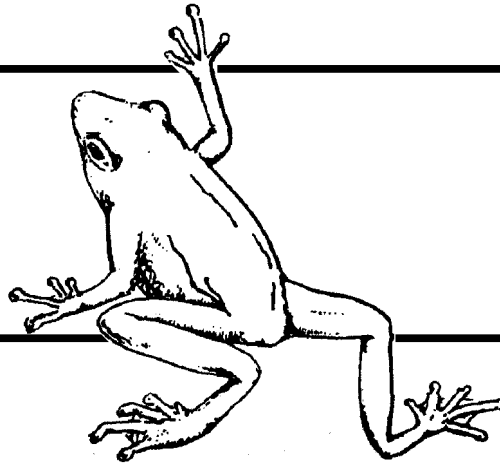

FROGFACTS

No. 8



The Frog and Tadpole
Study Group of NSW Inc
FATS GROUP

P.O. Box 296
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FROG HYGIENE FOR CAPTIVE FROGS

Introduction

Our frogs are now at serious risk from emerging diseases. The amphibian Chytrid fungus (*Batrachochytrium dendrobatidis*) is spreading through much of Australia and is a major factor in the deaths of wild and captive frogs. Ranavirus has recently also been found in Australia and may likewise become a severe problem for frogs. Current practices of frog keeping are no longer suitable: they can facilitate the spreading of diseases between adjacent groups of captive frogs, between frogs held by different keepers and between captive and wild populations. This information sheet explains how to reduce the danger of infecting captive frogs with Chytrid fungus, and possibly also with other frog diseases. Please check for updates on this subject, because at the time of writing, little of practical use is known about containing such rapidly spreading diseases.

Risk sources and risk levels

For captive frogs, the main risk sources of infection are probably:

- cross-infection between cages
- consecutive infection where the same cages are used for new frogs
- adding new cage inmates to existing stock
- infecting your garden, even your suburb
- infecting the wild
- infection from garden or e.g. nursery plants, tadpoles or water
- infection from other keepers, via handling or equipment

The risk levels vary according to the conditions in which frogs are kept. Some examples are:

- Low risk level: single indoors frog cage.
- Higher risk: frog cages in the house, frog pond outside.
- Very high risk: frog cages indoors, frog pond outside; also trading/swapping/conducting frog rescue/quarantine.

Some basic principles

1. We don't know enough about it.

At this stage,

- Chytrid fungus is becoming increasingly common in wild and captive frogs;
- it cannot be adequately detected by frog keepers, it cannot be quarantined against with certainty and it cannot be treated effectively;
- even less is known about Ranavirus.

2. Chytrid is water-borne.

It is spread by water drops, and by wet or damp hands or equipment. The spores die upon drying out. Chytrid on equipment can be killed either by keeping it completely dry for a time, or with disinfectants such as chlorine

bleach. In frog skin it becomes embedded and is hard to remove without harming the frog.

3. Keep your frogs perpetually at a reasonable level of quarantine.

Have two-way isolation between each of your cages, and between them and your garden. Have an intensive level of quarantine for new frogs and for cages in which a frog has become ill or has died.

4. Assume that all cages are infected, and at the same time that all cages can be infected from each other.

Frogs can be carriers for long periods and may or may not develop symptoms during the days before their death. Realise that you are flying blind.

5. Service the least likely to be infected cages first.

This is a precaution against quarantine isolation not always being perfect. Spreading a droplet from a healthy cage to an infected one is less serious than vice versa. Likewise, service those cages with any threatened frogs or breeding stock before you deal with common or non-breeding frogs.

6. Decide whether your quarantine is curative or revealing.

If you quarantine frogs in essentially bare tanks at 30 - 32°C, with 0.05% salt added to their water, and if you spray them and their cage daily with water containing 10 mg/l benzalkonium chloride (less for smaller frogs) and 5 drops/l Alive-O Aqua-Remedy, then any Chytrid fungus on the frogs is likely to be either eradicated or held in check as long as the treatment continues (it is not known which).

On the other hand, if you keep them cooler (perhaps below 25°C) and unmedicated, any frogs with Chytrid fungus are likely to die within about three months. Because co-inmates should then normally be euthanased, the latter method is better suited where each frog has its own quarantine cage for the three months period.

Tadpoles can be split into a curative (warmth and salt) and a revealing group, where most of them will die shortly after metamorphosis if infected. The entire batch should in that event be euthanased.

