

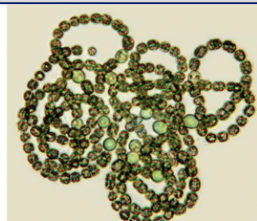
Toxins - Cyanobacteria

Harmful Algal Blooms (HABs)

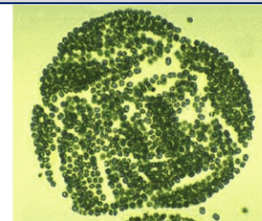
- Cyanobacteria begin multiplying very quickly
- Often occur in late summer or early fall
- ***Cyanotoxin Production***



Chroococcales (unicellular)



Anabaena (filamentous)



Microcystis (colonial)



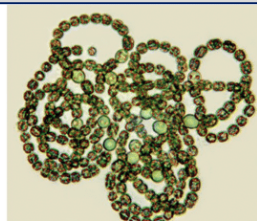
Toxins - Cyanobacteria

Cyanobacteria Toxin Production

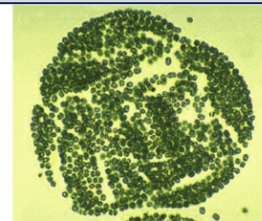
- Multiple types impacting skin, liver, and nervous system
 - *Cytotoxins, Hepatoxins, Neurotoxins*
- Most Commonly Reported:
 - *Hepatoxins*
 - Microcystins
 - Cylindrospermop-sin
 - *Neurotoxins*
 - Anatoxins
 - Saxitoxins



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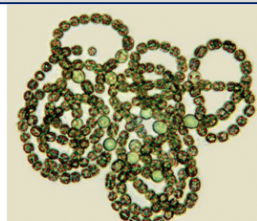
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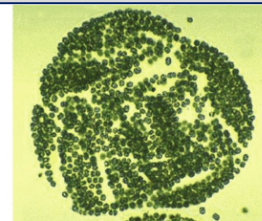
- Multiple types impacting skin, liver, and nervous system
- Cyanotoxins can cause disease and death of aquatic and terrestrial critters (terrestrials are more susceptible)
 - *Symptoms:* Nausea, liver hemorrhaging, central nervous system dysfunction



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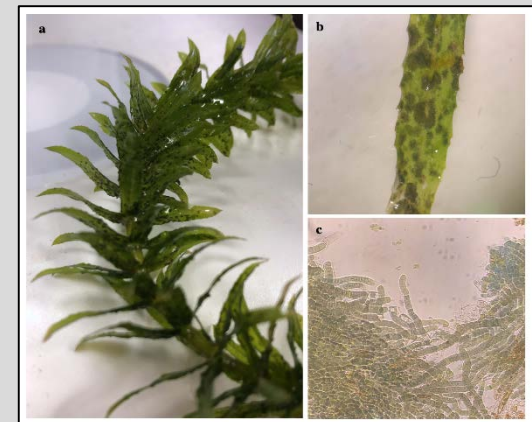
Microcystis (colonial)



Toxins - Cyanobacteria

Cyanobacteria Toxin Production

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 - **Wildlife Impacts:** (*Wildlife, domestic stocks and pets*)
 - Dogs swimming in ponds/lakes
 - **AVM:** neurological disease impacting birds of prey, waterfowl, fish,...
 - Cyanobacteria found on hydrilla



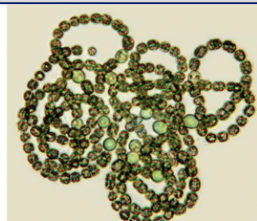
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Cyanobacteria Toxin Production

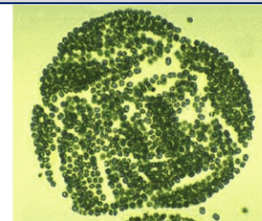
- Multiple types impacting skin, liver, and nervous system
- Cyanotoxins can cause disease and death of aquatic and terrestrial critters (terrestrials are more susceptible)
 - *Symptoms:* Nausea, liver hemorrhaging, central nervous system dysfunction
 - **Human Impacts:**
 - *Exposure:* ingesting water, water related activities, inhaling aerosols
 - Most acute impacts from ingestion
 - Neurological diseases have been related back to exposure



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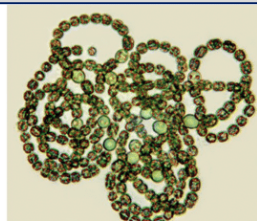
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Cyanobacteria Toxin Production

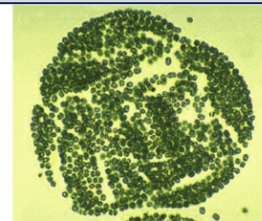
- Multiple types impacting skin, liver, and nervous system
- Cyanotoxins can cause disease and death of aquatic and terrestrial critters (terrestrials are more susceptible)
- Even if toxin-producing cyanobacteria are present within a system, it does not mean they are producing toxins.
 - *Environmental and physiological factors that drive toxin production are still not well understood*



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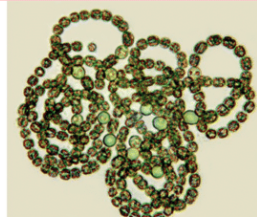
Toxins - Cyanobacteria

Cyanobacteria Toxin Production

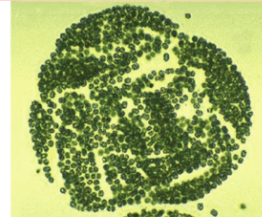
- Governmental HAB response focus on **planktonic forms** of cyanobacteria due to their high toxicity potential
 - EPA drinking and shellfish production restriction criteria



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Toxins - Cyanobacteria

Cyanobacteria Toxin Production

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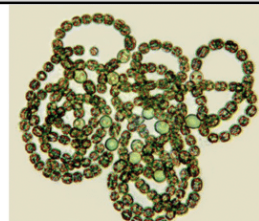
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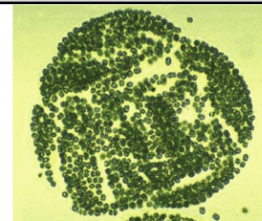
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Toxins - Lyngbya

Lyngbya Toxin Production

- Earliest studies from 1990's – Guntersville Reservoir, AL
 - Paralytic Shellfish Poison (PSP) neurotoxins
- Recent studies detected an analogue to the PSP neurotoxin, saxitoxin (neurotoxin)
 - St. Lawrence River, Canada
 - Butterfield Lake, NY
 - Lake Wateree, SC
- The saxitoxin derivatives associated with lyngbya is **less potent** than other PSP-producing cyanobacteria
 - Direct contact presents a relatively low risk to humans and animals



Toxins - Lyngbya

Lyngbya Toxin Production

- Lyngbya produced toxins can impact skin
 - Swimmer's Itch
- Six known neurotoxins produced directly by lyngbya:
 - *L. wollei* toxins (LWTs 1-6)
 - All related to saxitoxin
 - Vary widely in toxicity
 - Some are considered nontoxic

