

TECH-2-TECH

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This section offers readers the opportunity to submit informal contributions about any aspects of Animal Technology. Comments, observations, descriptions of new or refined techniques, new products or equipment, old products or equipment adapted to new use, any subject that may be useful to technicians in other institutions. Submissions can be presented as technical notes and do not need to be structured and can be as short or as long as is necessary. Accompanying illustrations and/or photos should be high resolution.

NB. Descriptions of new products or equipment submitted by manufacturers are welcome but should be a factual account of the product. However, the Editorial Board gives no warranty as to the accuracy or fitness for purpose of the product.

Introducing non-aversive mouse handling with 'squnnels' in a mouse breeding facility

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Based on the winning entry of the AS-ET sponsored LASA 3Rs prize 2021 *Non-aversive handling and mouse colony breeding productivity: welfare improves, costs decline*

Abstract

Based on queries received during our 2021 LASA 3Rs' presentation, we describe operational highlights and concerns that came up during the rollout of non-aversive handling as standard of care at our mouse breeding facility. We describe the development of the square handling tunnel (or 'squnnel'), some of the pros and cons of its introduction and use, general concerns about increased work burden associated with non-aversive handling and, key items to be included during planning and implementation when non-aversive handling is to be introduced as a new standard of care.

Keywords: mouse, non-aversive handling, 3Rs, square tunnel

Introduction

In 2010, Hurst and West published their landmark paper on non-aversive handling of mice.¹ They demonstrated that methods of lifting or transferring mice with cupped hands or a transfer tunnel were far less stressful to the animals than picking them up by the tail. Since then, numerous papers have come out on the welfare benefits to mice of non-aversive handling and as of 2019, more than half of UK institutions have switched from tail-handling to non-aversive methods.² Unfortunately the USA has lagged far behind in adopting these practices and in large breeding facilities it is still common to find mice being picked up by the tail with padded forceps (Figure 1). It has been argued that forceps handling should be used in large facility operations because it

reduces the risk of cross-contamination during cage cleaning and operator injury from bites. However, there is little evidence to support either of these assumptions and recent evidence shows that operator injuries are actually increased with forceps use because of repetitive hand and shoulder injury.^{3,4}

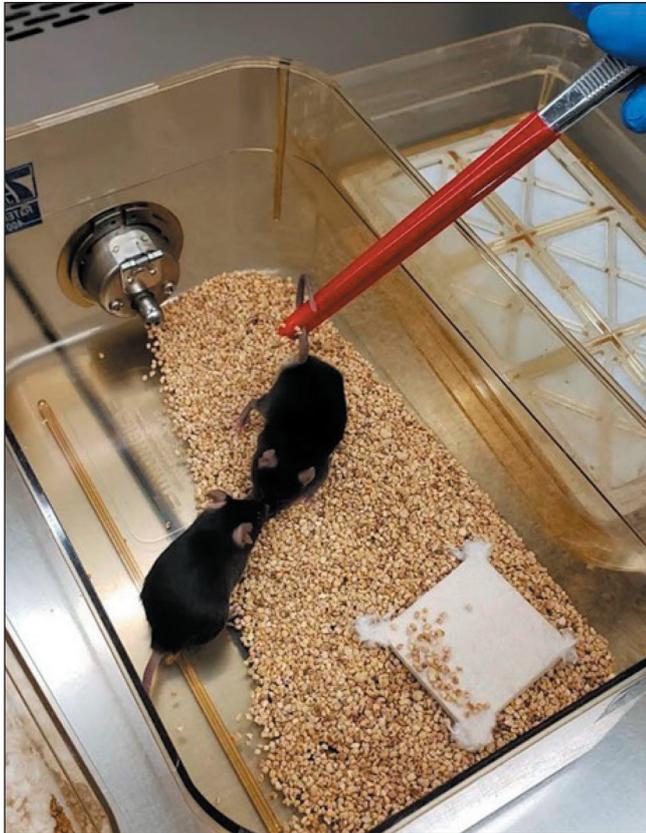


Figure 1. Showing padded forceps as used in the USA.

My colleagues (Dr Maggie Hull DVM and Dr Liz Nunamaker PhD DVM) and I were thrilled and honoured to have received this year's LASA 3Rs' prize. In our presentation, we described the multi-phase strategy by which we were able to establish non-aversive handling practices for mice at our university breeding facility, some of the problems encountered along the way and the types of evidence we needed to convince various stakeholders to change long-standing practice. The three of us were extremely interested in establishing non-aversive mouse handling as the new standard of care because of the well-documented benefits to animals. However we realised early on that you cannot just rock up and start changing things no matter how obvious the welfare benefits seem to be – you have to present convincing evidence that changing long-established work habits and human behaviour will be worthwhile for the people involved. Throughout the process we were extremely reliant on the active participation, cooperation and feedback from all animal care staff to test-drive methods, determine what worked and what did not and what needed to be done to improve operating procedures.

