

Description of Services:

Phycological Services

Potentially Toxicogenic (PTOX) Cyanobacteria Screen:

Microscopic observation is used to determine if potentially toxicogenic (PTOX) cyanobacteria are present, with recommendations are made for toxin analysis.

Qualitative Algal Identification:

All algae, including cyanobacteria, are identified but not quantified. A species list is composed in order of relative abundance based on the empirical judgment of the phycologist.

Cyanobacteria ID & Enumeration:

Only cyanobacteria species are identified and enumerated.

Total Algal ID & Enumeration:

All algae and cyanobacteria in the sample are identified and enumerated.

Algal ID, Enumeration & Biovolume:

All algae and cyanobacteria are identified, enumerated and biovolumes are calculated.

Molecular/Genetic Analysis (rt qPCR)

16s rRNA – Total Cyanobacteria are determined to be present or absent via the *Phytoxigene Assay*

mcyE/ndfA/cyrA/sxtA – The genes responsible for the production of microcystin, nodularin, cylindrospermopsin and saxitoxin are screened for using the *Phytoxigene Assay*

anaC – The gene responsible for anatoxin-a production is screened for using rt qPCR

Toxin Analyses

Microcystins/Nodularins (MCs/NODs):

Adda ELISA – A useful screening tool for the detection of Adda microcystins and nodularins, as described in US EPA Method 546. Confirmatory analysis (*e.g.* LC-MS/MS) is recommended for any positive samples.

Microcystins Suite (LC-MS/MS) – A targeted LC-MS/MS method used to accurately identify and quantify specific variants of microcystin (MC) and nodularin (NOD). Currently, the suite includes **14** variants of MC (*[DAsp³]MC-RR, MC-RR, MC-YR, MC-HtyR, MC-LR, [DAsp³]MC-LR, [Dha⁷]MC-LR, MC-WR, [Leu¹]MC-LR, MC-HiR, MC-LY, MC-LA, MC-LF, MC-LW*) and NOD-R. Internal standards (*e.g.* *[¹⁵N₁₀]MC-LR*) and/or standard addition are used in calibration.

Total Adda MCs/NODs via MMPB (LC-MS/MS) – The oxidation and subsequent analysis of samples for MMPB allows for the determination of total Adda MCs/NODs, bound and unbound, in complex matrix material or water samples.

Anatoxin-a & Cylindrospermopsin:

US EPA approved LC-MS/MS methods for the analysis of anatoxin-a & cylindrospermopsin in finished drinking water (Method 545) or ambient water (EPA document # EPA/600/R-17/130).

Anatoxin-a:

Anatoxin-a Suite (LC-MS/MS) – A method is used to accurately identify and quantify anatoxin-a, homoanatoxin-a (HTX), and dihydroanatoxin-a (dhATX). Other analogs qualitatively screened include dihydrohomoanatoxin-a (dhHTX), epoxyanatoxin-a (epoxyATX), and epoxyhomoanatoxin-a (epoxyHTX).

Cylindrospermopsin:

Cylindrospermopsin (LC-MS/MS) – A targeted method is used for the analysis of cylindrospermopsin and epi-cylindrospermopsin (quantitative). Deoxycylindrospermopsin can be screened for (by request; qualitative only).

Saxitoxins (STX, Paralytic Shellfish Toxins):

STX ELISA – A sensitive screening tool for saxitoxin (STX) in water with limited cross-reactivity to many STX analogs.

Saxitoxin Suite (LC-MS/MS) – A highly specific analysis utilized to quantify a suite of PSTs, including dcSTX, STX, NEO, C1/C2, GTX (1,2,3,4,5,6), dcGTX2&3

Dermatoxins:

Dermatoxins: Lyngbyatoxin-A and Aplysiatoxins (LC-MS/MS) – Currently the only method available for the reliable detection and quantification of the dermatoxins lyngbyatoxin-a, debromoaplysiatoxin and aplysiatoxin.

Domoic Acid:

Domoic Acid (LC-MS/MS) – A specific technique to accurately identify and quantify domoic acid.

BMAA (β -N-methylamino-L-alanine):

BMAA and isomers (LC-MS/MS) – A specific and direct analysis technique utilized to accurately identify and quantify free BMAA and the isomers BAMA, DAB, and AEG.

Brevetoxins (PbTx):

Brevetoxins ELISA – The recommended screening approach to analyze brevetoxins and associated metabolites from water, food products, and tissue extracts.

Guanitoxin (GNT):

OP/Carbamate Assay – A screening (qualitative) method for the detection of a wide range of organophosphates including the cyanotoxin guanitoxin, previously known as anatoxin-a(s).

GreenWater Laboratories utilizes a high level of quality assurance and control to provide reliable results to its clients. We maintain standards of all commercially available cyanotoxins we test for, which is necessary for accurate confirmation and quantification.

Complex matrices

GWL/CL has extensive experience with toxin extraction from complex matrices, such as tissues, blood, gastrointestinal contents, and algal supplement material. See our Biological/Complicated Matrices Page for more information:

<https://greenwaterlab.com/biological-matrices>