Harmful Algal Blooms

Hamzah D. Ansari

Oakland University

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Outline

Introduction

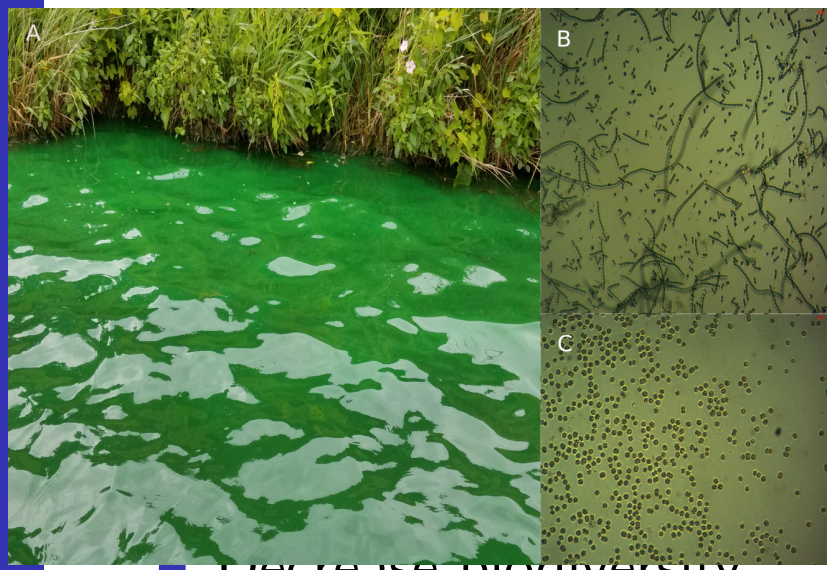
Survey

References

1 Introduction

2 Survey

Harmful Algal Blooms



- Decrease biodiversity
- Anoxic environment

HAB

- Naturally occuring
- Exacerbate from anthropogenic causes[1]
- Worldwide issue
- Coastal environments
- Freshwater lakes

[1] Rastogi, Sinha, and Incharoensakdi, "The cyanotoxin-microcystins: current overview".

Lake Erie 2014

cdn.coastalscience.noaa.gov

Possible causes

Toxicity

- Irritant
  - Lipolysacharides[2]
- Toxins
  - Microcystin and nodularin [1]
  - Cylindrospermopsin[3]
  - Anatoxin[4]
  - Saxitoxin [1]

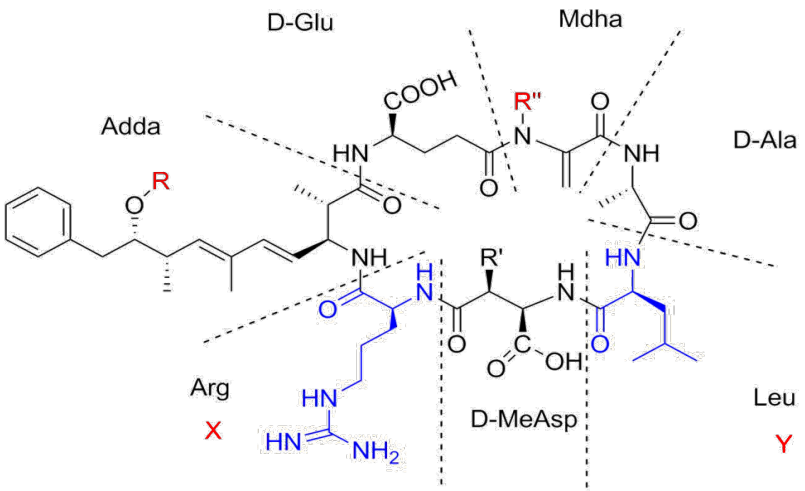
[2] Moore, Richard and Ohtani, Ikuko, "Cyanobacterial Toxins".

[3] Dittmann, Fewer, and Neilan, "Cyanobacterial toxins".

[4] Codd et al., "Cyanobacterial toxins, exposure routes and human health".

