K-STATE Research and Extension

Identification and Management of Blue-green Algae in Farm Ponds

MF-3065 Animal Safety

Blue-green algae include several different species of photosynthetic cyanobacteria that live in water. Cyanobacteria are bacteria capable of photosynthesis. These cyanobacteria can produce toxins that can sicken or kill livestock. Problems with blue-green algae and their associated toxins are most common during the summer and may become widespread in years with long periods of hot, dry weather.

Occasionally, blue-green algae rapidly reproduce and form blooms, or large colonies, that are visible as a scum on the water's surface. They also may change the water color of a pond. Such blooms of toxic cyanobacteria are often referred to as harmful algal blooms, or HABs. These are typically most severe in stagnant areas, such as coves or inlets, where wind disturbance of the water surface is minimal and water temperatures are higher. Floating algal scums may accumulate at the downwind shores of lakes and ponds.

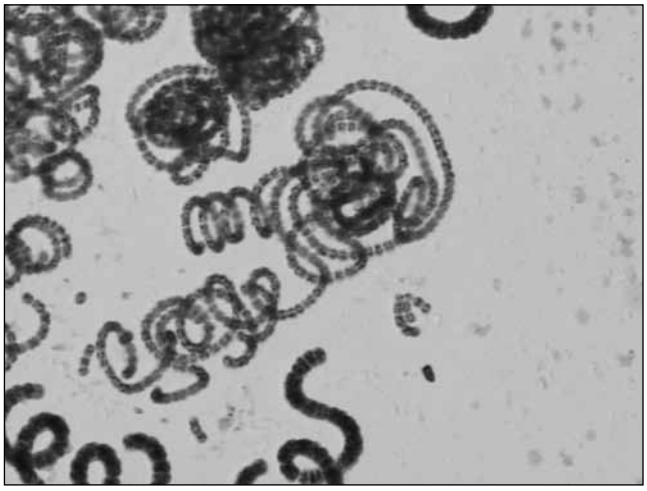
The causes of harmful algal blooms are not completely understood. They are related to increased nitrogen and phosphorus concentrations in water, but the exact relationships between nutrient concentrations and blooms are complex and difficult to predict.

Although agricultural nutrient runoff is a known risk factor, harmful algal blooms also are found in ponds surrounded by rangeland, where agricultural nutrient loading is rarely an issue. Other environmental factors that may favor the formation of blooms include hot, sunny weather with little wind. Ponds with relatively clear water, or low turbidity, may be more likely to produce harmful algal blooms due to high sunlight availability throughout the water column.

Most toxins that are produced during harmful algal blooms are stored within the cyanobacteria until they die. As the cyanobacteria decompose, they release stored toxins into the water. Toxins are not evenly dispersed in a pond. *Mycrocystis* species, which are generally the most problematic blue-green algae in Kansas, self-regulate their position in the water. They are often buoyant at or near the surface to capture the most sunlight for photosynthesis. When the wind blows in a relatively constant direction, these organisms accumulate on the downwind side of the pond, where toxin concentrations may increase. Other blue-green algae species are less buoyant and may be more widely dispersed.

Toxin concentrations can vary dramatically, even at nearby locations in the same pond. Pockets of water that contain lethal quantities of toxins may be within a few feet of areas with low concentrations, so it is impossible to determine whether or not a water body is toxic by using a single water sample. Generally, if measurable toxin levels are found, it is prudent to suspect the entire pond is toxic, and the pond should not be used for livestock or human drinking water. Cyanobacterial toxins also may irritate skin, eyes, and the respiratory system, so wading or touching the

Microcustis aeruginosa, a toxic species of blue-green algae.



A toxic species of blue-green algae in the genus Anabaena.

water should be avoided. Some toxin types may cause the meat of fish to be poisonous. Fish caught from these ponds should not be eaten.

A pond containing a harmful algal bloom may be covered with a scum that looks like bright green paint, but other colors are possible, varying from blue-green to grey, and occasionally red or brown. Some types are filamentous and may form slimy strands when many are clinging to each other. Blue-green algae can be distinguished from duckweed by size, as individual duckweed plants are visible without a microscope. To view images of these plants, visit the website *aquaplant.tamu.edu/plant-identification*. Water from a pond with a harmful algal bloom often will have an unpleasant smell. Most livestock will avoid water with this smell, but some dogs are attracted by the smell and are at risk of drinking the water or ingesting scum at the edges of the pond. This behavior may lead to lethal exposures.

