Appendix 5: Interim Fresh Water Algal Bloom Guidance[1]

1. About algal blooms

"**Harmful algal blooms** (HABs) are excessive accumulations of microscopic photosynthesizing aquatic organisms that produce biotoxins or otherwise adversely affect humans, animals and ecosystems"[2].

Algae are natural inhabitants of fresh water such as in lakes and reservoirs. When conditions are very suitable for growth – shallow, warm, slow-moving or still water - an algal bloom can occur.

Cyanobacteria or 'blue-green algae', a type of blooming algae, can produce toxins. These toxins can kill wild animals, livestock and pets. They can also harm people. Toxins include hepatotoxins, neurotoxins and endotoxins which cause human health effects[1] such as:

- Skin – rash, irritation, swelling, sores
- Gastrointestinal – nausea, vomiting, abdominal cramps, diarrhoea, anorexia
- Respiratory – nasal congestion, cough, congestion, wheeze, shortness of breath, chest tightness, sore throat
- Neurological – confusion, tingling, headache
- Eye/ear – watery eyes, eye irritation, visual disturbance, earache
- General – dizziness, muscle aches, fatigue, fever, malaise, back pain, weakness

Planktonic cyanobacteria often form obvious algal scums on lake surfaces and shorelines. However, some 'benthic cyanobacteria' (e.g. Oscillatoria, Phormidium) have also been directly attributed to or implicated in animal poisonings, with documented cases of fatal canine neurotoxicosis in several Irish lakes. These scums are less conspicuous, yet they produce very potent toxins (e.g. Anatoxin-a & Homoanatoxin-a). Their musty taste and odour may be attractive to dogs scavenging along lake shores, although other mammals and livestock are susceptible. Veterinary intervention often proves unsuccessful with death occurring quickly, e.g. 15-20 minutes after ingestion of relatively small doses. Benthic mats of cyanobacteria are also prevalent in remote oligotrophic freshwaters not normally anticipated to suffer from water quality problems and are widespread in rivers.

2. What to do if there is a suspected or confirmed algal bloom/ cyanobacteria incident?

Recognising a bloom

During an algal bloom water becomes less clear and may look green, blue-green or greenish-brown. Scums can form during calm weather when several bloom forming species rise to the surface. This can look like paint, mousse or small clumps – see photos.

Actions

[1] WHO is updating its international guidance and this document will be revised at that point – For more information please see **Toxic Cyanobacteria in Water: A guide to their public health consequences, monitoring and management** http://apps.who.int/iris/bitstream/handle/10665/42827/0419239308_eng.pdf;jsessionid=5D41342969592B97C8FF911FFBECD9C9?sequence=1

[2] Hillborn ED, Roberts VA, Backer L, DeConno E, Egan J, Hyde JB et al. Algal-bloom associated disease outbreaks among users of freshwater lakes, United States, 2009-2010. MMWR 10/1/2014 Vol 63, 1

Should an incident occur in a freshwater bathing site that gives cause for concern, the Local Authority will assess risk and bring the incident to the attention of the HSE. The following steps for the Local Authority are suggested;

1. Determine extent of suspect bloom (size of area involved, presence of scum in bathing location) and eliminate obvious cause (turbidity/discolouration due to weather/wave action/localised activity) which could give rise to such characteristics
2. Take a photograph of suspected bloom in situ.
3. Get a preliminary laboratory analysis if possible to confirm biological agent rather than suspended matter (suspended sediment, broken up seaweed, detritus, wastewater overflow etc). Local authorities will either use their own laboratory or a private laboratory to test the sample microscopically for species.
    a. Actual toxicity testing can be carried out through a Scottish laboratory with expertise in this area. [Scottish Water, PO Box 8855, Edinburgh, EH10 6YQ 0345 ph 00443456018855; e mail: scientific@scottishwater.co.uk]
    b. Kerry County Council has a lot of experience of monitoring and dealing with algal blooms and might be able to provide expertise in this if required

The following table may be helpful in guiding actions.

TableA5.1 - WHO Guidelines for safe practice in managing bathing waters which may produce or contain cyanobacterial cells and/or toxins[3]

