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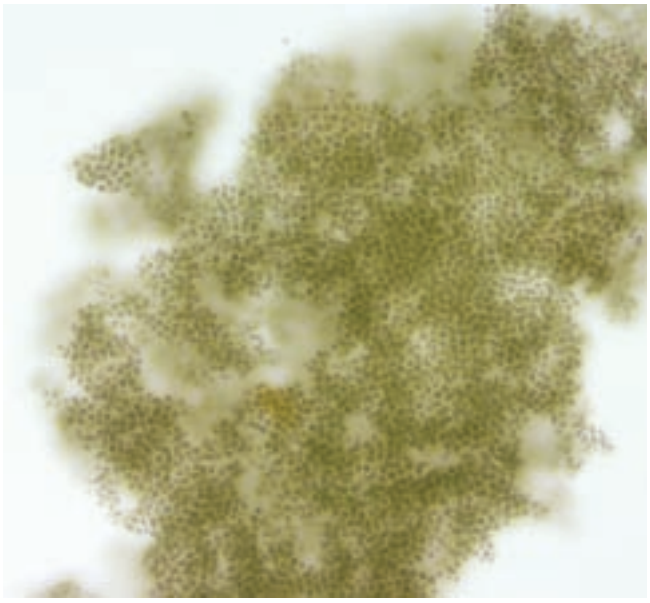
Toxic algal blooms

By D.C. Main, Veterinary Pathologist, South Perth



Toxic blue-green algae (Microcystis aeruginosa) under the microscope.

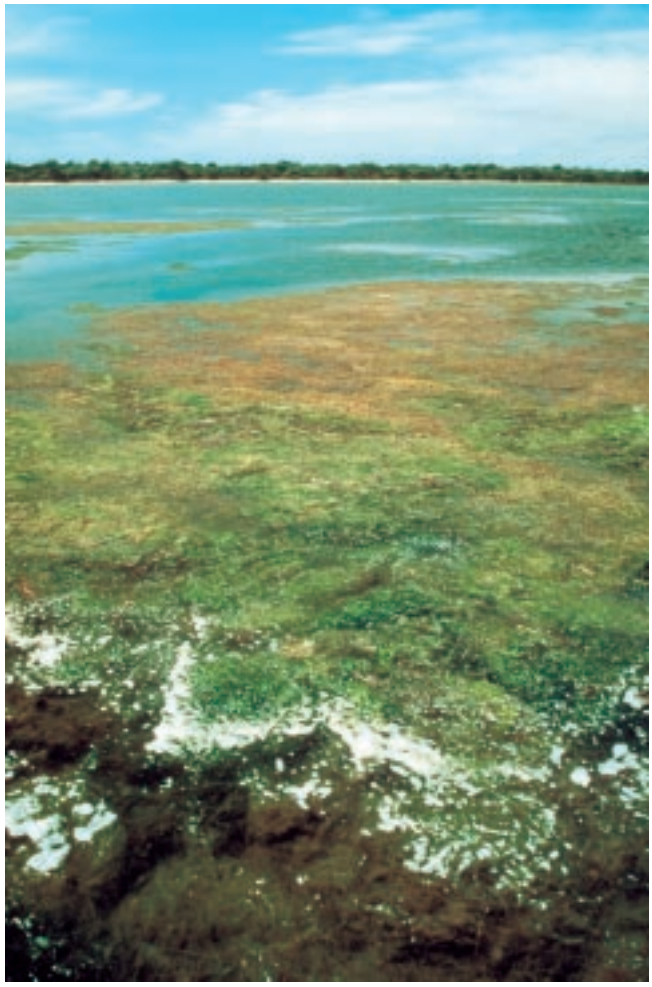
When a body of water becomes discoloured with a super-abundance of free-floating, microscopic plant or, in rare cases, animal life, it is said to develop a 'water bloom' or algal bloom.

Algae are primitive plants and include the seaweeds, fine hair-like green forms and microscopic single cells or colonies. Some of the microscopic species are the most dangerous and can multiply rapidly to produce prominent green, red, yellow and other discolouration of water. The most spectacular blooms in fresh water dams are produced by a group of algae known as the blue-green algae and several of these can produce toxins when conditions are favourable.

Development of algal blooms

Blue-green algae blooms thrive in warm, calm, shallow bodies of water where the water is hard, alkaline, and rich in nitrogen, phosphates, carbonates, and organic matter. Water inflow from fertile agricultural land and from sewage or certain industrial wastes also encourages algal growth.

