

Information about blue-green algae:

Background, potential impacts to human health and safety of drinking water.

What are blue-green algae?

Blue-green algae are primitive microscopic plants that have inhabited the earth for over 2 billion years. The first recognized species were blue-green in colour, hence their scientific name **cyanobacteria**, but they can range in colour from olive-green to red. Variants of these algae inhabit a wide variety of environments including fresh water bodies where they are more commonly known as pond scum.

Are fresh water blue-green algae a concern?

Normally blue-green algae are barely visible but when conditions are favourable algae populations can rapidly increase to form a large mass called a bloom. Blue-green algae blooms are natural phenomena that occur in fresh water lakes, bays and inlets in countries around the world.

Do blue-green algae blooms occur in Ontario?

Blooms of cyanobacteria have been reported in various locations throughout Ontario where they are a seasonal phenomenon. Blooms usually occur during the warmer weather of late summer and early fall and tend to occur repeatedly in the same water bodies.

What conditions favour algae growth?

Blue-green algae thrive in areas where the

water is shallow, slow moving, and warm, but they may also be present below the surface in deeper cooler water. One key factor affecting growth rates is the level of available nutrients such as phosphorus and nitrogen.

Where do these nutrients come from?

Although blooms of cyanobacteria are a naturally occurring phenomenon, human activities can provide the physical and chemical conditions cyanobacteria need to thrive. Storm water runoff, industrial effluent, agricultural runoff and effluent from waste management systems including faulty septic systems lead to the nutrient enrichment of water bodies, thereby promoting the occurrence of algae blooms. Controlling or eliminating the amount of additional nutrients entering the water body can effectively reduce the occurrence and severity of algae blooms.

How can I recognize a blue-green algae bloom?

Dense blue-green algae blooms may make the water look like bluish-green pea soup. When the blooms are very large, they may form solid-looking clumps. Fresh blooms often smell like newly mown grass; older blooms smell like rotting garbage. The nuisance (fouling) factor and the aesthetic (smell) problems caused by blue-green algae blooms are well known.

Should I be concerned about blue-green algae?

It is prudent to be cautious about blue-green algae blooms. Although many varieties of cyanobacteria are relatively harmless, blooms of cyanobacteria may contain algae species with the potential to produce toxins which may be harmful to human health and the health of animals. The first report of harm to animals from blue-green algae came from South Australia in 1878.

The most common toxins are called **microcystins**. These toxins are contained within the algae cell and are released to the water when the cell wall is broken either due to natural death and decay of the cell or by corrosive chemicals or abrasion. Higher levels of toxins may occur during blooms when cyanobacteria cell numbers are high and concentrated in one area. Therefore, as a precaution, any cyanobacteria bloom should be regarded as being potentially toxic.

Can blue-green algae blooms be treated?

Treating blooms with herbicides, copper sulphate or other algicides is not advisable because these treatments may break open algae cells and release more toxins into the water. This characteristic makes treatment of algae blooms difficult. Therefore, the mitigation of algae blooms is better accomplished through preventive rather than remedial measures.

How can blue-green algae blooms be reduced or prevented?

Blooms of blue-green algae may form when nutrients are readily available in the surface water body. Therefore, taking steps to reduce or prevent additional sources of these nutrients from entering the water can reduce the occurrence of blue-green algae blooms.

Preventative steps include, but are not limited to:

- using phosphate-free detergents;
- not using fertilizers and maintaining a naturalized shoreline on lakefront properties;
- taking steps to reduce agricultural run-off

such as populating set backs along waterways with plants; and

- ensuring that septic systems do not leak into the water source, have sufficient attenuation area to prevent nutrients in normal septic effluent from reaching the water, or by using alternative septic handling methods.

What are the potential health effects associated with blue-green algae toxins?

The severity of symptoms and level of risk to health is dependant on the mode of exposure to the cyanobacteria toxins. Human health effects from contact with these toxins may include:

- itchy, irritated eyes and skin that may result from direct external contact through recreational activities, such as swimming and water skiing; and
- if the toxins are swallowed, symptoms such as headaches, fever, diarrhea, abdominal pain, nausea and vomiting.

Higher levels of risk to human health are linked to ingestion of large quantities of cyanobacteria toxins in water. Drinking contaminated water is the most common route of toxin consumption.

For information on the health related risks and what to do to safeguard human health during a blue-green algae bloom, contact your local Health Unit.

For information about your health unit, call the Ministry of Health **INFOline** at 1-800-268-1154 or visit:

http://www.health.gov.on.ca/english/public/contact/phu/phuloc_mn.html

Can drinking water be contaminated with toxins from blue-green algae?

If drinking water is obtained from a surface water source during a blue-green algae bloom then it is possible that the water may become contaminated with toxins released during decomposition of the algae cells. Usually

people won't drink water contaminated with blue-green algae blooms because of its unsightly pea soup appearance and foul smell. However, sometimes it is hard to tell if the drinking water has been contaminated unless confirmed by laboratory tests specifically for measuring microcystin levels.

How much microcystin is allowable in drinking water under the Ontario Drinking Water Quality Standards?

Although appreciable levels are extremely rare in treated water, due to the potential health risk microcystin-LR has been identified as a toxin parameter of interest in drinking water. The Ontario Drinking Water Quality Standard for the cyanobacteria toxin microcystin-LR is a maximum acceptable concentration (MAC) of 0.0015 mg/L (O.Reg 169/03, schedule 2).

Can water containing cyanobacteria be treated to make it safe to drink?

Treatment of drinking water containing algae may be effective when the cyanobacteria have been removed through specialized filtration systems. These systems remove whole cyanobacteria cells early in the treatment process thereby reducing the potential for toxin release. Some treatment processes have also been found effective for removing toxins; these include particular oxidation processes, activated carbon, and membrane filtration.

For the most part, large drinking water treatment systems are more likely to have the specialized treatment facilities that are capable of dealing with the effects of cyanobacteria blooms.

What about smaller treatment systems and private supplies?

Small drinking water systems with modest treatment facilities and private supplies with either no treatment or minimal water treatment systems are less likely to have the specialized equipment to effectively filter and treat water during cyanobacteria blooms. The treatment methods most commonly used by these sectors are for the most part ineffective against cyanobacterial contamination because

they can potentially rupture the algae cell wall and release the toxins to the water.

For example:

- Countertop jug filtration systems do not provide reliable treatment because they do not properly filter the water of algae and toxins;
- Boiling the water may break the cell wall releasing more toxins into the water; moreover boiling does not remove or neutralize any microcystin present in the water; and
- Some disinfection techniques, such as using chlorine (bleach), are ineffective as the treatment may chemically corrode the cell wall thereby releasing more toxins into the water.

Take a cautious approach.

If you suspect a blue-green algae bloom, assume toxins are present and call the Ministry of the Environment Spills Action Centre at **1-800-268-6060**.

Reduce the likelihood of health risks by avoiding activities that increase exposure to these toxins during algae blooms; call the local Health Unit for information and follow their advice.

If you are unsure about the safety of water for drinking during an algae bloom, then use alternative water sources such as bottled, carted or tanked water.

You can also call a water treatment service provider for help. A detailed list of service providers is on the Ministry of the Environment's Web site at:

www.ene.gov.on.ca/envision/gp/4222e_appendix.htm

For more information on blue-green algae contact the Ministry of the Environment's Public Information Centre at: 1-800-565-4923 and see Health Canada's fact sheet at:

www.hc-sc.gc.ca/hecs-sesc/water/factsheets/blue_green_algae.htm