

Water Contaminant of the Month

Cyanobacteria, or blue-green algae are microscopic aquatic organisms which use sunlight and nutrients in the water to perform photosynthesis. They may occur as single cells or as groups of “pond scum” on the surface of still water bodies. Cyanobacteria release toxic compounds called cyanotoxins which are harmful to humans and animals.

Blue-green algae, as their scientific name, cyanobacteria, suggests are not really algae. Unlike the more common filamentous algae which occur frequently on nutrient-rich ponds in Oklahoma, blue-green algae are really bacteria. There are over 150 types of cyanobacteria, but the most commonly occurring species are anabaena and microcystis. They can cause an earthy, musty odor in water due to two organic compounds that are produced: geosmin and MIB (2-methylisoborneol).

Cyanobacteria are invisible in small numbers, but can multiply rapidly into raft-like “blooms” in warm, nutrient-rich, undisturbed water. Shallow ponds are especially susceptible in the hot days of late summer. Anabaena blooms can appear as a shimmering film along the downwind shore of ponds on calm mornings that look much like a thin coating of blue-green paint on the water surface. Other species can produce blooms that are green, blue-green, yellow, red or brown. The only sure way to detect cyanobacteria is to analyze a water sample under a microscope. The OSU Animal Disease Diagnostic Laboratory in Stillwater can analyze water samples for infestations.

Humans and animals can be affected by cyanobacteria by swallowing contaminated water or by inhaling aerosol-like droplets while swimming. Cyanotoxins produce gastrointestinal and lung ailments, allergic responses, skin and eye irritations, liver damage, tumors and neurotoxic effects. The effects of long-term consumption of low concentrations are unknown. Consumption of sufficient amounts of contaminated water can be fatal, and the OSU Veterinary Diagnostic Laboratory usually confirms at least one cyanotoxin death of livestock each year.

There are no state or federal standards for cyanotoxins in US drinking water. The EPA has added cyanobacteria to its Drinking Water Contaminant Candidate List (CCL). The World Health Organization guideline for the cyanotoxin *microcystin LR* in drinking water is 1 microgram per liter (1 ppb).

Disinfection methods using chlorine and ozone can kill cyanobacteria in water, but also destroy the organism cell walls which releases the cyanotoxins into the water. Chlorine and ozone speed the decomposition of cyanotoxins but significant contact time is required. Copper sulfate effectively destroys cyanobacteria infestations in ponds. Reverse osmosis, nanofiltration and ultrafiltration will remove the organisms and may also reduce the concentration of cyanotoxins in treated water. Activated carbon filtration will adsorb a significant amount of the cyanotoxins from treated water.

(Source: *Water Technology* 32:10; October, 2009 and
What Do You Know About Blue-Green Algae by Jerry Biberstine)