

Water-related diseases

Cyanobacterial Toxins

Cyanobacteria or blue-green algae occur worldwide especially in calm, nutrient-rich waters. Some species of cyanobacteria produce toxins that affect animals and humans. People may be exposed to cyanobacterial toxins by drinking or bathing in contaminated water. The most frequent and serious health effects are caused by drinking water containing the toxins (cyanobacteria), or by ingestion during recreational water contact.

The disease and how it affects people

Disease due to cyanobacterial toxins varies according to the type of toxin and the type of water or water-related exposure (drinking, skin contact, etc.). Humans are affected with a range of symptoms including skin irritation, stomach cramps, vomiting, nausea, diarrhoea, fever, sore throat, headache, muscle and joint pain, blisters of the mouth and liver damage. Swimmers in water containing cyanobacterial toxins may suffer allergic reactions, such as asthma, eye irritation, rashes, and blisters around the mouth and nose. Animals, birds, and fish can also be poisoned by high levels of toxin-producing cyanobacteria.

The cause

Cyanobacteria are also known as blue-green algae, so named because these organisms have characteristics of both algae and bacteria, although they are now classified as bacteria. The blue-green colour comes from their ability to photosynthesize, like plants.

Cyanobacterial toxins are classified by how they affect the human body. Hepatotoxins (which affect the liver) are produced by some strains of the cyanobacteria *Microcystis*, *Anabaena*, *Oscillatoria*, *Nodularia*, *Nostoc*, *Cylindrospermopsis* and *Umezakia*. Neurotoxins (which affect the nervous system) are produced by some strains of *Aphanizomenon* and *Oscillatoria*. Cyanobacteria from the species *Cylindrospermopsis raciborskii* may also produce toxic alkaloids, causing gastrointestinal symptoms or kidney disease in humans. Not all cyanobacteria of these species form toxins and it is likely that there are as yet unrecognized toxins.

People are mainly exposed to cyanobacterial toxins by drinking or bathing in contaminated water. Other sources include algal food tablets. Some species form a scum on the water, but high concentrations may also be present throughout the affected water. Surface scums, where they occur, represent a specific hazard to human health because of their particularly high toxin content. Contact, especially by children, should be avoided.

Distribution

The organisms can grow rapidly in favourable conditions, such as calm nutrient-rich fresh or marine waters in warm climates or during the late summer months in cooler parts of the world. Blooms of cyanobacteria tend to occur repeatedly in the same water, posing a risk of repeated exposure to some human populations. Cyanobacterial toxins in lakes, ponds, and dugouts in various parts of the world have long been known to cause poisoning in animals and humans; one of the earliest reports of their toxic effects was in China 1000 years ago (Chorus and Bartram, 1999).

Scope of the Problem

Cyanobacteria have been linked to illness in various regions throughout the world, including North and South America, Africa, Australia, Europe, Scandinavia and China. There are no reliable figures for the number of people affected worldwide. The only documented and scientifically substantiated human deaths due to cyanobacterial toxins have been due to exposure during dialysis. People exposed through drinking-water and recreational-water have required intensive hospital care.

Interventions

- Reducing nutrient build-up (eutrophication) in lakes and reservoirs, especially by better management of wastewater disposal systems and control of pollution by fertilizers (including manure) from agriculture.
- Educating the staff in the health and water supply sectors, as well as the public, about the risks of drinking, bathing or water sports in water likely to contain high densities of cyanobacteria.
- Water treatment to remove the organisms and their toxins from drinking-water supplies, where appropriate.

References

Toxic Cyanobacteria in Water: a guide to their public health consequences, monitoring and management, edited by J. Bartram & I. Chorus. Geneva, World Health Organization, 1999. Prepared for World Water Day 2001. Reviewed by staff and experts at the Federal Environmental Agency, Germany, and the Water, Sanitation and Health Unit (WSH), World Health Organization (WHO), Geneva.