Garden Wildlife Health 

Guidelines for safe disposal of waste water and other materials from captive amphibian enclosures

Background

As an amphibian keeper, it is essential to do all you can to ensure disease does not pose a risk to captive or wild amphibians. In addition to the newly-emerged chytrid fungus, *Batrachochytrium salamandrivorans* (Bsal), there are other amphibian pathogens that are a cause for concern, including *Batrachochytrium dendrobatidis* (Bd) and ranaviruses. **Biosecurity measures to prevent transmission of Bsal are paramount as current evidence shows that while the pathogen is present in captive amphibians, it has not yet infected wild amphibian populations in the UK, where it would pose a severe threat to native amphibian conservation.**

Disposal of water, substrate and other materials (e.g. plants, terrarium décor, faeces etc.) is one important route by which amphibian pathogens can enter wild populations. This document sets out guidelines for safe disposal of these materials from captive amphibian enclosures to reduce disease risks to wild amphibians. For a general overview of other ways you can reduce the risk of transmitting amphibian pathogens to wild populations, please see the latest Bsal disease alert pamphlet, which is available on the Garden Wildlife Health website (https://www.gardenwildlifehealth.org/garden-wildlife/#amph).

Many amphibians can carry and shed pathogens, such as chytrid fungi and ranaviruses, without showing any signs of disease **so a healthy captive population does not necessarily indicate a pathogen-free population**. It is therefore advised to treat all water, substrate and other materials coming into contact with amphibians as if they are infectious.

Water Treatment Guidelines

Equipment List:

- designated container (e.g. bucket/washing up bowl)
- brush
- disinfectant (see below)
- disposable or washing up gloves (disposable nitrile gloves ideal)
- bin bags for waste

Procedure:

1. Put on gloves.
2. Empty water from enclosure into designated container, noting the approximate volume of water.
    - If any water is spilled, disinfect the area with an appropriate disinfectant (see below).
    - If the water contains organic material (e.g. substrate/faeces), which can prevent effective disinfection, it should be filtered or drained through a fine-mesh net to remove this material. Depending on the material, it can then either be returned to the enclosure or disposed of as outlined in the "*Disposal of substrate and other materials*" guidelines.
3. Add an appropriate amount of suitable disinfectant to the water to achieve the correct concentration, following the supplier's instructions (see "*Disinfectant Solutions*").

4. Leave the solution for the appropriate period of time (see "*Disinfectant Solutions*").
5. Dispose of the water/disinfectant solution into the sewer system.
    - NB: Surface water drains, including road and car park drains, often discharge into rivers or the sea without treatment, so only dispose of disinfectant in this way if you are sure the drain is connected to the foul sewer. The sewerage undertaker – usually the water company – maintains a map of public sewers.
    - If you are in a remote area where sewage is discharged directly into a water body, this is not advised. Water/disinfectant solution should instead be copiously diluted with fresh water and disposed of in an area as far as possible from any water bodies.
6. Treat and rinse any utensils (e.g. siphons, nets) used by soaking in disinfectant solution of an appropriate concentration, according to supplier's instructions.
7. Dispose of gloves (remove without touching outer surface, place in sealable plastic bag and dispose of with landfill waste) & wash hands thoroughly.

Substrate/Décor Treatment Guidelines

Equipment List:

- designated container (e.g. bucket/washing up bowl)
- brush
- disinfectant (see below)
- disposable or washing up gloves (disposable nitrile gloves ideal)
- bin bags for waste

Procedure:

1. Put on gloves.
2. Remove substrate/décor from enclosure and place into a designated receptacle.
3. Disinfect substrate/décor.
    i. **Chemical disinfection**: Remove organic material and submerge in disinfectant solution, diluted to an appropriate concentration according to the supplier's instructions. Disinfect in small batches and ensure all surfaces are exposed to the disinfectant solution for the appropriate period of time (see "*Disinfectant Solutions*"). **This method is not suitable for organic material (e.g. soil/bark-based substrates, faeces etc.) or for materials being returned to an enclosure after disinfection.**

    OR

    ii. **Incineration**: Place material within a sealed plastic bag and send for incineration by a registered company that can dispose of clinical waste.

