

Science Short Answer Prompt

In the summer of 2014, residents of Toledo, Ohio, were warned: Don't drink the water! Toxins known as microcystins had been found in the city's water supply. During the two day ban, residents were told not to drink tap water, use it to brush teeth, or cook with it.

Microcystins are produced by cyanobacteria (blue-green algae). Algal blooms of cyanobacteria can occur when water is warm, sunlight is plentiful, and available nutrients are increased. The cyanobacteria multiply quickly and then die. Upon death, their single-celled bodies release microcystins. Toxic microcystins can cause liver damage by killing liver cells. In animals, microcystins cause diarrhea, vomiting, weakness, and death.

The nutrients that start the algal bloom come from a number of sources. Cyanobacteria use the same nutrients, especially nitrogen and phosphorus, that are used to treat agricultural crops. These nutrients are found in chemical fertilizers and cow manure.

Cow manure on farmland is usually considered an environmentally safer alternative to chemical fertilizer, because the nutrients in manure are released slowly. However, some farmers spread manure on fields early in the spring, before the snow has melted. The idea is that as the snow melts, the soil will get a mixture of water and nutrients that will increase the crop yield. But many of the nutrients run off the land into streams. When chemical fertilizers are used instead of manure, nutrient runoff occurs even without snow. Many streams join to form rivers that eventually flow into lakes, such as Lake Erie. In addition, the city of Toledo's treated sewage is released into Lake Erie. If sewage isn't treated effectively, some nutrients make their way into the lake from that source, too.

Toledo's water ban was blamed on an algal bloom in Lake Erie. But algal blooms have become more frequent in Lake Erie over the past several years. Microcystins have increasingly been found in water supplies around the world. The problem is widespread and serious enough that the World Health Organization has set a limit of 1.5 micrograms of microcystin per liter of water.

There may be many reasons for the increase in microcystins, but one is definitely the increase in phosphorus. Ultimately, two things cause the increase in phosphorus – the continuing growth in human population (around Lake Erie and in the rest of the world) and the never-ending attempts to raise more food per acre of land.

Prompt

Assuming that things continue as described in this scenario, what can the citizens of Toledo expect to happen to their drinking water in the future?

Type your response in the box. This task may require approximately 10 minutes to complete.

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