

Cyanosurvey Initial Contact Questionnaire

Introduction

In 1991, Peter Baker and Andrew Humpage from the Australian Water Quality Centre undertook a formal survey of the Murray-Darling Basin (MDB) for occurrence of toxic cyanobacteria (blue-green algae). One outcome was the identification of the Paralytic Shellfish Toxins, or saxitoxins, as the neurotoxins produced by *Anabaena circinalis*. The main producers of microcystins were identified, and we also got some idea of the distribution in the MDB of *Cylindrospermopsis raciborskii*, which at the time was the only known producer of cylindrospermopsin. Whilst local knowledge of toxic cyanobacterial occurrence has developed on an ad hoc basis as regional water and environment authorities have implemented their own monitoring programs, there has not been another large scale survey. It is known that distributions of some species have changed from those reported in 1991, for example, *C. raciborskii* has become a problem species in much of the Murray system. New Australian toxic species have been identified, such as *Aphanizomenon ovalisporum* and *Lyngbya wollei*, for which we have little understanding of their occurrence or habitat preferences. A number of species have been reported to be toxic overseas, and again we know very little about their occurrence or toxicity in Australia. Without accurate and current knowledge of the toxic cyanobacteria in our source waters, our risk assessments and incident planning are compromised.

Another change since 1991 has been the advances in detection methods for the cyanotoxins. In addition to the standard cell counts, mouse bioassay and HPLC with UV detection, we now have LC-MS/MS, ELISA, genetic and toxicity bioassays. But these have rarely been used side-by-side to compare their accuracy and usefulness within a given set of operational requirements.

Water Quality Research Australia Ltd is currently considering funding a project to update our knowledge in these areas. This project description and questionnaire is being circulated to solicit feedback that will help target the project to Water Industry needs.

Project Aims

This project will source cyanobacterial samples from as many habitats in Australia as possible. Particular emphasis will be given to sources of potable drinking water although wastewater settlement ponds will not be excluded since many of these can have significant blooms that cause operational concerns if they cannot be released to the environment due to their toxicity. Even when cell numbers are not high, these

effluents can provide inoculum for downstream waters. The samples will be characterised in terms of cyanobacterial species present, cell numbers of each species, habitat in which they were found (including water chemistry where available), and content of known toxins. A representative sub-set of strains from diverse habitats will be isolated into culture and their genetic variation within species analysed in relation to geographic and habitat variation. For example, one key area of interest will be to determine whether the *C. raciborskii* occurring in temperate regions is the same as that occurring in the tropics and sub-tropics. Our current risk assessments assume that they are the same but anecdotal evidence suggests otherwise. Rate of toxin production per cell will be determined and related to toxin gene copy number. Using this information about species and strain variation as a function of habitat, predictions will be made about likely occurrence trends in a warming and drying environment. Toxicity will also be assessed using a range of other detection methods, with emphasis on newer methods such as the recently available ELISAs and toxicity bioassays. Their strengths and weaknesses will be tabulated, and recommendations made as to their suitability for particular operational requirements. Finally, training in the recommended methods will be provided to selected staff of WQRA members (on a cost recovery basis).

Project Outcomes

- 1) Up to date understanding of geographic and habitat distribution of toxic cyanobacteria in Australia.
- 2) Better understanding of genetic differences between similar strains which can be used to refine our risk assessments.
- 3) Use of this data, in comparison with available historical data from the previous survey and monitoring data from other sources, to predict possible changes in distribution in a changing climate.
- 4) Cross-validation of a range of toxin/toxicity detection methods, with recommendations for usefulness in terms of operation requirements.

Identifying Interested Organisations and Collaborators

The purpose of this correspondence is to determine the level of interest and potential participation in this project. There are obvious benefits in undertaking this assessment at a National level, however, your support is needed to make this happen. To assist in the development of the project proposal for WQRA, it would be appreciated if you could respond to the questions below if you are interested in participating in this project.

- (1) Would your organisation be willing to provide the project with 3 - 10 bloom samples in each of 2 consecutive bloom seasons? Actual number would depend on the size and variability of the geographical region administered by

the organisation. In return for providing these samples, the contributing organisation would receive cyanobacterial cell number data and toxicity determinations on their samples.

- (2) For non-WQRA members, would your organisation be willing to contribute a cash contribution towards the research? Unfortunately, it will be difficult to justify significant involvement outside of WQRA membership without this.
- (3) Would your organisation be willing to provide any historical data it may have on cyanobacterial occurrence and toxicity, along with any related climatic and water chemistry data? Confidentiality agreements would be entered into as required by the data owner.
- (4) Are there any particular organisms or locations that are of concern to your organisation that you would like to have targeted by the project? Similarly, are there any toxin detection methods (or types of method, for example, rapid and simple versus slower but highly accurate) that are of particular interest to your organisation?
- (5) If your organisation wishes to take part in the project, please nominate a contact person who will be responsible for logistical matters such as organising sample collection, and also for dissemination of information from the project back to your organisation.

Please send your response to the above questions, any additional feedback, or requests for further information, to:

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