

Detecting toxic and non-toxic cyanobacteria in recreational and drinking water supplies using molecular methods

US Geological Survey
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Brief Background

- *Microcystis aeruginosa* reported as being the most prevalent cyanobacterial species present in Lake Erie (Oulette 2006).
- Within the last decade, blooms dominated by *Microcystis aeruginosa* have increased.

Individual *Microcystis* cells

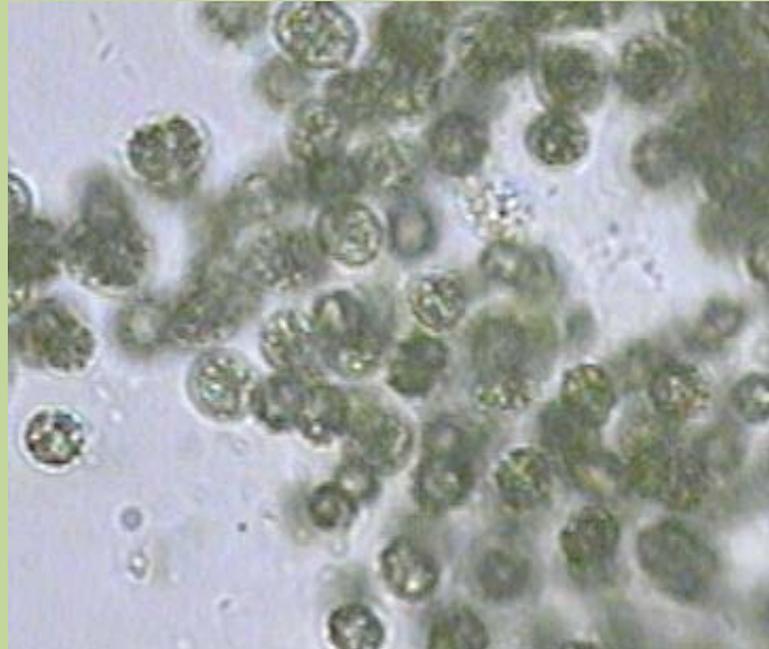


Photo Courtesy of Russel Rhodes
Missouri State University

Background

- Toxic and non-toxic *M. aeruginosa*
- Both strains can be found in colonies that look the same
- Genetic techniques needed to distinguish

Potentially toxic

Non-toxic

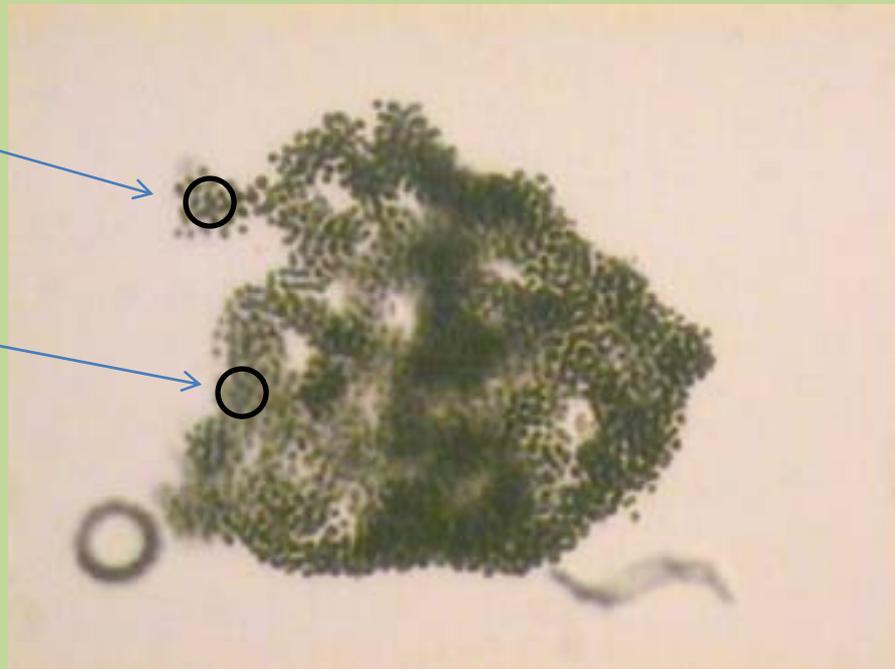


Photo Courtesy of Russel Rhodes
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Background

- Non-toxic *M. aeruginosa* does not have genes that produce microcystin toxin
- Mechanism of genetic regulation of microcystin genes has not been described
- Function of microcystin has not been described

Microcystis bloom in Willamette National Forest



Quantitative Polymerase Chain Reaction (qPCR)



- Quantitative measurement of the number of target DNA sequences within a sample using sequence-specific primers and probes



Project Summary

- Develop qPCR assay for three levels of cyanobacteria
 - Total cyanobacteria present in a given sample
 - *Microcystis aeruginosa* using 16S ribosomal sequence
 - Toxic *Microcystis aeruginosa* using *mcy* gene complex
- Apply assay to environmental samples experiencing bloom conditions during sampling season 2010

Microcystis bloom Lake Erie 2004
where microcystin concentration
was measured at 58 µg/L by NOAA



Photo by J. Dyble GLERL

Future Applications of Cyanobacteria qPCR Assay

- Use qPCR assay to characterize HAB's relative to *M. aeruginosa*
- Investigate physical and/or chemical factors that contribute to HAB's
- HAB community composition and dynamics

Algal bloom Western basin
Lake Erie Summer 2009
Bloom is primarily *Microcystis*



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