UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

UCDAVIS VETERINARY MEDICINE

Summertime - blue-green algae time

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Blue-green algae, also known as cyanobacteria, can be found in surface water like ponds. These photosynthetic bacteria do not necessarily pose a threat and are actually part of the ecosystem that provides oxygen to other micro-organisms. Under certain conditions, though, a so-called algal bloom may lead to a dramatic increase in their numbers and their subsequent die-off releases toxins into the water. Warm weather, stagnant water, and nitrogen or phosphorus fertilizer runoff are risk factors that can result in these algal blooms. Some slow flowing creeks and rivers can also be impacted – every year the Klamath Rivers seems affected and Clear Lake is known to have had problems as well. Mild winds can push and concentrate blue-green algae on the water's edge. You will see scum, foam, or a mat of algae, or they can look like paint floating on the water surface. Their color can vary between blue, bright green, brown or reddish.

Blue-green algae produce two types of toxins, neurotoxins and hepato-toxins (liver toxins). Both types can lead to sudden death in cattle if they drink water from ponds where blue-green algae were blooming. Dogs playing in or drinking from ponds and other animals have also been affected. Exposed cattle can have bloody diarrhea, be weak or seem confused. Often the only sign is sudden death. Those animals surviving hepatotoxic toxin exposure can develop what is called photosensitization caused by liver damage, a term for describing that their skin is more sensitive to light, where the skin, especially

the lighter areas like muzzle, teats, or vulva peels off. Blue-green algae toxicity is in any case a severe problem and ranchers should be on the lookout to avoid their cattle becoming exposed.

When you are suspecting a blue-green algae bloom, the best way to avoid problems is to prevent access to the water source by fencing off the pond and providing a different water source. Toxin levels will increase as the cyanobacteria die. Once the water has cleared up, the best way to assure the water is safe again is to test at the lab. Toxins likely distribute evenly throughout the water so pumping water from the bottom of the pond may not be safe. However, this can be a good method of prevention. Cattle standing in small ponds depositing nutrients can exacerbate conditions and lead to algal blooms. Smaller water bodies are more vulnerable, because a larger volume of water helps dilute the nutrient load, but large lakes and reservoirs are not immune and have been impacted as well. Diverting water from a pond to a water trough and then fencing off the pond can decrease the nutrient load and help prevent algal blooms. The Natural Resources Conservation Service (NRCS) can help cost share with this and other livestock water development projects.

If you are in doubt whether you have blue-green algae in your pond, there are a few simple tests to distinguish them from normal harmless water plants or other types of algae. Wear gloves for all these tests to avoid contact with toxins. Thrust a stick onto a mat of algae and pick it back up – if it comes back looking like it has been dipped in paint, it is blue-green algae. If it comes back with threadlike algae dangling from it, it is a different type of harmless algae. Another way to check for blue-green algae is to fill a mason jar or other clear container about ¾ with water and refrigerate overnight in a secondary container like a clear plastic bag to avoid any contact between the jar and other surfaces. Carefully inspect the next day; if all the algae are at the bottom, they are likely not blue-green algae. If they are floating at the surface, they are likely blue-green algae. These tests are not 100 % accurate but can be helpful in assessing the situation. If you identify blue-green algae in your pond, that does not necessarily mean that they pose a threat at that time. It does mean, however, that you should watch for algal blooms where toxins are released.

Testing at CAHFS lab is also possible. The lab offers an algae toxin panel, which is priced at $605 to test for 4 different toxins (Anatoxin-A, Cylindrospermopsin, Microcystins, Saxitoxins) or $165 for individual toxins. Testing requires 500 ml (about 1 ½ pints) of water that should be shipped on ice to the lab.

If one or more animals die acutely, it is important to consider a postmortem examination to try to determine if an algal toxin is the cause of death. The liver damage associated with exposure to hepatotoxic blue-green algae is dramatic and this can indicate the need to test for microsystins in water or gastro-intestinal content samples. The neurotoxic blue-green algae toxin does not cause any changes in organs after death, but gut contents can again be tested to help determine a cause of death.

Copper sulfate is a way to treat the water and kill the algae but can lead to high copper levels in the water, which can be harmful to cattle. Sheep are particularly susceptible to copper toxicity. Any treated drinking source should be tested for copper levels prior to allowing sheep to consume the water after a copper sulfate treatment. It is important to follow label directions to ensure enough product is used to be effective, but not an excessive amount that can cause toxicity to animals. Bleach can also be a successful treatment. If a pond is treated it will be necessary to determine the volume of the pond, so the proper amount of product is applied. UC ANR publication 8681 demonstrates a method for measuring pond volume. In addition, rapid die-off of algae can lead to large amounts of toxins being released into the water making it unsafe even though it appears clear. For this reason, and to ensure

ample time for the product to work, livestock should be excluded from the treated water source until the treatment period is over.

More sophisticated technical solutions are available but come with a price tag. Devices that emit ultrasound waves prohibit microscopic algae from floating to the water surface where algae need to spend time for photosynthesis, which is the plants' way of turning sunlight into energy. Blue-green algae will not survive without that energy source. Full systems adapt the emitted ultrasound frequencies according to an algorithm and monitor water quality in real-time alerting the user to any changes in algae levels. The advantages of this system are that the algal cells are not lysed and do not release their toxins into the water and no chemicals must be used that could be potentially harmful to non-target species. A ballpark figure is about $1,200 / surface acre for larger water bodies. Smaller, less sophisticated units are also available. The disadvantage of this system is that it is less effective in shallow water below 3-4 feet.

Mechanical aeration and mixing are other ways to decrease blue-green algae but require an electrical power source and systems maintenance. Mixing is more effective for deeper water bodies (> 45 ft).

Another thing to keep in mind is that cyanobacteria have been around for billions of years and know a thing or two about evolution. They can adapt to their environment, so whatever you do to control them it's important to stay a step ahead of them and not rely on the same method over time.