# Supported Liquid Membrane-Liquid Chromatography-Mass Spectrometry Analysis of Cyanobacterial Toxins in Fresh Water Systems

**Author(s)**
Elbert A Mbukwa
Titus Alfred Makudali Msagati
Bhekie B Mamba

**Abstract**
Harmful algal blooms (HABs) are increasingly becoming of great concern to water resources worldwide due to indiscriminate waste disposal habits resulting in water pollution and eutrophication. When cyanobacterial cells lyse (burst) they release toxins called microcystins (MCs) that are well known for their hepatotoxicity (causing liver damage) and have been found in eutrophic lakes, rivers, wastewater ponds and other water reservoirs. Prolonged exposure to low concentrated MCs are equally of health importance as they are known to be bioaccumulative and even at such low concentration do exhibit toxic effects to aquatic animals, wildlife and human liver cells. The application of common treatment processes for drinking water sourced from HABs infested reservoirs have the potential to cause algal cell lyses releasing low to higher amounts of MCs in finished water. Trace microcystins in water/tissue can be analyzed and quantified using Liquid chromatography-electrospray ionization-mass spectrometry (LC-ESI-MS) following solid-phase extraction (SPE) sample clean-up procedures. However, extracting MCs from algal samples which are rich in chlorophyll pigments and other organic matrices the SPE method suffers a number of drawbacks, including cartridge clogging, long procedural steps and use of larger volumes of extraction solvents. We applied a supported liquid membrane (SLM) based technique as an alternative sample clean-up method for LC-ESI-MS analysis of MCs from both water and algal cells. Four (4) MC variants (MC-RR, -YR, -LR and -WR) from lyophilized cells of Microcystis aeruginosa and water collected from a wastewater pond were identified) and quantified using LC-ESI-MS following a SLM extraction and liquid partitioning step, however, MC-WR was not detected from water extracts. Within 45 min of SLM extraction all studied MCs were extracted and pre-concentrated in approximately 15 μL of an acceptor phase at an optimal pH 2.02 of the donor phase (sample). The highest total quantifiable intracellular and extracellular MCs were 37.039 ± 0.087 μg/g DW and 5.123 ± 0.018 μg/L, respectively. The concentrations of MC-RR were the highest from all samples studied recording maximum values of 21.579 ± 0.066 μg/g DW and 3.199 ± 0.012 μg/L for intracellular and extracellular quantities, respectively.

**Keywords**
Eutrophication;
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