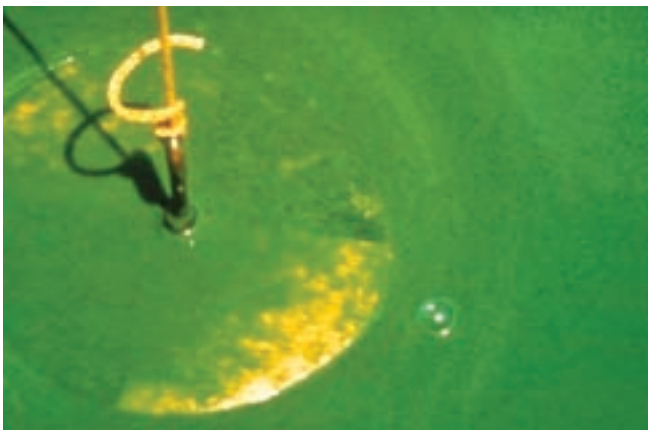
Livestock poisoning attributed to blue-green algae usually, but not always, occurs during summer. The



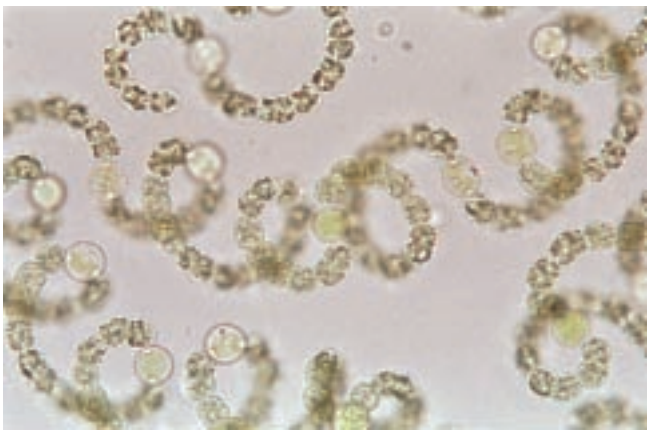
Algal bloom in the Peel Harvey Inlet.

ponds or lakes involved have been found to be enriched in some way by the inflow of water from arable land or by animal excreta.

Blooms of the blue-green alga *Nodularia spumigena* form a scum on sheltered shorelines when concentrated by winds or currents and otherwise can form a suspension in the water. These blooms have occurred in most spring-summer periods since the 1960s in the brackish to saline waters of the Peel-Harvey Inlet. One of the most spectacular blooms of *Nodularia* occurred in November 1990 when a 1000-kilometre stretch of the Barwon-Darling river system in NSW was affected.



A secchi-disc shows the depth of visibility in the Peel Harvey Inlet when there is an algal bloom.



Toxic blue-green algae (Anabaena spiroides) under the microscope.

These blooms can be toxic but fish, crabs and birds seem able to avoid the floating algal mats, although the abundance of certain fish species has declined in recent years. *Nodularia* blooms have been blamed for stock losses on farms in Western Australia, but the species more commonly implicated in livestock, waterfowl and fish deaths are *Microcystis* (formerly known as *Anacystis) aeruginosa* and *Anabaena circinalis.* Two other species known to be toxic, *Aphanizomenan ovalisporum* and C*ylindrospermopsis raciborskii* , are less common.

Livestock are poisoned during drinking when the algae are swallowed. Fish are often safe until a pond or dam dries or is drained down, bringing them into contact with floating algae.

Anabaena and *Nodularia* have been implicated in skin and eye irritations in man and dogs, while *Microcystis, Anacystis,* and another less commonly encountered alga, *Lyngbya,* have been reported to cause hay fever symptoms. There is also a suggestion that toxic products released from blue-green algae may be the cause of unexplained forms of human gastro-enteritis.

Fish deaths during algal blooms may be caused by the toxin in the algae, by the depletion of oxygen in the water, by the liberation of hydrogen sulphide and ammonia caused by cell decomposition, or by clogging of the gills. Intoxicated fish are usually found dead or gasping at the water surface.

Microcystis aeruginosa forms an emerald green scum in the water bloom stage and when dried looks like pale blue paint. *Anabaena circinalis* spreads to a greater depth (to 70 centimetres) but forms scum when winds and currents concentrate the water bloom in bays and backwaters.

Microcystis aeruginosa, Anabaena circinalis and *Nodularia spumigena* blooms produce a characteristic pungent, musky or earthy smell not unlike the insecticide Gammexane.

Algal poisoning

Symptoms of poisoning vary among livestock. Sheep poisoned with *Nodularia spumigena* suffer difficulty in breathing, muscular weakness and may show paralysis or nervous twitching. They may lapse into a coma before dying quietly. Most commonly, they are simply found dead near affected water. Sometimes the algal scum can be found on the forelimbs, lips and muzzle. Post mortem examination will often reveal a pronounced haemorrhage from the minute vessels under the skin and between the muscles.

Both *Nodularia spumigena* and *Microcystis aeruginosa* produce hepatotoxins, which cause severe liver damage and often may only be detected by examination by microscope.. *Anaebena ciricinalis,* on the other hand, produces neurotoxins and death results from paralysis of skeletal and respiratory muscles.

It is sometimes difficult to make a confident diagnosis of algal poisoning, since the clinical signs and post-mortem findings resemble a variety of diseases. Any change to the colour of the water should be investigated and because the algae are mobile all points of the dam should be inspected for evidence of scum. If algal poisoning is suspected, prevent access by stock and arrange access to a different water supply. If stock must be moved to another paddock, do it at a very easy pace. Once the stock have been moved, seek veterinary advice to confirm the diagnosis and send a sample of the bloom for identification to the veterinary practitioner investigating the problem or the Department of Agriculture officer involved.

