



Cyprus  
University of  
Technology

Faculty of Geotechnical  
Sciences and  
Environmental  
Management

**Master's Thesis**

**An updated review on cylindrospermopsin:**

**The global occurrence, detection, toxicity and treatment**

**Andreas Chrysanthou**

**Limassol, May 2017**



CYPRUS UNIVERSITY OF TECHNOLOGY  
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# Approval Form

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Presented by

Andreas Chrysanthou

Supervisor: Department of Environmental Science and Technology Maria Antoniou  
Assistant Professor

Signature \_\_\_\_\_

Member of the committee: Kostas Andreou Special Teaching Staff

Signature \_\_\_\_\_

Member of the committee: Marlen Vasquez Special Teaching

Signature \_\_\_\_\_

Cyprus University of Technology

Limassol, May 2017

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The approval of the thesis by the Department of Environmental Science and Technology does not imply necessarily the approval by the Department of the views of the writer.

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## ABSTRACT

Cylindrospermopsin (CYN) is a potent cyanobacterial toxin found in surface and marine waters, reservoirs, and even distribution systems worldwide. This study aimed to increase awareness on CYN's worldwide occurrence, toxicity, natural remediation and treatment technologies. Cylindrospermopsin has been found to be a potential cytotoxic, neurotoxic, dermatotoxic, genotoxic, hepatotoxic, immunotoxic, developmentally toxic, and may even be carcinogenic compound. Human exposure may occur through the consumption of contaminated drinking water, recreational activities and consumption of food where cylindrospermopsin has bioaccumulated in. Though wild life is particularly susceptible to cyanotoxins contamination, human fatalities have also been reported as CYN is believed to be part of the lethal cocktail of cyanotoxins that dialysis patients in Brazil were exposed to and 50 of them eventually expired. This updated review on CYN will present the historical background of the cyanotoxin (Chapter 2), CYN's chemistry and detection methods (Chapter 3), the global distribution of the cyanotoxin and CYN producing cyanobacteria (Chapter 4), CYN toxicity (Chapter 5) and natural degradation and treatment technologies (Chapters 6 and 7, respectively). The first reported human poisoning with CYN occurred in 1979 and there are still many gaps (early detection, toxicity, and treatment) regarding this toxin. Recently two new methods have been developed for CYN detection, Method 545 of the US EPA and an SPE-LC-MS/MS. In addition, new countries have reported on the detection of both CYN and CYN producing cyanobacteria. A new cyanobacterial species was found responsible for cylindrospermopsin production in Turkey, *Dolichospermum mendotae*. Also, a bacterium *Aeromonas sp.* was found to be able to biodegrade cylindrospermopsin giving new insights on bioremediation practices for the recalcitrant and highly stable CYN. Nevertheless, fields like monitoring and early detection, in-lake treatment and affordable treatment practices in drinking water treatment plants require further investigation to achieve water detoxification and money savings. This may be achieved by further investigating on filtration with reverse osmosis, bio filters, chemical oxidation and by obtaining a full understanding of the role that CYN intermediates can have in achieving water safety and detoxification. It becomes clear that countries worldwide need to implement legislation on cylindrospermopsin and mandatory surface

water monitoring on cyanobacteria and cyanotoxins, in general, in order to prevent population exposure and poisonings.

**Keywords:** Cylindrospermospin, Degradation, Toxicity, Occurrence, Treatment