A one-week curative treatment every month may be sufficient, with the intervening weeks at room temperature and with more diluted medication spray. This is less stressful for non-tropical species. It is important that the raised temperature should permeate all parts and corners of the cage, in water, air and any substrate (e.g. with the cage in a glass-fronted cupboard).

Where frogs are kept in cages without any ground cover, Betadine can be used instead of benzalkonium chloride plus Aqua-Remedy. Chytrid-infected adult Green Tree Frogs have recovered after continuous treatment in water with 25 drops Betadine/l (plus salt and warmth as above). The treatment lasted two weeks, with daily water changes, and was followed by a two month untreated period during which the disease did not reoccur.

7. Contain yourself. Don't be a compulsive collector.

Acquiring a frog from someone who has frogs from many different sources is risky. Similarly, if you acquire frogs from numerous sources, you run a much greater risk of infecting all your frogs and of spreading frog disease further.

8. Contain your frogs, and keep your hands out of the cage.

Don't release captive frogs and don't let them escape. Only touch your frog and the inside of its cage if there is a need to do so, and then either change disposable gloves or scrub your hands or your washing-up gloves, then dry them well, before putting your hands into the next cage. Especially if you have multiple cages, try to use a system with screw-on or plug-in food jars which you can access and change from the outside of the cage.

9. Keep ants out; keep food insects and furnishings uncontaminated.

It may be that ants spread frog disease when they travel between cages, or between a cage and the garden. Don't dip a contaminated hand into your mealworms, woodies, crickets, or fly pupae storage container.

10. Think ink. Don't drip, don't smear, don't spatter, don't forget.

One droplet could infect the next cage or the garden; one droplet from your pond could infect your cage. When you clean the cage or the water bowl or food bowl, pretend that each droplet you spatter around the sink or toilet is a strong ink that cannot be smeared completely away with a rag, and that your contaminated hands will stain anything you touch: rags, tap handles, water jug handles, door handles, light switches, spectacle frames. There is little point in scrubbing your hands or changing gloves if you promptly touch any of those items again. If a bucket held contaminated water before, and if you fill it to the level where the faucet dips in, or where drops splash up to it, you may now have contaminated the faucet. If you pour infected water down the sink and then omit wiping it with chlorine bleach, and if the next person later peels vegetables in that sink and throws the scraps on the compost, your garden may become contaminated. If you use a spray bottle to spray water into your cage through the perforated cage lid, and if droplets bounce off the lid onto the next cage, you could be transferring Chytrid fungus.

11. Disinfect cages and cage contents.

Disinfect cages and furnishings with laundry chlorine bleach (1 : 5 with water), before and after using them for

different frogs. Since a frog itself can't be disinfected, there is little point in thoroughly disinfecting its own cage during regular cleaning. Simply grab the frog through an inverted plastic bag, lightly inflate the bag, and leave the frog in it while you are cleaning its cage. Do not re-use the bag. Before putting any live plants into the cage, fully submerge them for one hour in a 1% salt solution - some plants are not suitable for this treatment. Don't use live plants in intensive-level quarantine cages.

12. The drain is just for rain.

Waste water from your cages must not go into the stormwater drain or into your garden, but it is thought to be safe to pour into the toilet. Also, solid waste from frog cages, including plants, should be wrapped up and placed in the garbage, not the garden. However, if you have a (suspected or known) Chytrid fungus outbreak or if you run a formal quarantine facility, please (a) chlorinate the waste water beforehand and (b) chlorinate solid waste and strain it before disposal into the garbage.

13. Unstressed frogs have better disease resistance; know their basic survival needs.

As a minimum, frogs need a water bowl with easy entry and egress, a dark hiding place, a clean cage (land and water), adequate humidity and temperature (including adequate night temperature for digesting), live food (mostly insects) with some variety and enrichment, unobstructed access to food, a suitable substrate for ground frogs and burrowing frogs, and an elevated perch and/or bright light for basking for some tree frogs. They need protection from larger frogs, from sharp objects in the cage or lid, from direct sunshine reaching the cage, from surplus adult crickets (unless a slice of carrot or other food for the crickets is available), and from overabundant flies if frogs have damaged noses or other skin damage. Individuals with damaged noses or with repetitive restless motions need larger cages and more hiding places of different types. Damaged noses must be treated, using e.g. Betadine or Nasalate cream. - Unless you have some understanding of biological filtration, don't pour water directly into the tank - water in a bowl which you can easily change twice a week is preferable. Untreated tap water is suitable for frogs (but not for tadpoles); it is initially a mild disinfectant.