    OR

    iii. **Heat treatment**: Divide into small batches and expose to temperatures of >60°C for 30 minutes. This can be achieved using a domestic oven; however, care must be taken to avoid contamination and to ensure that the entire substrate batch reaches the required temperatures for the full 30-minute period.

4. Once thoroughly disinfected, place material in a sealed plastic bag and dispose of with household waste (landfill waste **NOT** composting etc.) and dispose of waste water into the sewer system (see above).
5. Treat and rinse any utensils (e.g. siphons, nets) used by soaking in disinfectant solution of an appropriate concentration, according to the supplier's instructions.
6. Dispose of gloves (remove without touching outer surface, place in sealable plastic bag and dispose of with landfill waste) & wash hands thoroughly.

Disinfection Solutions

The following disinfection protocols have been tested and found to be effective against Bsal:

F10 Super Concentrate: 4ml solution/1000ml water (as per supplier's instructions) **for at least 1 minute.**

- F10 SC is widely available online and from exotic pet retailers.

Virkon-S: diluted with water to produce a 1% solution (as per supplier's instructions) **for at least 5 minutes.**

- Virkon-S is available as a powder or in tablet form and is available online or from farm/equestrian supply stores.

Bleach: diluted with water to produce a 4% solution **for at least 1 minute**.

- Bleach should only be used when other disinfectants (i.e. F10 SC or Virkon-S) are unavailable due to the large volumes required, its corrosive properties and the potential health hazards to animals and people associated with incorrect usage.
- When using bleach products for disinfection purposes, ensure you do so in a well-ventilated area and do not use bleach in conjunction with other disinfectants.
- Sodium hypochlorite is the active ingredient in household bleach, and concentrations vary between brands, typically from 8-15%.
- It is important you check the concentration of the brand you are using and adjust your dilution rate to arrive at 4% (Table 1).
- Concentrated household bleach should be used rather than 'thick bleach' products which can have limited efficacy.

Bleach product concentration	Dilution to produce 4% solution (bleach : water)
4%	No dilution
6%	1 : 0.5
8%	1 : 1
10%	1 : 1.5
12%	1 : 2
14%	1 : 2.5
16%	1 : 3

Table 1. Dilution ratios to produce a 4% bleach solution.

Further Information

Amphibian and Reptile Groups of the United Kingdom: Amphibian Disease Precautions: A Guide for UK Fieldworkers

Bsal Europe Website: (www.bsaleurope.com)

Amphibian Disease Alert

GWH Disease Factsheet on Amphibian Chytridiomycosis

GWH Disease Factsheet on Ranavirus Disease

Scientific publications

Stegen G, Pasmans F, Schmidt BR, Rouffaer LO, Van Praet S, Schaub M, Canessa S, Laudelout A, Kinet T, Adriaensen C, Haesebrouck, F (2017) Drivers of salamander extirpation mediated by *Batrachochytrium salamandrivorans*. *Nature* **544**(7650):353-356. doi.org/10.1038/nature22059

Van Rooij P, Pasmans F, Coen Y, Martel A (2017) Efficacy of chemical disinfectants for the containment of the salamander chytrid fungus *Batrachochytrium salamandrivorans*. *PLOS ONE* **12**(10):e0186269 doi.org/10.1371/journal.pone.0186269

Spitzen-van der Sluijs, A, Martel A, Asselberghs J, Bales EK, Beukema W, Bletz MC, Dalbeck L, Goverse E, Kerres A, Kinet T, Kirst K (2016) Expanding distribution of lethal amphibian fungus *Batrachochytrium salamandrivorans* in Europe. *Emerging infectious diseases* **22**(7):1286. doi.org/10.3201/eid2207.160109

Martel A, Blooi M, Adriaensen C, Van Rooij P, Beukema W, Fisher MC, Farrer RA, Schmidt BR, Tobler U, Goka K, Lips KR, Muletz C, Zamudio K, Bosch J, Lötters S, Wombwell E, Garner TWJ, Cunningham AA, Spitzen-van der Sluijs A, Salvidio S, Ducatelle R, Nishikawa K, Nguyen TT, Kolby J, Van Bocxlaer I, Bossuyt F, Pasmans F (2014) Recent introduction of a chytrid fungus endangers Western Palearctic salamanders. *Science* **346**:630-631. doi.org/10.1126/science.1258268

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Disclaimer

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