
Water Leakage in Rodent Cages: A Discussion by the Laboratory Animal Refinement and Enrichment Forum

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"It is not uncommon that malfunctioning in watering valves or leaks of water bottles result in the accumulation of water in rodent cages (especially during holidays and on weekends), a circumstance that can have serious implications for the animals trapped in such quasi-flooded living quarters. In your own experience, what's a practicable and reliable solution to this problem?" (Moderator)

"We rarely see this problem in rats but relatively often in mice, especially in C57Bl/6 and Tg strains with C57Bl/6. It seems to be worse if the animals are nervous or have litters. Since we have moved all our breeding colonies to a separate SPF unit where the animals are very little disturbed and are kept in cages that are provisioned with shelters/nests, the incidence of wet cages has become negligible. When we have an occasional problem cage we reduce the amount of sawdust (kiln dried softwood/aspen with high absorbency) but use more shredded paper.

Our institution only uses bottles. Drinker spouts with ball bearings can reduce the risk of leakage, but some animals may not be robust enough to use them properly. When ball bearings get stuck small mice may not be strong enough to free them.

In my experience water leakage is primarily triggered when the animals build a nest up against a drinker spout but is rarely due to a malfunctioning of the spout. Hence the strain difference and improvement when animals are bred in dedicated rooms with restricted entry, away from the everyday disturbances of the conventional animal room.

Having good technicians who are committed to checking each bottle for leaks obviously helps, and I must admit I am blessed with a 1st class team." (Barley)

"Cage flooding can be a serious problem in ventilated caging systems with automatic watering for mice. We have purchased Bio-Serv tunnels that hang off the top of the cage plus Tecniplast mouse houses, both functioning as life rafts so to speak. This doesn't do much for the young pups but at least we save the adults. We are hoping this will alleviate much of the drowning risk since we did not see any better options at this point. We are placing this type of enrichment/housing in each cage to provide the animals elevated dry refuge areas in case of water leakage." (Walsh)

"Although we always use water bottles for our own experiments (in order to measure water intake), our animal facility commonly uses an automatic drinking system. The number of animals dying as a result of flooding is very small. We have taken a number of measures that work well:

1. In order to prevent flooding of the cage, the drinking spouts have small metal gutters pointing downwards, away from the cage. Whenever a spout starts leaking, the water will drip on the floor, rather than into the cage (I believe the gutter is a normal feature of good drinking systems). It's important to make sure that the nipple and gutter are placed correctly.
2. Occasionally, the animals plug the spout with bedding material. When this happens, the cage will flood. To minimize this hazard, the whole watering system is cleaned by the manufacturer once a year. This is a bit costly, but worth the effort and money.
3. Careful instruction of the animal care takers can prevent the following hazards:
 - a) When water tubes are left on top of the cage, the animals invariably will gnaw on them thereby causing leakage.
 - b) If a cage rack contains both small and large cages, a leak in a spout of a small cage leaking away via the gutter may leak into a cage below, rather than onto the floor.
4. Of course, all cages are checked once a day (also on weekends and holidays) so no cage is left uncontrolled for more than 24 hours." (Van Loo)

"I am not a fan of automatic drinkers for rodents although we use them for rabbits and guinea pigs, but of course their cages are 'open' at the front. People I know who do use automatic drinkers for mice and rats have cages with a drainage hole in the floor. The edge of the hole is protected with metal and the hole itself is covered with a fine mesh which allows water to drain out but prevents escape of bedding or occupants!" (Barley)

"The hole in the floor device seems like a good idea, but how do you stop the water from dripping into the cages below? " (Sherwin)

"From what I remember there is a solid shelf between each row.

We would be expected to take some steps to ensure that cages cannot 'flood' as such although it is difficult to stop the bedding getting damp in some cases. Wet cages can seriously affect some strains of mice, particularly transgenic and the less robust inbred strains. In our experience it's due to them being cold, and not having a dry nest to warm up in. Our animals are checked at least once daily 365 days a year but for very young litters being damp even for an hour or two can be fatal. We've also noted that some dams are reluctant to mother their pups if they are wet. This may be due to the fact that cage debris tends to stick to them." (Barley).

"One problem we occasionally encounter is that mice push enrichment items such as cardboard or 3-D mazes accidentally against the nipple of the water bottle thereby causing it to leak into the cage. We try to prevent this by fixing the enrichment objects to the cage/lid so that the animals can't move them around.

Personally, I prefer bottles to automatic watering systems. If there is a leak, it will be limited to the contents of the bottle rather than the contents of the automatic watering system which could easily fill a cage if not noticed in time." (Sherwin)

"I have seen nipples for bottles with TWO ball-bearing valves in them, instead of the standard one at the tip. There's a regular ball-bearing tip at the mouse end of the nipple, but the metal tube to the bottle has another ball-bearing valve at the top. This means that the bottle can't run empty if the bottom valve is wedged open. They're very cunning and I have no idea how they work, but they do!" (Garner)

"While everyone is on the topic of leaking bottles and wet rodent cages, I'd like to ask some advice. We have some disagreements among caretakers about the amount of bedding to put in rodent boxes, i.e., mouse boxes. Some people reason that putting a very thin layer (hardly enough to cover the bottom of the box) and an 8oz water bottle prevent the mice from pushing the bedding up into the sipper tubes. And if the box does flood, only 8oz of water will be contained in the box. However, there are still incidences of animals, especially pups, dying as a result of water leakage.

Other people argue that putting at least 1/2" of bedding in the box will help keep the mice alive since all the bedding will absorb all the water that leaked from the bottles. But pups are likely to die from this also, since they would be cold from sitting on wet bedding. I like the idea of tubes suspended on the side of the cages to keep adult mice warm, but getting all the staff to agree proves very difficult. Some people have a hard time endorsing anything that looks like environmental enrichment, and tubes fall into that category." (Cherry)

"Suspended tubes can save animals from drowning and, therefore, should be regarded as basic furniture rather than as enrichment items for mouse and rat cages. The added enrichment effect is nice but certainly the lives of everyone's mice is a top priority. We are currently working on SOP's which will make elevated furniture a rule for all rodent cages. Exemptions will be granted only if an investigator specifies scientific reasons that prohibit such furniture." (Walsh)

"I have seen photos/videos of mouse and rat mothers carrying their pups in their mouths to new nest sites. If a cage was to incorporate an elevated dry refuge structure, I wouldn't be at all surprised if the mothers evacuated the young from damp substrate to this safer site." (Sherwin)

"In summary, water leakage in rodent cages can have serious animal welfare implications for mice, especially when automatic drinking systems rather than bottles are used. The problem can be alleviated by:

- checking all cages at least once every day, including weekends and holidays;
- checking all water bottles once every day, including weekends and holidays;
- cleaning automatic watering systems at least once a year;
- attaching a small drainage gutter on the drinking spout;
- providing the animals with enrichment items that they cannot move around;
- providing the animals with elevated/suspended dry refuge areas.

Nesting material is essential for the animals' well-being and, therefore, should be basic furniture of rodent cages regardless of the fact that it poses a certain risk factor for water leakage.

The commitment of the attending animal care staff is the key to avoid water leakage and possible flooding of rodent cages." (Moderator)

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Published in *Animal Technology and Welfare* 3, 111-114 (2004).