14. Know what to do when you've breached quarantine.

Restart any intensive quarantine period from the beginning if the cage has been potentially contaminated. If a Chytrid fungus infection is suspected or known in a planted display tank, either increase its temperature uniformly and permanently (air space and water) to 30 - 32°C and add 0.5g salt per litre, or move the frogs to essentially bare quarantine cages and disinfect the display tank with chlorine bleach, discarding the plants after chlorine treatment (wrapped up and into the garbage, not into the garden). Be prepared to drain and remove your frog pond if you find several of your garden frogs dead, or if a captive-raised sample of their metamorphs is dying.

15. Apply prophylactic and curative treatment as recommendations emerge.

To date, few if any authoritative studies of practical use on Chytrid fungus treatment are available. Stay in touch with the FATS Group.

16. Spread the word - not the fungus!

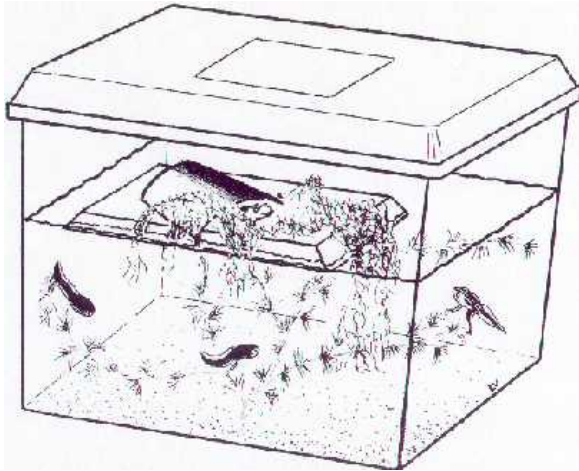
Most frog keepers have not yet heard of the need for frog hygiene or are not convinced that it also applies to them. There are too many Typhoid Marys amongst us!

Cage designs

Some cage designs are summarised that are suitable for "new-deal frog keeping", bearing the above principles in mind:

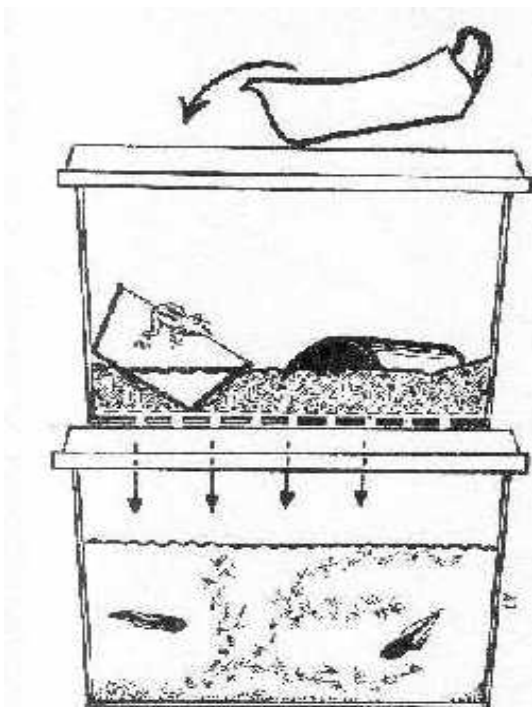
1. For tadpoles and metamorphs:

You need an L-size (33 cm long at mid-height) plastic tank or larger, with ventilated lid. Fill to 2/3 height with tap water; add water conditioner. Add disinfected (1 hour in 1% salt water) fast-growing water plants. Add a spoonful of garden soil (fully dried at room temperature to kill Chytrid spores) to provide useful nitrification bacteria and for the tadpoles to browse through. Add a floating polystyrene island to cover half the water surface. Put hiding places on the island - e.g. sphagnum moss and a piece of dark curved plastic from a flower pot. Add a maximum of 20 tadpoles - acclimatise them to the new water gradually. Change 20% of the water twice weekly; less often if water plant growth is good.



2. For tadpoles and young frogs:

Stack two L-size plastic cages on top of each other. The lower one is for tadpoles (as above, but without the island). With a hot fork, make numerous holes in the base of the top cage. Put a few layers of fly screen into the top cage and then a 5 cm layer of preferably palm peat or otherwise of sphagnum moss.