Microcystin

- Cyclic peptide
- 1000 Da
- Hepatoxin and carcinogenic
- Inhibits protein phosphatase
- Diverse structures



Cylindrospermopsin

- Polycyclic uracil derivative
- Covalently binds to DNA/RNA
- Inhibits protein synthesis
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Anatoxin

Saxitoxin

Exposure Route

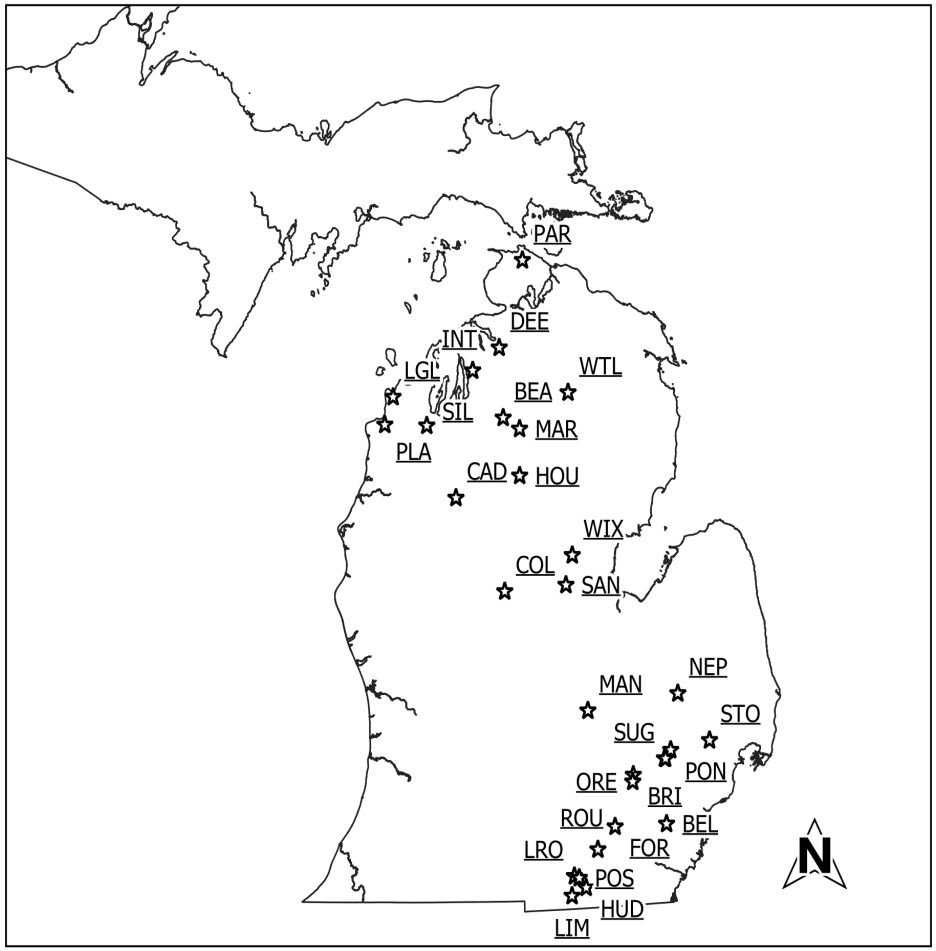
- Direct contact
- Aerosols
- Ingestion
  - Seafood/Fish
  - Drinking water
  - Algal supplements

Law and Regulation

- Safe Drinking Water Act
- Maximum Contaminant Level
  - Regulated and enforced
- Contaminant Candidate List
  - "More like guidelines"

Objectives

Surveyed Lakes



Water Sampling

- Sampled each lake once a month
- Collected water
- Quickly transported back
- Analyzed ASAP

SPATT

- Solid phase adsorbtion toxin tracking
- Sachet filled with resin
- Left for one month

- test

Analysis

Nutrients

- Orthophosphate-P
- Nitrate+nitrite-N
- Ammonia-N
- Total Kejdlahl nitrogen
- Total Phosphorus

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LC-MS/MS

- Freeze/Thaw
- Filter

SPATT

- Solid phase adsorbtion toxin tracking
- Similiar to the stationary phase

ELISA

Geospatial Analysis

Results

Could we predict HABs?

Acknowledgment

- My lab partners Brian Spies and Andrew Herrpich
- Jason Sckrabulis, Ryan Mcwhinnie, Melissa Ostrowski
- Dr.David Szlag and Dr. Thomas Raffel
- Michigan Department Environmental Quality
- Oakland University and the Chemistry Department

References I

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Dittmann, Elke, David Fewer, and Brett Neilan. "Cyanobacterial toxins: Biosynthetic routes and evolutionary roots". In: *FEMS microbiology reviews* 37 (Sept. 2012). DOI: 10.1111/1574-6976.12000.

Moore, Richard and Ohtani, Ikuko. "Cyanobacterial Toxins". In: *Gazzetta chimica Italiana* 123.6 (1993), pp. 329–336.

Rastogi, R. P., R. P. Sinha, and A. Incharoensakdi. "The cyanotoxin-microcystins: current overview". English. In: *Reviews in Environmental Science and Bio-Technology* 13 (June 2014), pp. 215–249. ISSN: 1569-1705. DOI: 10.1007/s11157-014-9334-6.