Birth of the 'squnnel'

One of the most important innovations made early on was the development of the square handling tunnel, or 'squnnel' (Figure.2). [Tremendous thanks to Alan White of GSK for coining this term!]. Many people are familiar with the standard plastic or cardboard 'round' tubes used for non-aversive mouse handling and these are readily available from commercial suppliers. However, both the cage-change and cage wash staff identified numerous problems with these tubes. Cardboard tubes did not last long because the mice chewed them – not a bad thing in itself, as chewing and shredding behaviours are important forms of enrichment. However it became expensive to maintain sufficient inventory of the cardboard tubes to allow frequent replacement and replacing shredded tubes with new intact tubes risked disturbing breeding mice more often than was advisable. Commercially available plastic handling tubes were too large for the breeding cages, so mice were at risk of being caught between the tunnel and cage top and injured or crushed. At our facility, breeder cages are usually provided with Safe Harbor Mouse Retreats™ so that dams have a place to move their pups if the cage is accidentally flooded. Addition of handling tubes made cages extremely crowded. After several brainstorming sessions, someone suggested that we should just make the handling tube square-shaped so it could function as both a retreat and a transfer tunnel and the 'squnnel' was born.



Figure 2. Square handling tube or 'Squnnel'.

Where can we get 'squnnels'?

Because square tunnels are not commercially available (yet!), they had to be custom-designed and ordered. Medical-grade clear polycarbonate tubes were cut to our desired specifications (approximately 9 x 5 x 5 cm). By ordering in bulk, costs work out to approximately US\$1.50

(GBP £1 or €1.3) per tunnel. Clear or translucent red are the best colours as they allow the operator to see the mouse when it is inside the tunnel. The plastic tubes last approximately 1 year. [Box 1].

How much extra work is involved with non-aversive handling?

Animal care staff frequently expressed the worry that introduction of non-aversive handling methods and equipment would increase their workload. Consequently, the rollout was gradual, first one cage rack, then one room at a time whilst technical care staff were trained in the correct methods of deploying the tunnels to pick up and transfer mice and learn new routines. The National Centre for Replacement, Refinement and Reduction of Animals in Research (NC3Rs) proved to be a tremendous training resource: the Resource Hub 'How to pick up a mouse' [<https://www.nc3rs.org.uk/how-to-pick-up-a-mouse>] has plenty of useful tips, a webinar, video tutorials and posters. Cage change personnel were especially encouraged by some pilot data collected on mouse handling times with the new tunnels (Figure 3). With very little practice (usually as little as one or two sessions), cage change times were equivalent or even faster with tunnels compared to forceps. Preliminary data from a few willing volunteers showed that tunnel handling times were 10-25 minutes

faster per 100 cages. Even a difference of as little as 10 mins can result in substantial time savings in a large facility where there are hundreds of cages to be changed per day.

Care staff also noted that extra time was needed to remove squnnels from dirty cages and add them to clean cages, although the amount of time involved became much less of a problem with familiarisation and practice. The modified 'squnnels' were far less annoying to use than conventional round tubes, being easier to stack and store and much less likely to roll merrily all over the floor when dropped. However, washing and disinfection phases introduced some new challenges. A major unforeseen problem was faeces build-up on the 'squnnels'. Mice prefer to defecate in places separate from the nesting area but conventional laboratory caging offers little in the way of spatial segregation.⁵ The introduction of the 'squnnels' meant that breeding mice chose to use the flat top as a latrine. During the several weeks that breeders were left undisturbed, the tops and interiors of the 'squnnels' became fairly thickly encrusted with faeces that set like cement and was almost impossible to remove during standard cage wash procedures. Fortunately, our brilliant cage wash manager, Shaina Wallach came up with a workable solution – soaking the 'squnnels' for up to two days in a solution of washing-up liquid prior to running them through the cage-washer.

