Common Myths about Blooms and Toxic Cyanobacteria

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MYTH: Toxic cyanobacteria blooms are new.

Fact: Toxic cyanobacteria blooms have been recorded since biblical times. Cattle deaths suspected to be linked to these events were recorded as early as 1878 in Australia, while blooms of *Microcystis* on the Potomac River in the early 1930's resulted in gastrointestinal illness in more than 5,000 people.

MYTH: All cyanobacteria toxins are similar.

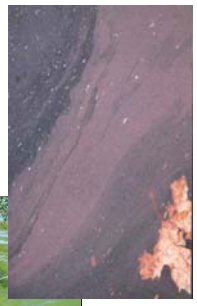
Fact: Cyanobacterial toxins can generally be divided into three functional types: hepatotoxins, neurotoxins, and irritants. Each category includes a wide range of different compounds. Hepatotoxins (liver toxins) are the most common, with the peptides microcystins accounting for most toxic blooms. Paralytic shellfish toxins responsible for red tides are an example of a neurotoxin that mainly affects coastal marine systems.

MYTH: You can recognize a toxic cyanobacteria bloom by looking at it.

Fact: The ability to produce toxins is encoded in the genes of the organisms. Some species have these genes and when they are activated, which varies even within the same bloom, these cells are toxic, while other species lack these genes and are non-toxic. You cannot tell if the genes are present or activated by looking at the bloom itself.

MYTH: You can tell what toxins are present by looking at the cyanobacteria in a sample.

Fact: The name of a toxin is usually based on the species from which the toxin was first isolated: ie. anatoxin from *Anabaena*, microcystins from *Microcystis* and cylindrospermopsin from *Cylindrospermopsis.* However, further work showed that other species produce them. For example, other species can also produce microcystin toxins, as well *Microcystis*. Similarly, *Cylindrospermopsis raciborskii* from Florida produces the hepatotoxin cylindrospermopsin, while an identical-appearing species from Brazil produces different toxins, saxitoxins (neurotoxic paralytic shellfish toxins). Often, blooms are composed of several species and it is not possible to visibly distinguish which are producing which toxins, although we can make an educated guess.



MYTH: Toxic cyanobacteria blooms look like blue-green paint spilled on the water.

Fact: Some dense blooms often resemble blue-green paint spilled in the water. Other blooms can have different colours ranging from pink to turquoise. Some species, such as C*ylindrospermopsis,* are notorious for forming sparse blooms with little visible indication at the surface of the lake of its presence. Some species grow on the bottom and represent 'hidden sources' of toxins once these cells die back and the toxins are released into the water. It is important to note that other algae and even pollen can form unsightly scums, which can be mistaken for toxic blooms

MYTH: You can taste when the water is bad to drink.

Fact: The absence or presence of taste and odour in water is not a measure of toxicity. There is no relationship between the genes that code for toxins and those which code for taste and odour production. Both or one of these different genes may be present in some Cyanobacteria. Some Cyanobacteria produce earthy smelling compounds such as geosmin and MIB, or other compounds that smell like sulphur, grass or hay/tobacco. But not all Cyanobacteria species produce these compounds, and Cyanobacteria are not unique in odour production. Other organisms (e.g. moulds, fungi and filamentous soil bacteria called Actinomyces) and other non-toxic algae (not

cyanobacteria) can also produce many of these odours.

MYTH: You can remove cyanobacterial toxins by boiling.

Fact: Some cyanobacterial toxins such as anatoxin-a are relatively unstable and boiling will remove them. Other toxins such as microcystins and the PSP toxins are extremely stable to boiling. In most cases, a boil-water advisory will kill the cells and not necessarily destroy the toxins. In fact, this may make the problem more difficult to control because this will release the toxins into the water and it is more difficult to remove dissolved compounds than cells by most conventional filtration methods. It should be noted that microcystins inhaled from steam (from kettles, saunas, hot showers) and spray (e.g. from waterskiing) can be absorbed through the lungs.

MYTH: Toxic cyanobacteria blooms are confined to small, nutrient enriched (eutrophic) bodies of water.

Fact: Toxic cyanobacteria blooms have been reported in large and small waterbodies from every province and state in North America and across the world. They are commonplace in the Great Lakes, Lake Champlain and Lake Winnipeg, along with the Baltic Sea. These blooms can be massive, spanning tens to hundreds of kilometres and are easily visible from space using remote sensing techniques (for example, visit http://www.esf.edu/merhab/index.asp or http://home.cc.umanitoba.ca/~gmccullo/LWsat.htm).

MYTH: Current regulations address this problem.

Fact: Advisory levels for microcystins and other toxins do exist in a number of countries, including Canada, although these vary among provinces. The U.S. has been hesitant to issue guideline values. .

MYTH: Various products and treatments available on the market are a good way to address this problem.

Fact: In most cases, toxic and non-toxic blooms are a result of over-fertilization (especially with phosphorus) and 'quick fixes' offered by various products (algicides, 'natural pond bacteria', clay and liming). Techniques such as aerators, etc. do not provide a long term solution and can actually lead to unexpected and problematic outcomes. In most cases, because these waterbodies have accumulated an excess store of these nutrients in the sediments, recovery requires a sustained change in the balance between nutrient input and output so that these stores are gradually used up. In much the same way, long-term weight control in people requires a change in the balance between intake and output of calories and 'crash diets' are ineffective. In both cases (lakes and people), each individual has a unique history, size/shape, metabolism and storage, and each should be carefully studied before any remedial action can be taken.