

Technical Notes

Cyanobacterial Blooms in Alberta Recreational Waters

Microcystins (µg/L)

There are several known classes of cyanobacterial toxins that can pose concerns for recreational water users. Microcystins are a common group of cyanobacterial toxins that affect the liver (hepatotoxins). The different structures of the various microcystins result in very different toxicities and microcystin-LR is a highly toxic example that is regularly found in Alberta lakes. Alberta Health uses a laboratory test called protein phosphatase inhibition (or PPI) to measure the inhibition of the enzyme that is the target of microcystins. This inhibition is expressed as equivalents of microcystin-LR and represents a measure of the total toxicity of the water sample due to all microcystins present. The [2022 Health Canada Guidelines for Canadian Recreational Water Quality - Cyanobacteria and their Toxins](#) for Total Microcystins is 10 µg/L (expressed as microcystin-LR). Exceedance of this value indicates the potential for exposure to cyanobacterial toxins in amounts which may be sufficient to be harmful to human health. Microcystin data generated by Alberta Health are provided to local Medical Officers of Health to inform risk assessment of recreational beach water during the open water season and issuance of public health advisories. Prior to 2022, the guideline was 20 µg/L (expressed as microcystin-LR). For further technical details including limits of detection and analytical methodologies, please see the dataset published on the Government of Alberta's [Open Government Portal](#).

Cell Count (cells/mL)

Total cyanobacteria cell count is a general indication of the potential for bloom development and is often used by public health officials for early detection of blooms. All species of cyanobacteria present in the water sample are counted and summed, including both microcystin-producing and non microcystin-producing species. The [2022 Health Canada Guidelines for Canadian Recreational Water Quality - Cyanobacteria and their Toxins](#) for total cyanobacteria cells is 50,000 cells/mL. Exceedance of the guideline value indicates the potential for exposure to cyanobacterial materials in amounts which may, in some cases, be sufficient to be harmful to human health. For example, direct contact with cyanobacterial materials can cause skin irritation and allergic reactions. This guideline is also protective against other less commonly monitored toxins that may be produced by cyanobacterial blooms (e.g., anatoxin and cylindrospermopsin). Prior to 2022, the guideline was 100,000 cells/mL. Total cyanobacterial cell count data generated by Alberta Health are provided to local Medical Officers of Health to inform risk assessment of recreational beach water during the open water season and issuance of public health advisories.

mcyE Gene (copy/mL)

The ability to produce microcystin toxins is coded by the mcy genes in the DNA of certain cyanobacterial species. The mcyE gene can be used as a molecular marker to detect cyanobacteria that have the

potential to produce microcystin toxins in beach water samples. This test is currently in the research and development phase and is not currently used for issuing public health advisories in Alberta. This test shows promise as a rapid, cost effective, future tool for the evaluation of cyanobacterial blooms in Alberta water bodies.

Visual Evidence

Visual inspection is a monitoring tool used to provide early warning of bloom formation and assist with the interpretation of laboratory results (i.e., cell count and microcystin data). Alberta Health Services environmental health officers assess beach water for color changes and presence of surface scums and diffuse blooms. Although often referred to as “blue-green” in color, cyanobacterial blooms range in color and can be blue, green, brown or red, depending upon the species composition and age of the bloom. Identification of cyanobacteria can be difficult because of its microscopic size, range in color and the presence of other organisms that may resemble a bloom. Exceedances of Health Canada Recreational Water Quality Guidelines are commonly associated with visual confirmation of a cyanobacterial bloom. Visual inspection results from environmental health officers are provided to local Medical Officers of Health to inform risk assessment of recreational beach water during the open water season and issuance of public health advisories. Most public health advisories for cyanobacterial blooms in Alberta are based primarily on visual confirmation results.

Notes on Data Visualization in AEPHIN - Differences Compared to Open Government Portal Dataset

For the purpose of presenting visual inspection data in AEPHIN, “Visual Evidence” is presented as “no” when the sample collector indicated there was “no evidence of a bloom” and the water was described as “colourless”. All other observations of water condition by the sample collector result in “yes” being presented for “Visual Evidence.”

The type of recreational water samples collected can be “composite” (pooled sample comprised of depth-integrated samples collected using a wine thief at 10 points along shoreline; approximate integrated depth = 0.5 m) or “grab” (sample collected into a single bottle at water surface from one point along the shoreline). Data from composite and grab samples are not comparable scientifically. Currently, only data from composite samples are visualized in AEPHIN as they comprise the majority of samples collected in Alberta (>90%). Data from grab samples and data from samples where no sample type has been specified are not visualized in AEPHIN.

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