

**Report to the Florida Harmful Algae Bloom Taskforce**

**Frequently Asked Questions About  
Blue Green Algae (Cyanobacteria) and Their Toxins**

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**Q: What are blue green algae (cyanobacteria)?**

**A:** Blue green algae are a group of organisms that are among the oldest on the planet. They can live in freshwater, salt-water or in mixed "brackish" water. Most of us know them as "pond scum." These "blue green" algae can actually be many colors including red, orange or brown. They also have been found to share some characteristics of bacteria, which has led to them being referred to as "cyanobacteria."

**Q: What causes these organisms to form "blooms"?**

**A:** When blue green algae multiply rapidly over a short time it is called a "bloom." It is known that light, temperature, and the water's nutrient content play roles in bloom formation. Under favorable conditions a large bloom can form overnight, and rise to the surface as a huge unsightly mat of pond scum. A blue green algae bloom can also lie below the surface of the water. Slow-moving water or water rich in run-off from farms or sewage treatment plants seem to be common places for the development of blue green algae blooms. Blooms can also spontaneously disappear or move to different parts of a pond or lake.

**Q: What causes some blooms to be toxic?**

**A:** There are thousands of blue green algae species and many more are still being discovered. Most actually do not produce toxins that are harmful to humans or animals. However, some types of blue green algae can produce substances that are known to be toxic. These blue green algae include *Microcystis*, *Cylindrospermopsis*, *Anabaena*, *Nodularia*, *Oscillatoria* and *Aphanizomenon*. These blue green algae produce toxins within their cells that are then released when the cells die or are ruptured. It is not possible to tell just by looking at a bloom whether it is toxic. Over time, these toxins are diluted and eventually break down and disappear. However, some of these toxins may remain in fish and shellfish that have consumed blue green algae. It is not yet clear why these blue green algae make toxins.

**Q: What systems of the body can be affected by blue green algae toxins?**

**A:** There are many types of blue green algae toxins, but they mainly fall into three categories: hepatotoxins, neurotoxins and dermatotoxins. Hepatotoxins affect the liver, neurotoxins affect the nervous system, and the dermatotoxins affect the skin and mucous membranes. Studies of these toxins in the laboratory show that at high concentrations the neurotoxins and hepatotoxins can be deadly to mice. The dermatotoxins can cause skin irritation (sores or blistering) with contact, and digestive problems when swallowed.

**Q: How do people and animals get exposed to these toxins?**

**A:** People and animals (including pets) can be exposed when a person or animal swims through a bloom or drinks untreated water containing high levels of blue green algae and/or their toxins. Water skiers, users of jet-skis, and others using water for recreational purposes may be exposed through inhalation of water droplets with high levels of bloom-related toxins. Farm workers can also be exposed if untreated water is used for irrigation.

There was a report in 1996 of human deaths in Brazil due to high levels of cyanobacterial toxins in water used for kidney dialysis. The dialysis patients were especially vulnerable to toxins because they were already sick. The water responsible for these deaths, which had not been treated, came from a reservoir with a major blue green algae bloom. It is important to note that this was a very unusual event in that already ill people were exposed to untreated water directly into their bloodstreams. This is not a typical route of exposure to blue green algae toxins.

Chronic exposure can occur when people consume the blue green algae toxins at low levels over many years in drinking water, or possibly food such as shellfish. The effects of chronic exposure to low levels of cyanotoxins are not well understood, and need further research.

**Q: What are the health effects of the blue green algae toxins?**

**A:** There have been case reports through the years of people and animals becoming acutely ill after drinking untreated water found to be contaminated with blue green algae toxins. Their health complaints have ranged from skin irritation or rash, to flu-like stomach ailments, particularly diarrhea. There have been many reports of animals dying after drinking untreated scummy pond or lake water with blue green algae overgrowth. Liver abnormalities have been found in laboratory animals exposed to blue green algae toxins, and also in humans who became ill after drinking water later found to be contaminated with blue green algae toxins. Persons having recreational and/or occupational exposure to blue green algae blooms have reported hay fever-like symptoms including itchy, watery eyes, and/or asthma. These symptoms usually clear up in several days to weeks, with treatment only for symptoms.

The question of the long term, chronic effects of exposure to small quantities of blue green algae toxins is still under study. In the mid-1980's, studies were done in China, where people were drinking untreated water contaminated with blue green algae toxins. It was found that drinking contaminated pond and ditch water was associated with high rates of liver cancer. When the quality of drinking water sources was improved in these areas, the rate of liver cancer decreased. Subsequent studies in mice have shown that some blue green algae toxins cause pre-cancerous damage to both the liver and the bowel. These toxins may be a special risk to people with liver disease, such as hepatitis. How many cases of cancer can be attributed to blue green algae toxins in the US (where drinking water is of high quality) remains unknown.

**Q: How can I prevent exposure to these toxins?**

**A:** Most people will avoid a blue green algae bloom automatically because the blooms that rise to the surface tend to be icky-looking and smelly. Sometimes however, pets and children will not have the good sense to stay away. *It is critical that pets and children are kept from getting into blue green algae blooms and the surrounding water.* There are numerous cases dating back to the 1800's of pets and livestock dying after drinking blue green algae contaminated water. Children also are more vulnerable generally to environmental toxins than adults.

