

## Executive Summary

Toxic algae have been reported in twenty-seven countries and are found on all continents, including Antarctica. Toxic algae are recognised as a significant water quality problem and a hazard in regard to their potential to contaminate water intended for a range of beneficial uses, including drinking water, recreational activity and agriculture purposes. Cyanobacteria produce a range of toxins and odour compounds which have a deleterious effect upon drinking water quality. To effectively deal with the problems posed by cyanobacteria water authorities require an integrated approach of risk management, monitoring and water treatment.

The issue of toxic algae is one of the priority areas of the GWRC. A project was instigated with the aim to review and exchange the present knowledge on the management of toxic algae and to develop a research strategy for further collaborative activities. GWRC member organisations are involved in three major initiatives for toxic algae research that are underway internationally at the present time. Coordination of these ongoing activities was also one of the objectives of the project. CRC WQT was the lead agent of the project and prepared a comprehensive literature survey on the subject in which the current knowledge on management of toxic algae was consolidated. AwwaRF, Anjou Recherche, STOWA, TZW, WRC-SA and WSAA participated in the research planning workshop. Supporting information was received from US EPA and WHO. The feedback from the participants of the workshop was very positive with all acknowledging the organisation, content and benefits of the workshop.

### ***Research strategy***

Within an overall framework of a risk assessment and risk management evaluation of the issue of the toxic algae and water supply, the participants of the workshop discussed and prioritised the identified gaps of knowledge and research needs. Each organisation specified their interest to support the different actions and research projects to address the priority issues and three topics were selected to be of major priority. Sub-groups of interested organisations developed the first draft of the specific research proposals which were further elaborated by the participants of the workshop. As major gap of knowledge, the limited availability of sound and comprehensive ***toxicological and epidemiological data to develop guidelines*** for toxic algae in water and water supply was identified. With support of all participating organisations it was decided to devise a research project on one of the missing pieces: short-term exposure to algal toxins.

Although the information on the impact of algal toxins is limited, the issue is beyond the primary scope of the GWRC – the urban water cycle – and therefore no further initiatives were formulated. In contrast to the above the available information on ***source water management and water treatment*** is overwhelming. But this valuable knowledge and know-how is not readily accessible and for that reason the consolidation of this information in a ***guidance manual*** is proposed.

With reference to the possible environment impact of chemical means to control algal toxins formation, the urgency to explore non-chemical means for control was expressed as a priority topic by the participants.

Although reliable off-line analytical methods for the identification and quantification of algal toxins are available, the absence of on-line monitoring methods was identified as issue of

concern. *On-line monitoring methods* would be of great support to evaluate and control water quality in a more efficient, less time-consuming and cheaper way. With the recent and promising technological development, this issue was selected as a priority topic to consider.

### ***Proposed projects and actions***

As follow up of the workshop three projects were proposed to address the identified priority gaps of knowledge and research needs. The projects are summarized below and the lead agents are indicated in brackets. More information is given in Appendix 4.

#### **Proposal 1 Toxicological studies for guideline formulation for short-term exposures to cylindrospermopsin and microcystins. Evaluation of reproductive toxicity of cylindrospermopsin. (CRC WQT)**

Well-defined guidelines assure appropriate treatment and monitoring expenditure. Cyanobacterial blooms have an impact on economic activity associated with affected waterbodies. Recreational guidelines define when there is, or is not, a real threat to public health. There is an urgent requirement for studies into the adverse health effects of short-term oral exposures. Such data have application for both drinking water and recreational guideline formulation.

#### **Proposal 2 Towards applying the most appropriate technologies for on-line and direct monitoring of recreational, source and treated waters impacted by toxic cyanobacteria (TZW)**

Cyanobacterial cells, cell by-products, taste and odour compounds and toxins are important Indicators for monitoring, early warning and modelling for harmful impacts of cyanobacteria. New technology could provide remote detection and cheap, rapid detection for early warning of toxins. The current knowledge on developing technologies such as real-time PCR, selective fluorescence measurements, mass spectroscopy, remote sensing and lake diagnostic systems indicate that this approach is feasible.

#### **Proposal 3 Guidance manual for the management of toxic algae (CRC-WRC)**

Over the past 20 years significant research has been conducted into the management of cyanobacteria and the toxins they produce. The work has been published in hundreds of papers, reviews, reports and books. Presently no single document exists that has consolidated this vast knowledge into a guidance manual that can be easily used by water suppliers in the management of toxic cyanobacteria. The objective of this proposal for the GWRC is to combine and consolidate the all information to produce a truly international document, written in a way that all levels of the water industry can appreciate. In addition to the three specific projects a number of actions were formulated to support the exchange of knowledge and coordination of ongoing activities with the GWRC framework. The actions are given below with the responsible member indicated within brackets.

### ***Exchange of information***

Impact of algal toxins on agriculture (CRC WQT)

Sampling (all)

Interlaboratory tests (all)

Need of a research project on non chemical means for control (WSAA)

Algal toxin section of GWRC website (CRC WQT, GWRC)

Coordination of ongoing water treatment projects (AwwaRF)

Involved organisations: AwwaRF, Anjou Recherche, CRC WQT and TZW

### ***Certification of standards***

- Discuss/facilitate cooperation of (inter)national organisations (GWRC)

### ***Database on occurrence***

Information on WHO, UNESCO initiatives (CRC WQT)

With the three specific projects within this research strategy – toxicological studies, consolidation of the knowledge on source water management and water treatment, and the development of online monitoring methods – the major blank parts of the map of knowledge can collectively and successfully be addressed. The supportive actions will allow members to effectively exchange and make use of the knowledge available within the GWRC network.