If blue-green algae are suspected, a water sample can be collected and sent to the Kansas State Veterinary Diagnostic Laboratory. (Directions for collecting and submitting water samples are at the end of this publication.) Because toxin concentrations can fluctuate widely within the same pond, animals drinking from the pond may or may not consume significant levels of the toxin. Because toxin consumption cannot be forecast with any degree of accuracy, water from a pond that tests positive for blue-green algae is considered unsafe for livestock consumption. The level of toxin in the water is generally not analyzed due to the cost of testing and because toxin concentrations vary so much by location and time within the same pond.

If a pond contains a harmful algal bloom, there are few choices for the livestock owner. Copper sulfate can be used to kill the blue-green algae. This chemical, however, will also kill competing organisms such as green algae, which help keep blue-green algae in check. Copper does not break down, but remains in pond sediment, where it can affect pond ecology for many years. Sheep are sensitive to copper. Hazardous levels of copper may remain in water and plants growing near treated ponds for several years after treatment. As blue-green algae die after the chemical application, toxins are released from the organisms and dispersed more widely.

A second option is to reduce the amount of sunshine available to the blue-green algae. Increasing turbidity through stirring up bottom sediment is not recommended. Instead, spreading a buoyant straw such as wheat or barley straw in a thin layer across the surface will shade the algae and may result in a decrease in blue-green algae bloom size. Straw will need to be replaced as it sinks. This method of control will have little lasting effect on the pond.

The third option is to provide an alternative water source for livestock. Using well water may necessitate drilling a well, which is not always an option. It takes time to have the well drilled, have the water tested, and set up a pumping unit and stock tank. Hauling water is expensive and time consuming but may be the only feasible way to supply clean water to livestock. Animals can be moved to another pasture with clean pond water or access to another water source.

The duration of harmful algal blooms is difficult to predict and is influenced by weather conditions. The condition may last from days to months. Cooler, cloudy weather with high wind speeds generally shortens the duration. Before allowing livestock to drink water from a pond that was previously determined to have a harmful algal bloom, another water test should be

Signs may be posted at lakes or ponds where blue-green algae have been found. Do not assume a body of water without a warning sign is safe.

Shorelines where algae collect are a good location to collect a water sample. Use care not to let the water contact exposed skin while sampling.

taken to make certain that hazardous concentrations are no longer present.

Harmful algal blooms are serious threats to livestock health and may be fatal. Testing suspect water sources is important to minimize livestock loss and poor animal performance. Once the presence of a harmful algal bloom has been confirmed, the best management practice is to find a different water source.

How to Collect a Water Sample to Submit for Blue-green Algae Detection

1) Find a location in the pond where algae is most concentrated. This may be a scummy area along the pond shoreline, or a patch of discolored water. If in doubt as to the best location, sample on the downwind side of the pond. Inlets and coves, where wind disturbance is minimal, are also good sites for collecting a sample.
2) Use a clean plastic bottle with a screw lid to collect the sample. The bottle does not have to be sterile. A 20-ounce or 1-quart soft-drink bottle will work well. Rinse the bottle with pond water before collecting the sample. If present, be sure to include some of the pond scum in the sample. Avoid touching the water or wear gloves while collecting samples.
3) Fill the bottle with pond water, screw on the lid, and immediately place it into a cooler with ice or transport it to a refrigerator.
4) Keep the sample cool until it is shipped to the lab. Although the sample can be kept cool for a few days before submitting it to the lab, it is recommended that it be shipped the same day it is collected. It is preferable to avoid collecting and shipping samples on days when they will arrive at the lab on the weekend and sit 1 to 2 days before being processed.
5) Fill out a sample submission form that includes your name, preferred contact method, and contact information (phone, fax, email, or address). A submission form can be found at: *www.vet.k-state.edu/depts/dmp/service/pdf/general.pdf* . Fill out the owner/producer section of the form. Specify the test you are requesting as "blue-green algae" in the history section at the bottom. Add any information you may need to identify where the sample was taken (Bottle 1, Jedlicka pasture, west pond). Place the form in a resealable zipper bag so moisture from the ice packs doesn't cause it to disintegrate or the ink to run.
6) Wrap the joint between the lid and the bottle with tape to seal it. Put the bottle in a resealable zipper bag and seal it. Place the bottle in a box or small polystyrene foam container and surround it with ice packs. Place enough packing insulation and ice packs around the bottle to keep it cool until it arrives at the lab. Multiple bottles can be included in one shipping container, but each should be clearly marked with the site where it was collected so results can be matched with water source.

Ship the water sample to :
Kansas State Veterinary Diagnostic Laboratory
Mosier D-117
1800 Denison Avenue
Manhattan, KS 66506-5601

Results should be available within 24 to 48 hours after the sample arrives.

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