Cyanotoxins detected in the drinking water reservoir at Sambaa K'e

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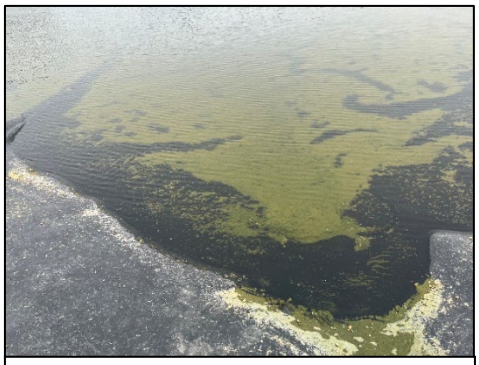
Report prepared by: Jennifer Korosi (York University), Rebecca Gasman (York University), Michael McPhee (Sambaa K'e First Nation), and Ruby Jumbo (Sambaa K'e First Nation)

Summary:

An algal bloom (visible surface scum) was observed in the drinking water reservoir at Sambaa K'e in July 2024. The bloom was accompanied by complaints of noxious taste and odour compounds in tap water and reports of diarrhea and upset stomachs. It also occurred in association with a series of other failures within the water treatment system that resulted in a boil water advisory. Examination under a field microscope revealed that the algal bloom was made up of cyanobacteria (a.k.a. blue-green algae) taxa that have the capacity to produce cyanotoxins that can be harmful to human and animal health. Untreated water samples were collected from the reservoir on July 15, 19, 24, and 25, and sent to a commercial lab for analysis of microcystin-LR, the most commonly measured cyanotoxin.



Cyanobacteria bloom in the Sambaa K'e drinking water reservoir as visible on July 19, 2024. Samples were collected for microcystin-LR analysis on July 15, 19, 24, and 25. Photo taken by Rebecca Gasman, York University.

Lab analysis confirmed the presence of microcystin-LR at levels higher than the maximum acceptable concentration (MAC) established and recommended by the federal government for total microcystins in drinking water (1.5 µg/L for adults, 0.4 µg/L for infants). Treated water was not tested and we do not know if gastrointestinal illnesses were caused by cyanotoxins.

The drinking water reservoir in Sambaa K'e is favourable for bloom development.

The reservoir is an open, standing water body with a black liner that is filled with water from Trout Lake once or twice per year. It is unprotected from windblown sediment and receives direct sunlight. This leads to stagnant warm waters and concentrates nutrients, which promotes bloom development. Waterfowl and other wildlife are often observed in the reservoir, and fecal coliform exceedances have been documented in the past.

This problem will get worse with climate change as summers get longer and hotter.

The water treatment plant at Sambaa K'e cannot remove cyanotoxins effectively.

Drinking water treatment needs to be able to remove both cyanobacteria cells and extracellular cyanotoxins that are released to the water when the cells rupture. Sambaa K'e has a Corix Water Treatment Plant (2012) that uses a combination of coagulation, membrane filtration, and chlorination. It is not designed to remove extracellular cyanotoxins. Cyanobacteria blooms in drinking water systems also block intake valves and filters, which could compromise the effectiveness of water treatment methods for other compounds of concern. Boiling water also does not remove cyanotoxins and may actually increase risk if it causes the cells to rupture and

release intracellular toxins. Sambaa K'e had to drain and clean the reservoir and household water tanks, a process that took approximately 3 weeks, during which time residents in Sambaa K'e did not have access to treated water.

Photo of the drinking water reservoir after it was drained, before the cyanobacteria residue was cleaned. Photo taken by Rebecca Gasman, York University.

Key questions that have emerged:

- How prevalent are cyanobacteria blooms in drinking source waters? Is this a larger problem that has flying under the radar in the NWT?
- What efforts are being undertaken to help local communities and water treatment plant operators identify, monitor for, and respond to cyanobacteria blooms as the effects of climate change become more pronounced in the NWT?
- How can Sambaa K'e and other communities with similar drinking water infrastructure reduce the frequency of cyanobacteria blooms in the reservoirs?
- How can communities be supported to make the necessary upgrades to drinking water treatment methods to prevent exposure to microcystins and other cyanotoxins?

Targeted strategies are needed to protect NWT residents from exposure to cyanotoxins.