a bloom, so be wary of any apparent accumulations of cyanobacteria.



Photo Credit: SDSU Extension



In addition, the toxin may be present after a bloom has subsided or disappeared. For example, microcystin, one of the more common liver toxins produced by some HABs, can exist in water for months⁴. Because of these factors, it is important to keep animals away from water bodies after the bloom disappears until the water can be tested for toxins.

Signs of Toxicity in Animals

Some species of cyanobacteria can produce toxins that are harmful, or even deadly, to livestock and other mammals. Depending on which toxin is present, once ingested, acute symptoms, including death, can occur in 24 hours or less.

Livestock, pets, and wildlife can all show adverse reactions after contacting cyanotoxins. Symptoms range from diarrhea, vomiting, disorientation, and jaundice to animals staggering around; having difficulty breathing; or having seizures, muscle tremors, paralysis, or respiratory failure (Table 1). Dead wildlife can be a sign that cyanotoxins are present.

If you notice these symptoms with your domestic animals or livestock, take immediate action to keep livestock and other domestic animals out of the water.

Neurotoxins can cause death within minutes to hours. Hepatotoxins sometimes result in quick deaths, but in other cases, death is delayed as various functions of the liver become compromised. However, signs of illness from the toxins may not be seen until near-lethal amounts have been consumed. Dermatotoxins may result in skin rashes, skin lesions, or skin peeling.

Tips for Domestic Animal Exposure

Domestic animals can consume cyanobacterial toxins when they drink the tainted water; eat scums, mats, or dried material on shore; lick their fur; or eat dead fish or other animals found near a bloom.

In dogs, water intoxication (from swallowing too much water) and heat stroke share symptoms with cyanobacterial poisoning. Give dogs plenty of breaks from playing and retrieving in lakes, and give them flat objects for retrieval instead of balls. Always provide shade and fresh, clean water to drink, and wash them off with clean water after they swim so that they don't lick cyanobacteria from their coats.



If what appears to be a cyanobacterial bloom is seen, assume that toxins are present even if they may not be.

Antidotes are not available for cyanotoxins. Treatments that may help include the use of activated charcoal, calcium, atropine, and intravenous fluids. Seek help from a veterinarian as soon as possible. Artificial respiration also may be helpful, according to some published studies⁴.



Tips for Livestock Exposure

Monitoring livestock water quality is a critical component of animal production because poor-quality water can have negative effects on growth, reproduction, and the general productivity of livestock. In some cases, death can occur within hours or days after consumption of contaminated water. It is important to monitor stock dams, dugouts, or other places that collect and retain water for consumption for possible blue-green algae outbreaks and to remove animals from access to contaminated water sources.

It is recommended that producers test their water supply prior to turning livestock out to pasture, especially in those areas that have chronic water quality issues, use shallow water sources, or are experiencing drought.

Many agricultural testing laboratories provide a livestock suitability package for their clients that can include parameters such as pH, total dissolved solids, hardness, sodium, nitrates, and sulfates. Testing and understanding the results are important for making informed decisions about the suitability of the water supply for livestock.

However, it is important to note that livestock suitability packages do not test for cyanobacteria, so even water sources with acceptable suitability tests can have cyanobacterial toxins that are harmful to livestock.

If you are interested in establishing toxin testing as a part of your routine monitoring, you may need to set up accounts with specific laboratories. The EPA⁵ provides a list of laboratories that analyze for cyanobacteria and associated toxins at [Laboratories that Analyze for Cyanobacteria and Cyanotoxins](#). Several different types of tests are available, including rapid screening tests that detect and identify whether cells or toxins are in the water (EPA, 2023).

You can also find specific HABs information for any U.S. state by visiting the EPA's [state HAB resources](#) or learn more about what cyanobacteria look like by visiting the Interstate Technology and Regulatory Council's [Visual Guide to Common Harmful Cyanobacteria](#).



