BLUE-GREEN ALGAE

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Blue-green algae, also known as cyanobacteria, are commonly found in Iowa's lakes, ponds, rivers, and streams during the summer and autumn. Cyanobacteria often form dense blooms that create mats on the water surface and are fueled by nutrient loading from the watershed. Late summer blooms are often stimulated by phosphorus and nitrogen runoff from storms. Blooms can be especially bad when storm events are followed by prolonged periods of hot temperatures.

Blue-green algae can pose a health risk to humans, livestock, pets and wildlife as they sometimes produce nerve and liver toxins. During blooms, toxin concentrations can reach very high levels and can produce severe adverse reactions, including human and livestock fatalities, if that water is consumed. Because it is difficult to predict toxicity from these blooms, it is best to not let animals consume or swim in water that is "pea soup" green in color.

Blue-green algae can produce several toxins including neurotoxins that are extremely poisonous and can be fatal within a few minutes. Occasionally, livestock are found dead next to water with blue-green algae blooms. Clinical signs of neurotoxin poisoning are rapid onset of rigidity and muscle tremors followed by paralysis, cyanosis and death. Poisoning with the neurotoxin does not result in gross or microscopic lesions.

Blue-green algae also can produce hepatotoxins that are toxic but do not kill livestock as rapidly as neurotoxins. Clinical signs associated with hepatotoxins include gastrointestinal tract disturbances characterized by vomiting (depending on species), abdominal pain and diarrhea. This is followed by weakness, lack of responsiveness and death. In the liver, destruction of hepatocytes occurs soon after ingestion. Rapid necrosis of the liver cells often results in severe hemorrhaging into the liver which can cause shock and death. If death due to shock does not occur, then death results from liver failure, often within 24 hours. Secondary (hepatogenous) photo-sensitization can occur after ingestion. On gross examination, the liver often is enlarged, swollen and dark red. In some cases, there is significant edema around the gall bladder. There can be massive liver necrosis with severe intrahepatic hemorrhage.

Toxicosis due to neurotoxins or hepatotoxins are diagnosed based on history of exposure to blue-green algae, clinical signs, the presence of blue-green algae in the gastrointestinal tract, and gross and histological liver lesions for hepatotoxins only. In addition to tissue samples, a small amount of contents from the duodenum and upper ileum should be collected and fixed in 10% neutral buffered formalin (NBF) for identification of blue-green algae. In cases of suspected blue-green algae poisoning, the algae should be collected from the suspected water source soon after the incident. One quart of water should be collected for toxin identification. An additional quart of water should be collected for identification of algae. Both samples should be refrigerated or kept on ice and transported to the analytical laboratories as soon as possible. We have a new test available to look for the actual toxin in the water sample. Great care should be taken to insure safety of the collectors. The ISU Limnology Laboratory can analyze water samples for blue-green algae presence and abundance.

Various techniques have been used to reduce blue-green algae blooms in lakes and ponds. First and foremost, watershed management strategies to reduce nutrient runoff should be implemented to reduce the occurrence of future blooms. Reducing nitrogen and phosphorus fertilizer applications and establishing vegetated buffer strips around the lake/pond or inflowing streams are two ways to minimize nutrient loading into the system. Installing an aeration or mixing device to create turbulence reduces the competitive advantage that blue-green algae have by not allowing them to regulate their depth in the water column.

Algaecides and other additives can be effecting at mitigating algal blooms. Blue dyes will block the wavelengths of sunlight needed for photosynthesis and prevent algal growth while algaecides such as copper sulfate kill algae. Algaecides should be applied carefully and in small doses as they are harmful to fish and wildlife and rupture algal cells which can release lethal levels of toxins. Barley straw extract also can be used to prevent the formation of blooms. In this treatment, barley straw is placed loosely in a mesh bag and suspended within the affected lake or pond. Barley straw should be applied before algal blooms develop as the compounds released by the straw are more effective in preventing algae growth than in killing algae already present. The straw becomes active within a month and will continue to inhibit algae growth for up to six months.

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