

Nutrients in Iowa's Water Bodies May Lead to Harmful Microcystin Toxin

Every summer the hot weather ushers in a series of swim advisories at Iowa's lakes. One of the reasons for a swim advisory is the presence of microcystin toxins. A swim advisory is a warning that unsafe levels of microcystin exist, levels that are harmful to human health. The toxins are created by bacteria that thrive in waters that are polluted with nutrients (mostly phosphorus) and blue-green algae growth.

On June 6, 2019, the federal Environmental Protection Agency (EPA) released its final recommendations for levels of microcystin toxins that are safe for people who are swimming or participating in primary contact recreational activities on the water. EPA recommends the level of exposure to be 8 micrograms per liter in order to protect swimmers and swim advisories at levels higher than that.¹ The Iowa Department of Natural Resources (DNR) implemented this recommendation prior to the 2020 swimming season.



A dead fish in microcystin contaminated water at Binder Lake in Adams County in Iowa. Credit: Dr. Jennifer L. Graham, U.S. Geological Survey

How microcystin is created

Blue-green algae looks like a blue-green scum on a lake. The algae can also form thick mats.

Blue-green algae growth is caused by nutrient-rich runoff from farm fields and urban areas entering water bodies during warm weather. The nutrients come from commercial fertilizers and manure. The algae growth attracts a bacteria called *Microcystis* which produces a toxin called microcystin. The water becomes green and smelly.

Unfortunately one cannot use the appearance and smell of the water to determine if microcystin toxins are present. Sometimes elevated levels of microcystin toxins are present even though there are no signs of a blue-green algae bloom. Although most people would not recreate in smelly water, the toxin can be carried in water droplets, which can expose folks who are not recreating in the water.

Exposure to microcystin toxins is harmful

Exposure to the toxin can cause serious health problems. "The primary concern with microcystin pollution is very young children who play in the shallows and may put their hands in their mouths."² However

¹ "Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin", Environmental Protection Agency, June 6, 2019

² Erin Jordan, "Warning of toxins is first for Lake Macbride, Researcher describes 'pea soup' as far as the eye can see" at Solon site", *Cedar Rapids Gazette*, June 30, 2019

people of all ages can be harmed by exposure to microcystin. People who come into contact with the water laced with the toxin can develop blisters around the mouth and rashes. Drinking water contaminated with blue-green algae and the related toxins can result in diarrhea, nausea, vomiting, stomach pain, headaches, sore throats, and even liver and kidney damage. Breathing contaminated water droplets can cause respiratory problems such as pneumonia.

Microcystin can also have negative effects on farm animals, pets, and wildlife, including seizures and paralysis.³.

Blue-green algae and microcystin toxins have affected drinking water

Microcystin toxins may enter into drinking water systems. In August, 2014, national news carried reports that the drinking water in Toledo, Ohio, was unsafe to drink due to the toxin formed by the presence of blue-green algae. For several days, residents of Toledo, Ohio, were forced to drink bottled water and to curtail other uses of tap water.

Iowa cities that rely on surface water sources for drinking water are particularly vulnerable, including Des Moines, Iowa City, and Davenport. Also vulnerable are those cities that rely on water taken from shallow wells, including Cedar Rapids. Luckily, Iowa's municipal drinking water utilities have remained safe.



Photo credit: Gene Alexander, USDA NRCS

Conclusion

Although the Iowa Department of Natural Resources tests 39 state park beaches for microcystin toxins every week during the swimming season, the DNR cannot possibly test all waters in Iowa and consequently cannot post warnings at those areas, including those on private land. In spite of voluntary efforts to reduce farm-produced levels of nutrients that are entering Iowa's water bodies, a significant quantity of phosphorus runs off the landscape and into the water. Microcystin toxin poisonings will continue until nutrient levels are significantly reduced in Iowa's water bodies.

For current information on swim advisories, contact the Department of Natural Resources at 515-725-3434. You can also consult the DNR's webpage at <https://programs.iowadnr.gov/aquaria/Programs/Beaches>

³ Jane J. Lee, "Driven by Climate Change, Algae Blooms Behind Ohio Water Scare Are New Normal," *National Geographic*, August 4, 2014