Photo Credit: Robin Salverson, SDSU Extension

Table 1. Harmful algal bloom toxins and symptoms

Toxin type	Toxin	Example organisms	Symptoms
Hepatotoxin (liver)	Microcystin	<i>Microcystis</i> , <i>Dolichospermum</i> (formerly <i>Anabaena</i>), <i>Planktothrix</i> , <i>Aphanizomenon</i>	Vomiting Diarrhea Excessive drooling Fever Sore throat Photosensitivity Jaundice Blistered mouth Unresponsiveness Lethargy
	Cylindrospermopsin	<i>Raphidiopsis</i> <i>Aphanizomenon</i> <i>Lyngbya</i> <i>Cylindrospermopsis</i>	Liver cancer Necrosis of the liver Liver failure Respiratory arrest Death
	Nodularin	<i>Nodularia</i>	
Neurotoxin (nervous system/tissue)	Anatoxin-a	<i>Dolichospermum</i> (formerly <i>Anabaena</i>), <i>Aphanizomenon</i> , <i>Microcystis</i> , <i>Planktothrix</i> <i>Lyngbya</i>	Staggering Numbness Muscle twitches Convulsions Loss of balance Gasping for breath Respiratory arrest Respiratory paralysis Death
	Guanitoxin (formerly Anatoxin-a(S) "Salivary")	<i>Dolichospermum</i> (formerly <i>Anabaena</i>)	
	Saxitoxin	<i>Dolichospermum</i> (formerly <i>Anabaena</i>), <i>Aphanizomenon</i> , <i>Cylindrospermum</i> , <i>Microseira</i> (<i>Lyngbya</i>)	
Dermatotoxin (skin)	Lyngbyatoxin-a Lipopolysaccharides	<i>Microseira</i> (<i>Lyngbya</i>), <i>Microcystis</i> , <i>Spirulina</i> , <i>Dolichospermum</i> (formerly <i>Anabaena</i>)	Rashes Hives Itching Irritation

Sources: Backer (2002)⁶; Rastogi et al. (2015)⁷; Wolfe (2021).

What You Can Do

- If the water looks slimy, the water is colored or looks like floating paint, dark-colored mats are on the bottom or floating, or the water has an odor, keep animals away from the water.
- Monitor stock dams, dugouts, or other places that collect and retain water for consumption for possible cyanobacterial outbreaks, and remove animals from access to contaminated water sources.
- If you suspect a cyanobacterial bloom and have concerns about poisoning, keep livestock and domestic animals away from the water supply and contact the appropriate health department, veterinarian, public safety officer, or agency to determine where to send samples (Table 2).
- Contact the appropriate health department, hotline, or environmental agency if someone in the household, a pet, or one of the livestock becomes ill from ingesting HABs. Talk to your doctor or veterinarian, contact the appropriate agency for poisoning cases, or call the Poison Control line at 800-222-1222.

Table 2. State contact information for harmful algal bloom (HAB) poisoning in the North Central region