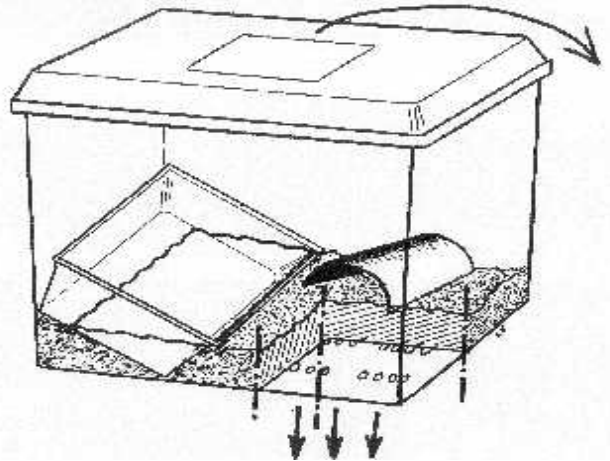


Bury a rectangular plastic takeaway container into the palm peat near one end of the cage, at a slope so that one top edge and the opposite bottom edge of the container are flush with the substrate surface. Fill the container initially with water from the tadpole (bottom) cage. At the other end of the top cage, provide a dark plastic hiding place. Check the bottom cage daily for metamorphs whose arms have emerged and place these into the water container in the top cage. Every day, pour one litre of water through the ventilated lid into the top cage. This will keep the surface of the palm peat clean and will drain into the bottom cage. Twice a week, lift and tilt the top cage to empty the takeaway container. When the bottom cage is full, pour some of its water out through its closed lid, into the toilet. With this set-up, most of the maintenance can be done without inserting your hands into the cages. For feeding, also use a hands-off method, especially if you have more than one cage - see (3) below.

3. For small frogs:

As in (2) above, but without a tadpole tank underneath. Instead, the cage drains into e.g. a tray in which it stands on spacers, into an indoor planter pot. You can also stand several on a large filtered fish aquarium, provided the water from it is properly disposed of; or (for larger-scale quarantine shelves) into a gutter system leading to a chlorinated waste water drum.

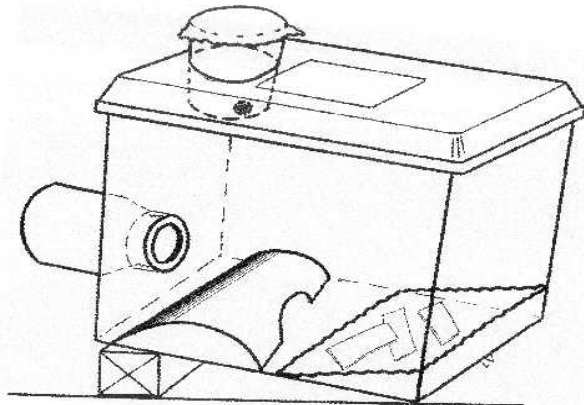
Feeding is achieved by cutting a round hole into the clip-on cage lid (these often have a round perforation to facilitate this) and then inserting a disposable plastic cup halfway through the hole into the cage. The cup contains the live food insects (e.g. fruit flies or small crickets) or the fly pupae and the enriched insect food, and is covered with a piece of paper and two elastic bands. Immediately before inserting, cut a small hole into the cup, near its bottom, through which the insects will crawl into the cage. Take care that the water bowl is not immediately underneath the food cup. This method allows food cups for a number of cages to be quickly swapped against fresh ones without cross-contamination.



4. For frogs in intensive quarantine:

Unless you can use drained cages without spilling, it is safer to use a plastic quarantine cage without holes in the bottom but then without palm peat or any other substrate. Put a spacer under one end of the cage. Add water or medicated water so that 1/3 of the floor is covered and the water is about 2 cm high at the deep end. Make an entry hole into an upturned plastic flowerpot and place it (or better still, wedge it) into the land area. Add a bushy synthetic plant if available. Use a food cup in the lid over the land area as described in (3), but also have pieces of thin polystyrene (cut from a fruit tray) floating on the water as refuge islands for insects. - For medium-sized and larger frogs that are also fed mealworms, take several identical