Identification of algae

The blue-green algae that form water blooms consist of loose colonies or threads of cells and have to be viewed under a high magnification microscope to be identified.

Algae submitted for identification should preferably be fresh and healthy. They should be submitted in a small (100 millilitre) screw-topped jar fresh, or, if possible, with sufficient formalin added to make up a three per cent solution.

Farm water supplies

Algae in water tanks may be controlled by covering the tank to exclude light and reduce the temperature.

Deep dams are better than shallow dams as they reduce algal use of the sun's energy.

Nutrient levels in farm dams may be reduced by screening systems that reduce fouling of dam water by stock excreta and plant debris, by the restriction of

fertilisers in the immediate catchment area, and by ensuring the size of the catchment area is large enough to cater for sufficient run-off to cause an overflow in most seasons.

Chemical control

Algae can be killed with several chemicals, including Simazine, copper sulphate, calcium hypochlorite and Cupricide.

For best results, the treatment used should be done when algal development is first noticed. Note that some chemicals may be toxic to plants or livestock and aquatic animals such as fish and crustaceans (for example, marron, yabbies, koonacs and gilgies). It is important to read the product label carefully and follow the manufacturer's instructions.

Algal bloom in creek.

Simazine

Simazine is marketed at different strengths (25 per cent, 50 per cent and 90 per cent active ingredient) and under a variety of trade names, including Gesatop® and Simatox®.

The amount of commercial product required per 1000 litres (one cubic metre) of dam water is:

- 25 per cent product 8 mL
- 50 per cent product 4 mL
- 90 per cent product 2.2 g.

Premix the chemical in a drum or small tank of water before adding it to the dam. A convenient method is to then spray the premix over the dam surface using a fire-fighting unit. Mixing can be improved by dragging a tree branch through the water or by using an outboard motor or a fire pump to circulate the water. The last two methods will also help oxygenate the water.

Simazine will continue to kill algae for several days after application. Because it is a herbicide, it will also kill plants, so treated water should not be used on the garden for at least 14 days. The average half-life of simazine in ponds where it has been applied is 30 days, with the actual half-life dependent on the level of algae present, the degree of weed infestation, and other factors. Although it is regarded as virtually non toxic to bees, aquatic animals and many mammals, sheep and cattle are susceptible to poisoning by simazine when exposed to dose rates far greater than that recommended for algal control.

Chemical treatment of toxic algae can cause a sudden release of its toxin, which can persist for several days. Do not use water containing toxic algae, and which has been treated with Simazine, for irrigation or watering livestock for two weeks. This will ensure the residual effects of both the algal toxin and Simazine have dissipated.

Copper sulphate

This treatment has been used commonly but we no longer recommend it as it can kill crustaceans, fish and other aquatic life, and can also be dangerous for livestock already suffering liver damage or given copper bullets.

Toxic blue-green algae (Anabaena sp.) under the microscope.

Calcium hypochlorite

The amount of calcium hypochlorite needed varies with the conditions, particularly the extent of algal infestation and water temperature. A rate of 12 grams of 70 per cent material in 1000 litres of water is often effective. Correctly chlorinated water is safe for domestic purposes and stock, although a taste may be imparted to the water for a limited period and fish and crustaceans may be killed. The concentrate is corrosive to metals.

Algal blooms may reappear following chlorine treatment and periodic treatments will be necessary.

Ferric alum

Single or repeated treatments using block ferric alum at the rate of 50 mg/L will reduce algal blooms in farm dams. It removes phosphorus from the water by adsorption into a precipitate.

Place the block ferric alum in a hessian bag attached to a float (an empty 200 L drum) which is moored in the dam. In New South Wales, where this treatment was developed, dams were treated before the main season of algal growth (about August) and another treatment was given to some dams in about October.

Cupricide

This is a complexed chelated copper product that kills algae without the toxicity risks associated with copper sulphate. The dose rate varies from190 mL – 4.8 L per 1000 m^2 depending on the type and depth of algae being treated. Under field conditions Cupricide is effective in controlling a wide spectrum of algae. For planktonic (suspended) algae and free-floating filamentous algae mats, application rates should be based upon treating only the upper 50 to 100 centimetres of water. Check label for details.

Water treated with Cupricide is suitable for use on plants such as the watering of sports grounds and ornamental plants. Although it is far less toxic than copper sulphate, it should not be used in hard water containing trout, native fish or crustaceans.

It should not be used by farm animals grazing heliotrope or ragwort, nor should it be used in areas where aquatic birds are feeding on the algae. Refer to the product label for detailed information.

Disclaimer: Mention of trade names does not imply endorsement or preference of any company's product by the Department of Agriculture, and any omission of a trade name is unintentional. Recommendations are current at time of printing.

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