

# Harmful Algal Blooms | HABs

## Information for Health Care Providers



Harmful algal blooms occur when several types of bacteria (known as cyanobacteria) grow in fresh or brackish waters. Under certain conditions and with sufficient nutrients, some of these bacteria can rapidly reproduce and grow into large, visible blooms that may produce harmful toxins. These blooms can occur both on the surface and on the bottom of water bodies.

### HAB Toxins

- Microcystin: hepatotoxin, and the most commonly encountered HAB toxin
- Cylindrospermopsin: hepatotoxin and nephrotoxin
- Anatoxin-A: acts as a nicotinic acetylcholine receptor agonist that can cause tremors or seizures
- Saxitoxin: sodium channel receptor blocker that can cause paralysis

### Symptoms of Exposure

- Typical symptoms include typical cold symptoms (coughing, sniffing, low grade fever), gastrointestinal (nausea), neurologic (dizziness) and skin rashes.
- Higher levels of exposure can result in neurological symptoms (tremors or seizures), respiratory distress, nephrotoxicity and hepatotoxicity. Depending on the toxin, these more severe intoxications are rarely known to occur in humans.

For patients presenting with non-specific gastrointestinal, neurological or skin irritation symptoms and a recent history of exposure to a freshwater waterway, consider possibility of a HAB toxin exposure.

### Treatment Options

Treatment options for HAB illnesses vary depending on the toxin. There are no specific antidotes for these toxins in event of poisoning. Treatment is supportive and described in detail on the next page.

### Report Suspected HAB Illnesses

It is important to identify suspected HAB illnesses so that public health officials can increase public awareness to reduce additional HAB illnesses in affected recreational waters.

Please report a HAB illness through one of the following:

- [Bloom Report Form](https://mywaterquality.ca.gov/habs/do/bloomreport.html) (<https://mywaterquality.ca.gov/habs/do/bloomreport.html>)
- Email: [CyanoHAB.Reports@waterboards.ca.gov](mailto:CyanoHAB.Reports@waterboards.ca.gov)
- California Poison Control: 1-800-222-1222

# HAB Toxins, Treatment and Supportive Care

## Microcystins

Targets:	Liver, kidney, testes, thrombocytes
Mechanisms:	Inflammation, hepatocellular hemorrhage, glutathione depletion
Symptoms/Signs:	Headache, sore throat, skin rash, abdominal pain, GI upset nausea/vomiting, acute hepatitis, elevated liver enzymes, coagulopathy
Treatment*:	Cholestyramine, N-acetylcysteine, vitamin K, supportive care

## Cylindrospermopsin

Targets:	Kidney, liver, lungs
Mechanisms:	Glutathione depletion, activated by liver CYP enzymes, inhibition of protein synthesis, induction of inflammatory immune response
Symptoms/Signs:	Fever, headache, vomiting, bloody diarrhea, hemolysis, kidney and liver damage, wheezing, respiratory distress (if aspirated)
Treatment*:	N-acetylcysteine, anti-inflammatories**, supportive care

## Anatoxin-A

Targets:	Central nervous system
Mechanisms:	Nicotinic acetylcholine receptor agonist
Symptoms/Signs:	Tingling, numbness, incoherent speech, respiratory paralysis
Treatment*:	Activated charcoal, benzodiazepines or barbiturates to control seizures, assistance with ventilation as needed, supportive care

## Saxitoxin

Targets:	Central nervous system
Mechanisms:	Sodium channel blocker
Symptoms/Signs:	Nausea/vomiting, muscle weakness, vertigo, respiratory paralysis
Treatment*:	Activated charcoal, prompt assistance with ventilation, supportive care

\* Human data are not available for some toxins. Specific treatments may be based largely on experimental animal and veterinary medicine case reports.

\*\* Long term use of non-steroidal anti-inflammatories should accompany liver and kidney function assessment.

# Physician Algorithm for Possible HAB Toxicity

Compatible symptoms (one or more): Nausea, vomiting, diarrhea (sometimes bloody), headache, fever, dizziness, eye irritation, rash, vertigo, sore throat, wheezing, respiratory distress, abdominal pain, tingling, numbness, confusion.



Ask about recent (within several days) recreational water exposure (lake, river, swimming, boating, etc.). Ask about timing/duration of exposure (water ingestion, dermal exposure or inhalation of spray).



Test for hepatotoxicity and renal toxicity:  
liver function, BUN/creatinine (normal results do not rule out HAB toxicity).



Rule out alternative diagnoses.



Suspect harmful algal bloom case in patient with compatible symptoms, exposure history and no alternative diagnosis. Supportive care.



Report to HABs agency, California State Water Resources Control Board, and/or County Environmental Health and Health Officer.

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## Resources

[California Harmful Algal Blooms Web Portal](https://mywaterquality.ca.gov/habs/) (https://mywaterquality.ca.gov/habs/)

[Harmful Algal Blooms \(ca.gov\)](https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHIB/Pages/EIS/Harmful-Algal-Blooms.aspx)

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## References

1. Rankin K, ALroy K, Kudela R, Oates S, Murray M, and Miller M. 2013. Treatment of Cyanobacterial (Microcystin) Toxicosis Using Oral Cholestyramine: Case Report of a Dog from Montana. *Toxins (Basel)* 5(6):1051-1063.
2. Bautista AC, Moore C, Lin Y, Cline M, Benitah N, and Puschner B. 2015. Hepatopathy following consumption of a commercially available blue-green algae dietary supplement in a dog. *BMC Vet Res* 11:136.
3. Kubickova B, Babica P, Hilscherova K, and Sindlerova L. 2019. Effects of cyanobacterial toxins on the human gastrointestinal tract and the mucosal innate immune system. *Environ Sci Europe* 31(31). doi.org/10.1186/s12302-019-0212-2
4. Oliveira V, Avila M, Carvalho G, Azevedo S, Lima L, Barreiro E, Roncally A, and Zin W. 2015. Investigating the therapeutic effects of LASSBio-596 in an *in vivo* model of cylindrospermopsin-induced lung injury. *Toxicon* 94:29-35.
5. Puschner B. 2018. Cyanobacterial (Blue-Green Algae) Toxins. *Veterinary Toxicology* (3rd Ed). Elsevier Publishing 57:763-777.
6. Gray J. 1978. Paralytic shellfish poisoning. *Can Med Assoc J.* 119(11):1281.

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