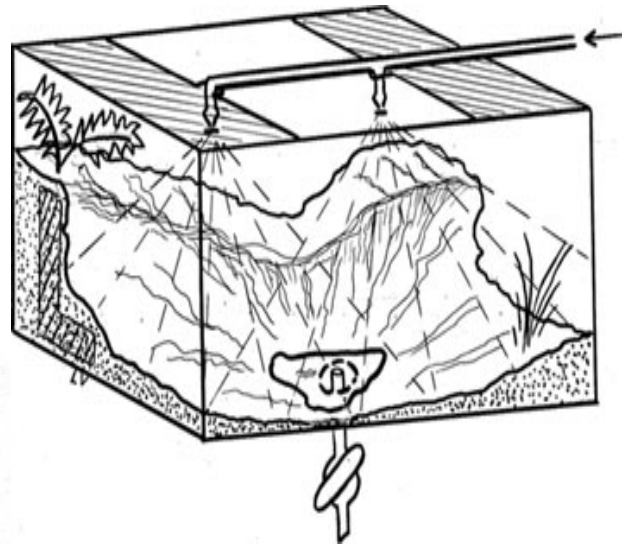
plastic jars, make a hole in the side of the cage with a hot screwdriver and sandpaper - 8 mm less in diameter than a jar lid, cut a hole of the same size into the jar lid, glue the lid onto the outside of the cage, with the lid's wide opening facing outwards, place mealworms (dusted with additive) into one of the jars, together with a cardboard spacer (e.g. slices from toilet roll cores) so that the wet frogs can't smother the mealworms, and screw the jar onto the cage. Clean the jar by replacing it with a sterilised one. - Cleaning the cage is done by carefully pouring waste water out through the closed lid (or through a hole in the bottom of the cage, with a glued-in tap) and rinsing several times. - If heating for a number of cages needs to be improvised, they can be stood on an electric blanket with an upturned polystyrene broccoli box over each cage, with a thermometer penetrating through the styro box and with a spacer under the box for temperature regulation and for some light. A more permanent glass-fronted heating cupboard with a thermostat and electric heating is preferable.



5. For larger frogs:

Other than for intensive quarantine, large Green Tree Frogs should have at least 60 cm, and White-lipped Tree Frogs 90 cm long cages, and preferably extra high ones. A cage with rounded gravel on its floor, a bowl with water that is changed twice a week, with climbing branches and with artificial or disposable plants is easy to keep clean if there are only a few inmates, and to strip down to disinfect. Such tanks can be heated when necessary by thermostat-controlled ceramic heaters or incandescent down-lights from above and – if there is no thick layer of substrate – by heat-mats from below. If a number of tanks are kept, they are easiest to keep clean if spray jets are installed in each lid, using an electronic tap timer, and if the tanks have drain holes at the bottom that are connected to a waste system. The resulting water puddle in the cage should be as small as possible, unless further provisions for cleaning it are made. - An alternative method uses circulating water and biological filtration, with one submerged pump running continuously and perhaps driving a small waterfall, and with the other and larger pump (powered via an electric timer)

driving a set of rainbars. Advantages of this method include less waste water to dispose of, warm circulating water and the ability to use convenient aquarium heater/thermostats and to create attractive aqua-terrariums. There is also no need for a bottom drain, unless a hybrid system is used that would give the advantages of both methods.



Some of the above cage designs will be explained in more detail in other *FrogFacts* publications, together with designs for burrowing frogs and for display paludariums. You will also find information on feeding and food raising in further *FrogFacts*.

Further information

- The postal address of the Frog and Tadpole Study Group of NSW Inc (FATS Group) is: P.O. Box 296, Rockdale NSW 2216. When requesting *FrogFacts*, please send a small donation for photocopying and postage.
- FATS Group meetings: Every first Friday of every even month, 7 pm for a 7:30 start, at Newington Armoury, Bldg. 22, northern end of Jamieson St., Homebush Bay. Parking at boom gate.
- FATS Group website (with links to other frog groups): www.fats.org.au
- Frogwatch Helpline: 0419 249 728, (02)9599 1161, (02)9371 9129
- Voigt, L. and White, A. (2001). *FrogFacts* No. 6 - Collecting, Raising and Releasing Tadpoles. FATS Group, Sydney.
- Wellington, R., Haering, R. and Voigt, L. (2001). Helping frogs survive - a guide for frog enthusiasts. NSW NPWS. (poster)
- Frog Hygiene Protocol on DEC / NPWS website: www.nationalparks.nsw.gov.au/PDFs/hyprfrog.pdf
- Amphibian Diseases website of James Cook University: www.jcu.edu.au/school/phtm/PHTM/frogs/ampdis.htm

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