Cyanobacteria and Drinking Water Supplies
Cyanobacteria

- Microscopic Organisms
- Once Called Blue-green Algae
- Many Different Types
- Found in All Water Bodies
- Usually Found in Low Numbers
Increased Concentrations May Create Problem Blooms

• Low Water Flow
• Warm Summer Water Temperatures
• Nitrogen & Phosphorus Enter the Water

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• Taste and Odor Problems for PWS
• Public Health Concerns for Humans & Pets
• Cells May Contain Toxin
<table>
<thead>
<tr>
<th>Genus</th>
<th>Toxins Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anabaena</td>
<td>Anatoxins, Microcystins, Saxitoxins</td>
</tr>
<tr>
<td>Aphanizomenon</td>
<td>Saxitoxins, Cylindrospermopsins</td>
</tr>
<tr>
<td>Microcystis</td>
<td>Microcystins</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Common Cyanobacteria</th>
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</thead>
<tbody>
<tr>
<td>Anabaenopsis</td>
<td>Microcystins</td>
</tr>
<tr>
<td>Cylindrospermopsis</td>
<td>Cylindrospermopsins, Saxitoxins</td>
</tr>
<tr>
<td>Nostoc</td>
<td>Microcystins</td>
</tr>
<tr>
<td>Phormidium (Oscillatoria)</td>
<td>Anatoxin</td>
</tr>
<tr>
<td>Planktothrix (Oscillatoria)</td>
<td>Anatoxins, Aplysiatoxins, Microcystins, Saxitoxins</td>
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<tr>
<td>Hapalosiphon</td>
<td>Microcystins</td>
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<tr>
<td>Lyngbya</td>
<td>Aplysiatoxins, Lyngbyatoxin a</td>
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<tr>
<td>Nodularia</td>
<td>Nodularin</td>
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</tbody>
</table>
Health Concerns Depend Upon

• Type of Exposure

• Concentrations of Cyanobacteria Species & Toxins Present
Routes of Exposure in DW

Dermal Contact

Toxins are released when the cells are ingested and they break down in the stomach.

After an algae bloom ends and the organisms die, the toxins are released into the water where they can be directly ingested.
Symptoms From Exposure

- Skin Rash
- Numb lips
- Tingling fingers & toes
- Dizziness
- Abdominal pain
- Diarrhea
- Vomiting
Symptoms from Exposure

• Elevated Levels of Toxin: Serious liver damage

• Deaths in Animals (dogs) Have Occurred in Massachusetts At Recreational Waters
• Cyanobacteria are not regulated by EPA or by Massachusetts.

• Some DW Treatment Plant Processes Are Effective In Removing Some Cells and/or Some Toxins
In Lake Treatments

• Chemicals
• Aerators & Mixers
• Dilution & Flushing
• Algal Harvesting
• Sediment Removal
• Ultrasound
• Ozone Injection
Source Water Protection

• Reduce nitrogen and phosphorus in watersheds.

• Septic Systems  Direct Flow or Through
• Lawn/Gardens  Stormwater
• Agricultural
• Golf Courses
• Other
More Cyanobacteria Blooms Are Expected As Climate Change Results in Warmer Water Temperatures & Periodic Drought (Low Flow) Conditions.
DWP Outreach & Training Plan for Surface Water Suppliers

• MassDEP Committee
• DWM research document
• DWP fact sheet (monitor for, treat, prevent)
• DWP template for a cyanobacteria plan
• Incorporate into PWS Emer. Response Plan
• Article in ITM, etc.
• Training in spring 2014
Partners

• DWP
• DWM
• ORS
• WES
• MassDPH
• Other NE States & NY
• NEIWPCC
• PWS & Boards of Health
MassDEP Contacts

- **WERO**  Kim Longridge (or Deirdre Cabral)
- **CERO**  Bob Bostwick
- **NERO**  Nick Zessoules (or Tom Mahin)
- **SERO**  Rick Rondeau
- **Boston**  Kathy Romero