

Toxic *Microcystis* in shallow lake Müggelsee (Germany) – dynamics, distribution, diversity

Martin Welker^{1,2*}, Hans von Döhren¹, Helgard Täuscher², Christian E. W. Steinberg² and Marcel Erhard³

With 6 figures

Abstract: The occurrence of toxic blooms of cyanobacteria in due course of the eutrophication of most inland waters has become an increasingly important issue of scientific and public health concern. One objective of many field studies is to assess the predictability of bloom toxicity. Here we present data of a four-year monitoring of microcystins in lake Müggelsee together with data on spatial distribution and diversity of the predominant toxin-producer *Microcystis* sp. Microcystins were detectable in all seasons when *Microcystis*-biovolumes were detectable with seasonal maximum concentrations of 1–3 µg/L. In spatially resolved samples, the microcystin concentrations spanned more than an order of magnitude between up-wind and down-wind sites with highest concentrations at the latter ones. The bloom development of *Microcystis* and *Aphanizomenon* was significantly correlated to the ratio of DIN:SRP and it is discussed whether this reflects a causal relationship or rather similar trends in both variables related to third one, like water temperature. The microcystin content of *Microcystis* was negatively correlated to *Microcystis* abundance, thus blooms were relatively less toxic during their peak. A metabolic typing of strains isolated from a single bloom sample revealed that the *Microcystis* bloom was composed of a multitude of toxin-producing and non-producing strains that differed in their production of microcystins and other non-ribosomal peptides. The number of distinguishable chemotypes clearly exceeded the number of microscopically determined morphotypes. Given the high clonal diversity of the *Microcystis* community we argue that a quantitative prediction of bloom toxicity is not possible without a better understanding of the molecular ecology of *Microcystis* and that an avoidance of toxic blooms of *Microcystis* is best to be done by appropriate restoration measures.

Key words: microcystin, *Microcystis*, biodiversity, cyanotoxin, temporal dynamics.

¹ **Authors' addresses:** Technische Universität Berlin, Institut für Chemie – AG Biochemie und molekulare Biologie, Franklinstr. 29, 10587 Berlin, Germany.

² Leibniz-Institut für Gewässerökologie und Binnenfischerei, Müggelseedamm 301, 12587 Berlin, Germany.

³ AnagnosTec GmbH, Im Biotechnologiepark, 14943 Luckenwalde, Germany.

* Corresponding author; E-Mail: martin.welker@chem-tu-berlin.de

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green algal toxins the factors which affect blue green algal bloom production and approaches to controlling algal populations

Microphyte Toxins Guido Premazzi, Laura Volterra, 1993 **Ingested Nitrate and Nitrite, and Cyanobacterial Peptide Toxins** IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2010 This publication represents the views and expert opinions of an IARC Working Group on the Evaluation of Carcinogenic Risks to Humans which met in Lyon 14-21 June 2006 **Proceedings** International Association of Theoretical and Applied Limnology, 2003 **Harmful Algae News**, 2006 **South African Journal of Science**, 1988 **Algae**, 2002 *Angewandte Botanik*, 2000 **Manual on Harmful Marine Microalgae** Gustaaf M. Hallegraeff, 1995 *Canadian Journal of Fisheries and Aquatic Sciences*, 2008 The Science of the Total Environment, 1994 An international journal for scientific research into the environment and its relationship with man *Acta Zoologica Taiwanica*, 1998 Environmental Toxicology and Chemistry, 2007 Fundamental and Applied Limnology, 2008 **Archiv Für Hydrobiologie**, 2000

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