

Cyanobacterial Toxicity

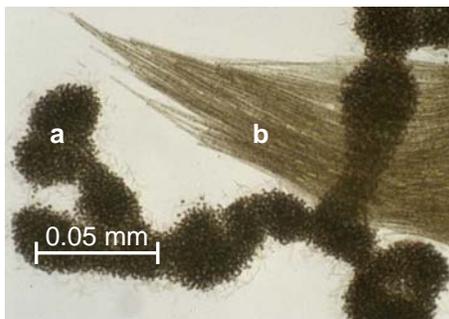
What are Cyanobacterial Blooms? – Cyanobacteria are a unique group of bacteria that, in the same fashion as algae and plants, utilize photosynthesis to generate the energy required for growth and reproduction. When cyanobacteria grow profusely and congregate, they make lake water look like pea soup. This condition is called a cyanobacterial bloom. Cyanobacteria are natural inhabitants of Alberta's lakes and more than 100 species of cyanobacteria have been recorded.

Why Do Cyanobacteria Make Lakes Toxic? – Of concern is the fact that several common bloom-forming species produce potent toxins. Cyanobacteria have long been known to be toxic. Since the first reports over 100 years ago, numerous cases of animal poisonings have occurred worldwide, including periodic episodes within Alberta. Even reports of human illness and death have been documented in several countries over the years. Continuing research has shown that cyanobacteria can produce different types of toxins. The most common of these globally are the liver toxins called microcystins. Less common are several neuro- (nerve) toxins, including anatoxin-a, anatoxin-a(s) and saxitoxin (otherwise known as paralytic shellfish poison). Furthermore, some cyanobacteria produce mild dermal toxins that act as skin irritants.



Cyanobacterial bloom on Hastings Lake, AB

Can Toxicity be Predicted? – Not all species of cyanobacteria produce toxins, yet some species produce several types of toxin. Even within a single species, some strains are toxic while others are not. This makes the prediction of toxicity an arduous task and certainly more difficult than simply predicting bloom occurrence.



Common bloom forming species of cyanobacteria: a) *Microcystis aeruginosa* and b) *Aphanizomenon flos-aquae*.

In most cases, however, toxic and non-toxic strains of a species occur simultaneously. The concentration of toxin(s) is dependent on the density of toxin-producing species in a lake. Intensity and species composition of blooms varies both over time and with location in lakes, as a result so too will toxicity. Lakes that have never had a problem can suddenly become toxic and, conversely, lakes that have shown toxicity in the past may not be for several years. Some parts of the lake could become toxic while others could remain safe. Caution should be exercised at any lakes where blooms have occurred in the past.

Toxicity is temporary. Neurotoxins degrade rapidly in the environment. Microcystins, on the other hand, are more persistent, but generally about 90 per cent of the toxin will degrade naturally within two weeks following the collapse of a bloom.

How Do Cyanobacterial Toxins Affect Animals?

– When a lake becomes toxic as a result of cyanobacteria, the only sign of a problem may be dead waterfowl or wildlife near the shoreline. Occasionally, domestic animals such as livestock or dogs may be poisoned if they have no other source of drinking water.



Shoreline bloom on Pigeon Lake, AB.

Microcystins primarily affect the liver and cause a slow death, up to 36 hours following consumption of tainted water. Common symptoms of poisoning are lethargy, pallor, extreme gastro-intestinal pain and diarrhea. This may lead to liver damage and hemorrhaging and in severe cases result in death by shock as much of the body's blood pools in the liver. In contrast, neurotoxins cause a rapid death, often within 30 minutes due to paralysis and respiratory arrest. To confuse matters, several toxins may be present at once and thus symptoms may vary or lack clear definition. The amount of water required to kill an animal generally depends on the density of toxin-containing cyanobacteria and the size and health of the animal. Old, very young, sick or weak animals generally have lower tolerance levels and will be poisoned with much smaller volumes of water consumed.

How Do Cyanobacterial Toxins Affect People? – Humans are just as susceptible to cyanobacterial toxins as animals, but it is unlikely that people would voluntarily drink affected lake water because of its objectionable appearance and odour. This explains the few records of toxicity causing death in humans. However, people can suffer acute discomfort after ingesting or contacting cyanobacteria.

Symptoms of liver or neuro toxicity may include fever, headache, dizziness, stomach cramps, vomiting, diarrhea and sore throat. Dermal toxicity usually includes skin and eye irritation and swelling, sore throat and swollen lips, but may also include other symptoms usually associated with swimmer's itch, such as hives. Symptoms seldom persist for more than two or three days. Children may be more intensely affected because they spend more time in the water than adults. Also, they may accidentally ingest contaminated shoreline water and have lower tolerances to the toxins than adults.



Severe cyanobacterial bloom

How is Toxicity Determined?

– Confirming the presence of toxins in lakes and reservoirs is not a routine procedure. If the death or distress of animals is observed near a lake or human illness occurs, several methods, each with their own limitations, can be used to determine whether cyanobacterial toxins are implicated. Currently, laboratories in the Province are able to rapidly determine the concentrations of the liver toxin microcystin and the neurotoxin anatoxin-a.

Trained analysts can determine the presence of potentially toxic cyanobacteria microscopically, but this technique cannot distinguish toxic from nontoxic strains because the strains look alike. However, the presence of toxin-producing species is generally considered an appropriate indicator of the presence of one or more toxins and their density is a reasonable indicator of the degree of toxicity.

What Precautions Can You Take?

- Treat all blooms with caution
- Do not drink water from cyanobacteria laden or bloom-infested lakes and reservoirs
- Do not swim or wade in water containing concentrated cyanobacteria
- When at the lake, watch your children carefully
- Provide alternative sources of drinking water for domestic animals and pets

Who Can You Contact?

If you suspect a health problem related to cyanobacteria, including whether to swim in a lake, contact your [regional health authority](#).

If someone experiences symptoms that may be related to cyanobacteria, **contact a physician** immediately.

If your pet has symptoms, **contact a veterinarian** as soon as possible.

If you have questions about water quality or if you find dead animals in or near a lake, contact your [regional](#) Alberta Environment office or the Environmental Monitoring and Evaluation Branch by calling toll-free (310-0000).

For more information on this issue read about [Cyanobacterial Blooms in Surface Waters](#).