Harmful Algal Blooms and Health

A harmful algal bloom refers to aquatic phytoplankton growth that may be harmful to people, animals, or the environment. The Department of Health Office of Communicable Disease Epidemiology will be the leading resource for local health jurisdictions investigating and responding to reported human cases of illnesses associated with harmful algal blooms.

Harmful algal blooms

Harmful algal blooms are caused by aquatic algae. Harmful algal blooms can occur in marine, brackish, and fresh waters. Most freshwater harmful algal blooms are caused by cyanobacteria (“blue-green algae”), whereas those in marine waters are caused by microalgae (diatoms and dinoflagellates). Growth of these aquatic organisms is promoted by warm temperatures, increased nutrients such as nitrogen and phosphorus from residential or agricultural use of fertilizers, low water flows during droughts, and other environmental changes. An algal bloom may cause discoloration or scum on surface but can also occur without any visible change to the water. In addition, not all visible algal blooms have harmful effects.

A harmful algal bloom may produce chemicals that are toxic to humans, pets, livestock, wildlife, and other animals. These chemicals include neurotoxins (e.g., anatoxins), hepatotoxins (e.g., microcystin), and dermatotoxins. Exposures to the toxins can occur through recreational water or drinking water in various ways:
- Direct skin or eye contact when swimming in contaminated water
- Swallowing contaminated drinking water or recreational water
- Consuming contaminated fish or shellfish
- Inhaling toxins from aerosols or droplets from water

www.cdc.gov
While freshwater exposures to harmful algal bloom toxins are often associated with swimming or other recreational activities in ponds and small lakes, drinking water distribution systems that draw their water from contaminated bodies of water can also be a source of exposure. In 2014, an algal bloom in Lake Erie resulted in unsafe levels of microcystin in drinking water taken from the lake. In response, the City of Toledo issued a water advisory for four counties with over 400,000 people to use alternate water sources for drinking, cooking, and bathing.

**Illnesses Associated with Harmful Algal Blooms**

A variety of illnesses in humans have been associated with algal toxins. The nature and severity of the illness depends on the route of exposure, the amount of toxin, the type of toxin, and the length of time exposed. Symptoms usually begin within hours of exposure and can last for a few days.

**Freshwater and marine harmful algal blooms: Associated algae, toxins, and exposures**

<table>
<thead>
<tr>
<th>Water Body</th>
<th>Freshwater</th>
<th>Marine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Aquatic Algae</strong></td>
<td>Cyanobacteria</td>
<td>Microalgae (diatoms, dinoflagellates)</td>
</tr>
<tr>
<td><strong>Toxins Produced</strong></td>
<td>Microcystins, anatoxins, saxitoxins, and others</td>
<td>Brevetoxins, azaspiracid, ciguatoxins, domoic acid, okadic acid, dinophysistoxins</td>
</tr>
<tr>
<td><strong>Skin contact or inhalation</strong></td>
<td>Skin, eye, nose, or throat irritation; respiratory illness</td>
<td>Skin, eye, or throat irritation; shortness of breath; coughing; sneezing</td>
</tr>
<tr>
<td><strong>Ingestion</strong> (swallowing water or eating contaminated seafood)</td>
<td>Abdominal pain, headache, neurologic symptoms, vomiting, diarrhea, liver damage, kidney damage</td>
<td>Nausea, vomiting, diarrhea, abdominal pain, peripheral or central nervous system symptoms (e.g., paralytic, diarrhetic, or domoic acid shellfish poisoning)</td>
</tr>
</tbody>
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Skin or eye exposure can cause rashes, swelling, sores, and visual disturbance. Inhaling aerosolized water can result in nose and throat irritation, cough, chest tightness, wheezing, and shortness of breath. Ingestion can cause abdominal pain, vomiting, diarrhea, and neurologic effects (such as confusion and tingling sensations), and liver or kidney damage; severe cases from ingestion can result in death. Non-specific symptoms reported during outbreaks include headache, dizziness, back pain, muscle aches, weakness, and fatigue.

Identifying illnesses associated with harmful algal blooms is typically a diagnosis of exclusion, based on clinical manifestations, reported exposures, and ruling out other etiologies on the differential diagnosis. Liver function tests may be useful when exposure to hepatotoxins (e.g., microcystin) may have occurred.

Illnesses have also been described in animals after exposure to algal toxins. With longer skin exposures or higher levels of ingestion than a person would typically experience, animals have had severe symptoms such as excessive salivation, weakness, staggered walking, difficulty breathing, or convulsions. Death in animals has occurred within hours or days of exposure.

Surveillance and Monitoring

**Illnesses.** Local health jurisdictions can contribute to surveillance and reporting in Washington State for harmful algal blooms. Jurisdictions should report suspected human cases to Communicable Disease Epidemiology (206-418-5500). Suspected animal cases should be reported to the DOH Public Health Veterinarian in Environmental Public Health (360-236-3369). DOH will work with local health jurisdictions to report individual human or animal cases to CDC via the One Health Harmful Algal Bloom System (OHHABS, [https://www.cdc.gov/habs/ohhabs.html](https://www.cdc.gov/habs/ohhabs.html)). Illness outbreaks due to harmful algal blooms would be reported to CDC via the National Outbreak Reporting System and OHHABS, which would also include environmental data (information on the water body, bloom, and any laboratory testing).

**Water monitoring.** The Washington State Department of Ecology’s Freshwater Algae Monitoring Program, in partnership with the King County Environmental Laboratory, performs identification of algal blooms and toxicity testing for residents and local health jurisdictions ([http://www.ecy.wa.gov/programs/wq/plants/algae/index.html](http://www.ecy.wa.gov/programs/wq/plants/algae/index.html)). The program also provides an online, searchable database for known toxic algal blooms ([https://www.nwtoxicalgae.org/](https://www.nwtoxicalgae.org/)).

**Prevention**

Prevention starts by avoiding factors that contribute to algal growth in lakes. Properly apply fertilizers so that nutrients could promote phytoplankton growth are not washed into fresh or marine waters.

People should protect themselves, their pets, and livestock from possible exposure to contaminated water. Drinking directly from lakes and rivers should be avoided even when the water looks clear. In addition, people and their animals should avoid going into or playing in a body of water that:
• Smells bad
• Looks discolored
• Has foam, scum, or algal mats on the surface
• Contains or is near dead fish or other dead animals (e.g., lake with dead fish on its shore)

If a water advisory is issued, the water should not be used for any purpose. Boiling water does not inactivate the toxins, and skin exposure should be avoided. It is important to provide alternative sources of safe drinking water, particularly for children, pets and livestock.

If people think that they or their animals had recent exposure to water contaminated with a harmful algal bloom, they should rinse their bodies with clean, fresh water as soon as possible. Anybody with signs or symptoms of harmful algal bloom illness should consult with a health care provider or veterinarian and mention the recent exposure.

Although reported illnesses from harmful algal blooms are currently rare in Washington State, contaminated bodies of freshwater occur throughout the state, and climate change could increase this problem in future years. People or their animals who engage in recreational activities in these waters could be at risk. Simple precautions can prevent exposure to water contaminated with harmful algal blooms.

Resources

Department of Health
Overview: http://www.doh.wa.gov/CommunityandEnvironment/Contaminants/BlueGreenAlgae
Water system guide: http://www.doh.wa.gov/Portals/1/Documents/Pubs/331-531.pdf


Washington State Toxic Algae: https://www.nwtoxicalgae.org/

CDC Harmful algal bloom resources
Illness overview: https://www.cdc.gov/habs/
Prevention and Control: https://www.cdc.gov/habs/prevention-control.html