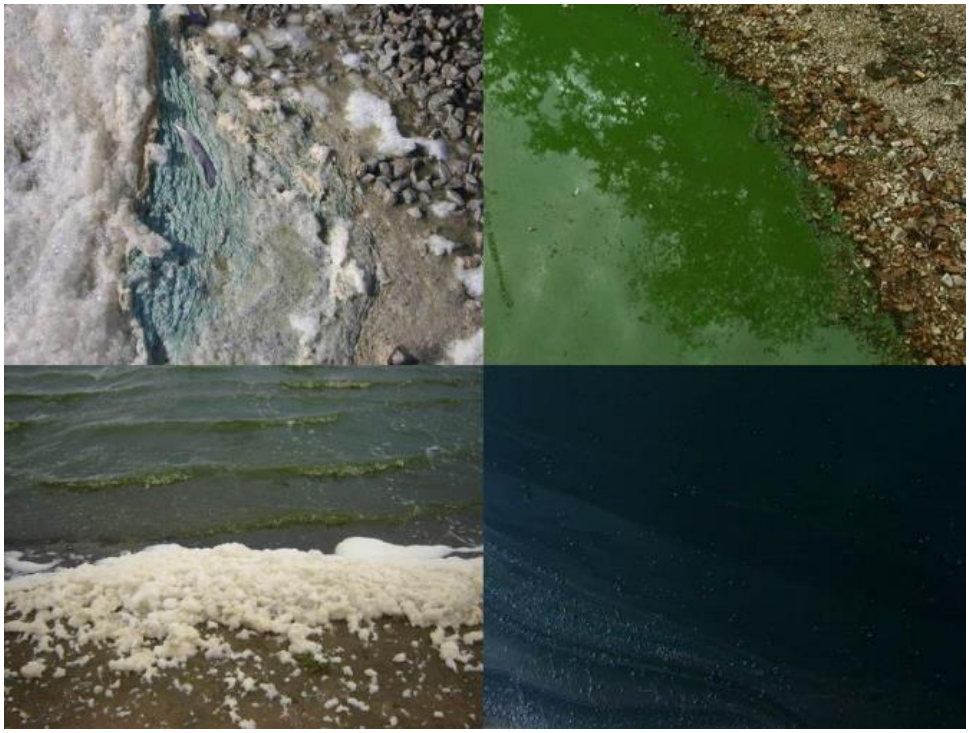
Guidance level or situation	How guidance level derived	Health risks	Recommended action
Cyanobacterial scum formation in bathing areas	Inference from oral animal lethal poisonings Actual human illness case histories	Potential for acute poisoning Potential for long-term illness with some cyanobacterial species Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness	Immediate action to prevent contact with scums; possible prohibition of swimming and other water-contact activities Public health follow-up investigation Inform relevant authorities
100,000 cells cyanobacteria per ml or 50 µg chlorophyll a per litre with dominance of cyanobacteria	From provisional drinking water guideline for microcystin-LR, and data concerning other cyanotoxins	Potential for long-term illness with some cyanobacterial species Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness	Watch for scums Restrict bathing and further investigate hazard Post on-site risk advisory signs Inform relevant health authorities
20,000 cells cyanobacteria per ml or 10 µg chlorophyll a per litre with dominance of cyanobacteria	From human bathing epidemiological study	Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness, probably at low frequency	Post on-site risk advisory signs Inform relevant authorities

4. If confirmed as a Harmful Algal Bloom (HAB), bathing and exposure to contaminated water must be prohibited and the suggested standard warning signs should be erected. Depending on the nature and extent of the HAB the suggested standard warning may be supplemented with further advice to the public. Table 1 is helpful

[3] Hillborn ED, Roberts VA, Backer L, DeConno E, Egan J, Hyde JB et al. Algal-bloom associated disease outbreaks among users of freshwater lakes, United States, 2009-2010. MMWR 10/1/2014 Vol 63, 1

but if laboratory results and a detailed risk assessment is not possible/delayed and there is a concern about exposure risk, it may be safest to assume toxicity initially and bathing and exposure to contaminated water must be prohibited (See suggested standard warning sign below).

5. The decision as to when to remove restrictions should take into account a variety of factors including the species toxicity, presence of scum and will be dependent on obtaining a favourable environmental risk assessment including;
   - 2 clear samples if possible, ideally a week apart
   - No obvious evidence of algae present
   - No weather and environmental conditions which could cause recurrence of the bloom



Examples of Blue Green Algae[4]

3. Suggested standard warning sign

WARNING

- This water contains high levels of blue-green algae which may cause illness in humans and animals including pets
- Avoid contact with scum, visible algae and surrounding water
- Do not swim in water near visible algae
- Do not touch scum on the shore
- Wash hands if you touch the algal material

[4] Water Quality Guidance for Open Water Events and Training Sessions. (2018). [ebook] British Triathlon, Royal Life Saving Society UK, p.11. Available at: http://www.triathlonscotland.org/wp-content/uploads/2017-Water-Quality-Guidance.pdf [Accessed 5 Apr. 2018].

- Keep children and pets away from the water's edge
- Do not let pets drink the water. Wash pets if they come into contact with water

4. Minimising future algal bloom

Minimising future algal bloom should be considered based on environmental conditions (and those predicted with climate change) and importance of the water body for ecology and human use. Algal blooms block sunlight from reaching other plants in the water. They also use up oxygen in the water at night which can suffocate fish and other creatures. Oxygen is also used up when the bloom decays. For example, increasing shade and reducing nutrients in the water can control algae.