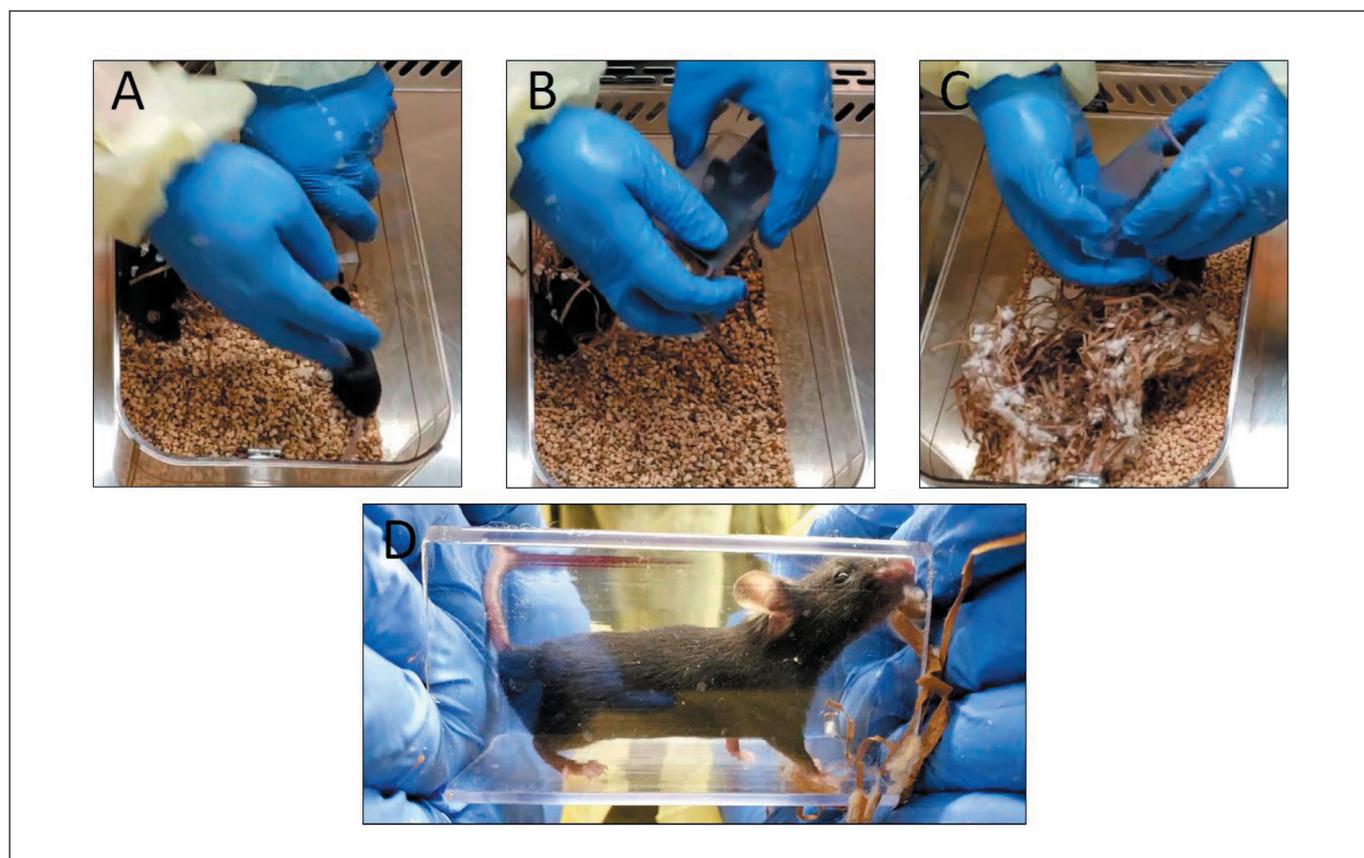


Figure 3. The 'squnnel' in use.

Concluding thoughts

Even though benefits of non-aversive handling to both animals and people may be obvious, changing human behaviour is hard. Therefore, it is essential that a well thought out implementation plan is put in place before any major changes are made. Elements of a good plan include having a responsible lead or 'champion' to coordinate planning, a multifaceted plan for introduction, assessment and follow-up of the new methods and a few simple practical benchmark measurements to chart progress. Regular planned communication and education sessions are essential, as are compliance spot-checks. Well-trained and motivated technical care staff are central to the whole process – they are the eyes and ears that can identify logistic problems as they occur and their knowledge and experience enables them to develop innovative and easily-implemented remedies. Finally, high-level support from institutional veterinarians and AWERB members is crucial to success. Happier animals and technical staff will be well worth all the hard work needed to switch handling methods.

Box 1. Tunnel suppliers

Conventional round plastic or cardboard tunnels can be ordered from several scientific laboratory animal suppliers: Datesand Ltd. Braintree Scientific Inc.; LBS; IPS; Serlab, Plexx EU, Otto Environmental

'Squnnels' were custom ordered from Petro Extrusion Technologies, 205 Hallock Ave Suite B, Middlesex, NJ 08846, USA
www.petroextrusions.com

Clear medical-grade polycarbonate tubes (part #J-1002) were cut to our desired length specifications (approximately 9 x 6 x 5 cm).

References

- ¹ **Hurst, J.L., West, R.S.** (2010). Taming anxiety in laboratory mice. *Nature Methods*. 2010;7(10):825-6.
- ² See <https://www.nc3rs.org.uk/mouse-handling-research-papers>
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- ⁴ **Kerst, J.** (2003). An ergonomics process for the care and use of research animals. *ILAR J.* 2003;44:3-12.
- ⁵ **Makowska, I.J., Franks, B., El-Hinn, C., Jorgensen, T., Weary, D.M.** (2019). Standard laboratory housing for mice restricts their ability to segregate space into clean and dirty areas. *Scientific Reports*. 2019;9:6179. doi.org/10.1038/s41598-019-2512-3.