*Swimming in water that is visibly rich in blue green algae is a bad idea.* Swimmers have reported rashes, hay fever-like symptoms and even pneumonia associated with blue green algae blooms and their toxins. Abdominal cramps, nausea, diarrhea, and vomiting may occur if the swimmer swallows the untreated water. Even water-skiing, showering or cleaning with this water may make people sick because the toxins may be absorbed from water breathed into the nose. Unfortunately, boiling water does not remove or destroy these toxins.

**Ways To Limit Your Contact With Blue Green Algae Toxins**

- 1) Do not drink, cook or shower with untreated water from lakes, ponds or streams.**
- 2) Do not allow pets or livestock to swim in or drink scummy water.**
- 3) If you or your animals accidentally get into a blue green algae bloom, wash with fresh water and soap after skin contact, and avoid swallowing or inhaling water. Wash animals' fur thoroughly before they start to groom themselves.**
- 4) Avoid exposure to irrigation water drawn from untreated sources.**
- 5) Notify your local water quality officials if you notice unusual changes in the taste or smell of your tap water.**

**NOTE:** People who have liver problems (such as cirrhosis or hepatitis) may be at increased risk of harm from blue green algae toxins, and pregnant women should avoid contact since the effects of toxins on a fetus are unknown.

**Q: Can blue green algae supplements (such as *Spirulina*) contain toxins?**

**A:** *Spirulina* and other blue green algae species sold as health food are themselves non-toxic. However, some manufacturers collect their blue green algae from the wild where many species (toxic and nontoxic) can grow together. A recent study of supplement products produced in the weeks following a blue green algae bloom in Oregon found that 85% of the products tested contained significant levels of the blue green algae liver toxin microcystin. The US FDA has received some complaints from consumers about nausea, diarrhea and other symptoms after taking blue green algae supplements but these cases have not been confirmed as being caused by the supplements.

At this time, people who choose to use these products should exercise caution. If you take them, you might ask the manufacturer if they monitor their products for the presence of toxins, and if they culture their blue green algae or collect it from the wild. Children, pregnant women and people with impaired liver function should avoid these products until their safety has been proven.

**Q: What can be done to control blue green algae growth and prevent the toxins from causing illness?**

**A:** Blue green algae growth can be controlled by minimizing sources of nutrients (such as phosphates and nitrogen) into water bodies. These nutrients can be from fertilizer run-off, agricultural run-off (such as manure) or sewage. Plant shrubs along canal borders and only fertilize to within ten feet of a water body. Do not over-fertilize.

While blue green algae growth can be controlled with the preventive use of copper sulfate, do not use this or any common algaecide when a bloom has already formed because they can cause the cells to dump toxins into the water. There have been reports of human illness in Australia linked to the post-bloom use of copper sulfate in drinking water sources.

Research is ongoing about how to remove the small traces of blue green algae toxins from drinking water taken from surface water sources (i.e. rivers, lakes). Normally, standard drinking water treatment processes are enough to break down whatever toxins enter the treatment systems. However, when massive blooms occur in source waters, small amounts of toxins can remain even in the treated drinking water.

This is a newly discovered problem that is being taken seriously by drinking water quality officials. Currently, there is no monitoring program in place in Florida. However, when drinking water treatment facilities realize that there is a blue green algae bloom in progress, they can take steps to remove the bad taste, odor and most toxins by adding activated charcoal and other steps to ensure the safety of the drinking water.

Of note, the World Health Organization (WHO) has established guidelines for the safe level of toxins in drinking water as well as possible treatment processes to remove these toxins. Unfortunately, these are expensive measures that cannot be maintained over long periods. Researchers in Australia, UK and US are all looking for more practical means of safeguarding the water supply from blue green algae toxins.

Watching our water for blue green algae blooms is going to become important in preventing toxins from causing illness. Because there is limited monitoring for blue green algae blooms in Florida, it is important to report unusual bloom activity to your local water quality officials.

**Q: Are there any drinking water standards for these toxins?**

**A:** There are currently no standards for blue green algae toxin levels in drinking water in the US. The EPA is in the process of evaluating these toxins to decide whether, and at what levels, they should be regulated. Other countries and the World Health Organization have developed guidelines for drinking water, but these are not regulatory levels.

**Q: Whom can I contact to report a blue green algae bloom or to get more information about water quality?**

**A:** There are several toll free hotlines available for people to report unusual water events such as dead fish in the water or illness associated with water contact.

Fish Kill Hotline (FL Fish & Wildlife Conservation Commission)	1-800-636-0511
Human Illness (Poison Information Center)	1-888-232-8635

If you have been exposed to possibly toxic blue green algae and are experiencing symptoms, be sure to mention your exposure to your doctor. It is important for public health authorities to record cases and take action to prevent the exposure of others.

For more information about blue green algae, please visit the Florida Marine Research Institute Website (<http://www.Floridamarine.org/>).