CYANOBACTERIA AND HUMAN DISEASE

EMERGING CONTAMINANTS CONFERENCE
MAY 21 2019
UNIVERSITY OF ILLINOIS URBANA CHAMPAIGN

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Cyanotoxins and ALS: Guam
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Observations of ALS around Lake Mascoma

• Enfield NH appears to have a high rate of ALS.

• Lake Mascoma has a history of significant cyanobacterial blooms.
ALS Incidents at the Same Address
2011 Spatial Analysis: NH & VT

- 637 ALS cases identified: NH=315, VT=322
- Age adjusted overall incident rate: 2.17 +/- 1/6 (95% CI)
- Lake Mascoma, Goose Pond, Shelburne Pond, Lake Iroquois, Milton, VT, Shelburne, VT, Burlington, VT; Windsor, VT; Sunapee, NH.
Observations of ALS around Lake Mascoma

<table>
<thead>
<tr>
<th></th>
<th>Brain n=3</th>
<th>Liver n=3</th>
<th>Muscle n=1</th>
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</thead>
<tbody>
<tr>
<td>BMAA Free</td>
<td>0.03 μg/g ± 0.025</td>
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<tr>
<td>BMAA protein</td>
<td>0.40 μg/g ± 0.004</td>
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<tr>
<td>BMAA total</td>
<td>1.28 μg/g ± 0.034</td>
<td>1.27 μg/g</td>
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<tr>
<td>Microcystin</td>
<td>61.7 mg/g ± 4.62</td>
<td>ND</td>
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± 2 standard deviations

- Both BMAA and MC identified in a large carp and in aerosol filters from in and around Lake Mascoma
Aerosolized Cyanobacteria
Aerosolized Cyanobacteria

- Nasal Swabs and Bronchoscopies
  - >75% Positive PCR for CB
  - Residential proximity to waterbodies was not predictive of results
  - Seasonality was not a factor
Cyanobacteria Blooms
Cyanobacteria Blooms: Lake Erie
Cyanobacteria Blooms: Missisquoi Bay, VT
Other Considerations and Future Directions

• CB is everywhere
  • Soil, fossils, urban structures
  • Can survive in the air

• Next steps:
  • Geospatial analysis with residential history to map exposures
  • Genetic analysis with risk factors
  • Autopsy samples of lung and brain tissue
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