State	Contact information
Illinois	Suspected human or animal cases of HAB-related illnesses should be reported to the Illinois Department of Public Health via the HAB Human Illness Report Form or the HAB Animal Illness Report Form .
Indiana	Contact a veterinarian immediately. Animals may die within minutes of clinical signs appearing but can survive for several hours or up to two or more days after being exposed. If the animal has consumed a lethal dose, no antidote exists for the toxins. Email: animalhealth@boah.in.gov or call 317-544-2400 or 877-747-3038.
Iowa	Health care providers are required to report suspected and confirmed cases of exposure to blue-green algae (microcystin poisoning) to the Iowa Department of Public Health (IDPH). To report cases, please call the IDPH at (800) 972-2026 (business hours only).
Kansas	If a person or animal becomes ill after suspected exposure to an algal bloom, consult medical or veterinary care providers immediately. Call the Epidemiology Hotline at 877-427-7317 for more information.
Michigan	If you or your livestock/pets have had contact with or swallowed water that have HABs and feel sick, call your doctor or Poison Control at 800-222-1222. Always report suspicious-looking algae to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) by calling 800-662-9278 or emailing AlgaeBloom@michigan.gov . For other reporting sources, go to www.Michigan.gov/HABS . A new Michigan Harmful Algal Bloom Reports map is now available online at Michigan.gov/HABSMap .
Minnesota	If you suspect poisoning, contact your veterinarian or Infectious Disease Epidemiology, Prevention, and Control Division at 651-201-5414. A form to fill out is available at: IDEPC Comment Form
Missouri	Report any HAB-related illnesses to your local public health agency or the Department of Health and Senior Services (DHSS) Public Health Emergency 24/7 Hotline: 800-392-0272. If you are currently experiencing symptoms, seek medical attention or contact the Poison Center helpline 24/7 at 800-222-1222 or visit www.poisonhelp.org/ . Let the medical personnel know that you have been in an area affected by a bloom and may have been exposed.
Nebraska	If you experience health symptoms, notify your physician and also report it to the Nebraska Department of Health and Human Services at (402) 471-0510. You can also contact the Nebraska Regional Poison Center at 800-222-1222 for more information.
North Dakota	Contact your health provider or veterinarian if you are or your pet is ill after swimming in or drinking water with HABs. Contact the Department of Environmental Quality at 701-328-5210 for more information. Water samples should be submitted to the North Dakota State University Veterinary Diagnostic Laboratory or a commercial laboratory at www.vdl.ndsu.edu/ .
Ohio	Report any suspected, probable, or confirmed cases to your local health district. Consult the comprehensive search tool to find the contact information for your district at ODH Find Local Health Districts Ohio Department of Health ; after reporting, fill out the "Harmful Algal Bloom-related Animal Illness Report" and submit this document to the Ohio Department of Health Bureau of Environmental Health and Radiation Protection at BEH@odh.ohio.gov ; (614) 644-1390.
South Dakota	If livestock come into contact with HABs-impacted water, the first point of contact is a veterinarian. Other contacts are a poison control center or the South Dakota State University Animal Disease Research & Diagnostic Laboratory at 605-688-5171. If you have become ill after swimming in or drinking water with HABs, contact your doctor or the South Dakota Department of Health (800-738-2301).
Wisconsin	To report a case of potential health effects caused by harmful algal blooms, visit the Department of Health Services algae website at Blue-Green Algae Wisconsin Department of Health Services or contact the Bureau of Environmental and Occupational Health at 608-266-1120.

Notes

- 1 Stewart, I., A.A. Seawright and G.R. Shaw. 2008. Cyanobacterial poisoning in livestock, wild mammals and birds—An overview (pp. 613-638). In H.K. Hudnell (Ed.), *Cyanobacterial Harmful Algal Blooms: State of the Science and Research Needs*. Springer Science.
- 2 Meehan, M.A. and M. Mostrom. 2021. Cyanobacteria (Bluegreen Algae) Poisoning. North Dakota State University (V1136, revised). www.ndsu.edu/agriculture/extension/publications/cyanobacteria-poisoning-blue-green-algae.
- 3 Arnold, M. n.d. Harmful Algal Blooms—Are My Cattle in Danger? University of Kentucky Cooperative Extension Service, Lexington. afs.ca.uky.edu/files/harmful_algal_blooms.pdf#:~:text=Water%20is%20the%20most%20critical%20factor%20in%20the,and%20intake%2C%20and%20are%20potentially%20toxic%20to%20livestock..
- 4 Wolfe, E. 2021. Harmful algal bloom resources for livestock veterinarians. *Journal of the American Veterinary Medical Association* 259(2):151-161.
- 5 EPA. 2023. Determination of Cyanotoxins in Drinking and Ambient Freshwaters. www.epa.gov/cyanohabs/determination-cyanotoxins-drinking-and-ambient-freshwaters#:~:text=These%20methods%20include%3A%201%20Enzyme%20E2%80%93linked%20immunosorbent%20assays%20%28ELISA%29,%28UV%20FPDA%29,%204%20Liquid%20chromatography%20Fmass%20spectrometry%20%28LC%20FMS%29%20More%20items.
- 6 Backer, L.C. 2002. Cyanobacterial harmful algal blooms (cyanoHABs): Developing a public health response. *Lake and Reservoir Management* 18(1):20-31.
- 7 Rastogi, R.P., D. Madamwar and A. Incharoensakdi. 2015. Bloom dynamics of cyanobacteria and their toxins: Environmental health impacts and mitigation strategies. *Frontiers in Microbiology* 6(1254):1-22.



NORTH CENTRAL REGION
WATER NETWORK

This fact sheet was developed by the Algal Bloom Action Team, a collaboration of water professionals, researchers, and educators from the national network of Water Resources Research Institutes, the North Central Region Water Network, and Cooperative Extensions from the 12 states in the North Central Region of the United States.

More information at:
northcentralwater.org/habproject