

Microcystis Aeruginosa and *microcystins* in the Río de la Plata

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Microcystin are family of hepatotoxic peptides produced by cyanobacteria of *Microcystis*, *Anabaena*, *Planktothrix* and *Nostoc* genera. Acute illnesses and deaths in both human and animals following exposures to microcystins (MCYST) contaminated water sources have been reported worldwide. Several detection methods are currently in use to detect these toxins, including high performance liquid chromatography (HPLC), cell culture bioassays, immunoassays and protein phosphatase inhibition assays. Several studies have shown that conventional treatment technique such as coagulation, sedimentation and filtration are not effective for removing microcystins.

In this study, we investigated firstly the biodiversity of cyanobacteria at the Río de la Plata reservoir which supplies the drinking water for many urban communities in Buenos Aires, Argentina and the concentration of MCYST in the river and in drinking water during the period of study (October 2004 – march 2006).

Phytoplankton samples were obtained using a 30µm mesh plankton net. Part of those samples were analyzed “in vivo” with a Wild M20 microscope. Cells were concentrated by centrifugation (10 min, 3000 × g) and then lyophilized for toxin extraction.

A method based on liquid chromatography coupled to mass spectrometry with positive electrospray ionisation was applied for cyanobacterial hepatotoxin in samples. The chromatographic separation was performed using two microbore columns, 2 mm and 1 mm I.D. columns, which allowed the coupling of liquid chromatography to mass spectrometry with no flow splitting. Analytes were eluted using two different water- acetonitrile, both acidified with formic acid gradient. Detection limits for the 2 mm I.D. column ranged from 0.077 to 2.057 in full scan and from 0.021 to 1.153 ng in SIM mode. However, limits of detection as low as 60-340 pg in full scan and 6-72 pg in SIM mode were achieved for the 1 mm I.D. column. This method was applied to the analysis of MCYST in water samples previously SPE extraction.

Microcystis aeruginosa were found in all blooms study in the months between December and April 2005 and 2006 in the Río de La Plata. Total phytoplanktonic ranged between 20850 y 459000cél.ml⁻¹. The specie more important was *Microcystis aeruginosa*, with values between 10200 y 458400 cél.ml⁻¹

Chromatograms obtained showed the presence of six different MCYST: [D-Asp³] MCYST-HTyrR, MCYST-LR, MCYST-LW, [L-Ser⁷]MCYST-E(OMe)E(OMe), MCYST-RR, [D-Asp³, Dha⁷]MCYST-EE(OMe). A big variation of these toxins during the monitoring showed that presence of different strains of *Microcystis aeruginosa* that expressed the toxins in different time. The concentration of total MCYSTs ranged 0 and 23,17 µg/L in the reservoir. MCYST in drinking water samples obtained in different place of cities during the first fortnight 2005 ranged between 0 and 7 µg/L. The WHO has suggested a safety limit of 1 µg/L MCYST in drinking water. The variability in the presence of different toxins in the blooms sampled would indicate the successive presence of different *M. aeruginosa* strains, which also present different toxicities and thus different risks for the population. Some strains reach toxicities above 5 mg/gr dry weight, placing these strains among the most toxic ones described in the literature.

KEYWORDS: *Microcystin, Water, Cyanobacterial*

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