

Recommendations

Implementation of Tunnel Handling in Swiss Facilities

The Swiss 3RCC recommends the use of tunnel handling for mice in Swiss animal facilities as an alternative to traditional tail handling.

Where was the information collected? The 3RCC performed an on-line survey and semi-structured interviews in May/June 2022 at four Swiss Institutions that performed small pilot studies in Switzerland, including one germ-free facility. These included two institutions from the French-speaking region, and two institutions from the Swiss-German speaking region. Animal caretakers were also surveyed for their experiences using the tunnels handling technique.

What has been done? In brief, four institutions performed qualitative pilot assessments of the use of tunnels in one of their facility locations. **Table 1** shows the general characteristics of the facilities. **Standard mouse handling techniques**, as in the handling techniques that were generally applied outside the pilot assessment, varied between tail-handling with fingers, tail-handling with forceps, and cup handling. The pilots involved in the vast majority C57BL/6JRj mice of both sexes, mainly in experimental cages. Two facilities tested red tunnels on floor (Plexx: #13102, 1CHF/unit; Zoonlab: custom-made, 6.20CHF/unit), and two other facilities have used transparent tunnels (Datesand #CLIP-ON-CHT, 5.5CHF/unit; Labodia #213-1051, 3.5CHF/unit), either clipped on grid or on floor, respectively. Enrichment varied between cardboard or red plastic houses, kleenex paper and/or cotton sticks as nesting material, and wood sticks as gnawing substrate. However, in the germ-free facility, only autoclavable material (excluding cardboard and wood material) could be used.

Table 1. Description of the facilities that have evaluated the use of tunnel handling. General information on the facility is provided on cage types [individually ventilated cages (IVC), or open cages in germ free (GF)], size of the facility (in terms of number of cages), total full time equivalent (FTE) animal care takers at the facility, and the standard handling method in the facility. For the pilot, information is given on the number of FTE involved in the pilots, how many cages were tested and the types of tunnels, the strain of mice involved and the types of cages [whether experimental (exp) or breeding (breed)].

General characteristics					Pilot characteristics					
Facility	Cage type	Size (N° cages)	Total FTE	Std handling	N° care takers involved	N° cages tested	Tunnel color	Tunnel's position	Strain	Cage type
A	IVC	2k	16	Tail	3	?	Red	Floor	C57BL/6JRj	Exp
B	IVC	7k	40	Tail	5	20-30	Transp.	Clipped	C57BL/6JRj	Exp Breed
C	IVC	10k	30	Forceps	2	~120	Transp.	Floor	Various GM ^a lines	Exp
D	GF	40	1	Tunnel ^b	4	40	Red	Floor	C57BL/6N	Exp Breed

^a GM = genetically modified

^b In the context of this germ-free facility, tunnel handling was used as standard handling technique from the outset to reduce stress and minimize the risk of biting incidences that would compromise sanitary status by perforation of the safety gloves.

Outcome of the study

The outcome of the structured interviews represents qualitative observations collected from a total of four sites, representing the experience of 14 animal caretakers involved in these pilot assessments.

Observations on workload: From a logistic and management perspective, facility managers acknowledge that 10% increased time is required for cage change when using transparent tunnels. Red tunnels require even more time (50%) due to the difficulty in performing complete health checks on the animals. In general, anal checks remained difficult to perform, and thus, for complete health checks, mice may have to be transferred on occasions from the tunnel onto hands. One pilot observed that clipped transparent tunnels were preferred by animal staff because animals were habituated to the tunnels faster. Indeed, when checking early in the morning on mice behaviours in the cage, these were found 10 times more frequently in clipped tunnels when compared to those on ground.

The attachment system for the tunnel which was tested in the pilot entailed a clip moulded onto the tunnel. This system was reported to require some physical effort by the handler to re-clip the tunnel to the grid. Staff expressed concern that excessive repetition of the re-clipping manoeuvre could become strenuous when performed on a larger volume of cages.

Observations on handling, safety, and hygiene: Qualitative observations suggest that animals prefer tunnels clipped on grids, whereas those on floors are dirtier as males use it more to mark territory. Also, a further observation is that the use of tunnels appears slightly more complex with young animals (< 4 weeks of age). Placing the tunnels in the cage one week before weaning helps calming the young animals.

Cardboard tunnels used in the past were not effective as health checks could not be performed and animals would grip on it and gnaw them within a week, whereas this would not happen with polycarbonate tunnels that have lasted more than 2 years with minimal grinding. From a hygienic perspective, using one home cage tunnel per cage was considered safer as there was no cross-cage contaminations.

Cost aspects: Tunnels on ground appear near 2€/unit cheaper than those that can be clipped on grid. Price varied a lot depending on the supplier and the negotiation.

Observations on animal welfare: With regards to animal welfare, no quantitative measure was performed but overall managers, staff and researchers agreed that animals were calmer. Tunnels are very much appreciated in the germ-free facility, as caretakers do see animals are much calmer than what they traditionally observed in standard conditions where tail-handling is performed. Two of the 4 facilities have purchased a total of 4'000 tunnels to expand the implementation to a larger scale. Animal facility staff survey on 20 animal caretakers confirms a high rate of global satisfaction, and general support of the use of tunnel handling instead of tail handling (**Fig. 1**).

Conclusions and preliminary recommendations based on outcome

Characteristics of the tunnels: Observations conclude that cardboard tunnels are not suitable for cage transfers, handling and have poor durability. Staff report that transparent tunnels are preferred over red because transparency facilitates health checks. If other enrichment material is provided (e.g. wood sticks) plastic tunnels are not gnawed on.

Spatial location of the tunnels: One pilot observation suggest that tunnels clipped on grid are preferable for habituation and hygiene. However, the repeated physical effort of re-clipping could become strenuous when implementing tunnel handling to high volumes of cages. An alternative system seems to be where the clip is separate from the tunnel, thus allowing less efforts to remove and replace the tunnel on the clip device. However, these clips are currently made in non-autoclavable plastic. Discussions with manufacturers are ongoing on whether autoclavable metal clips can be designed, presumably facilitating the work of the animal caretakers as well as hygiene.

Time for cage change: An increased time in cage change was observed during the learning phase of both animals and caretakers. However, when routinely implementing tunnel handling, trained staff self-assess time spent on cage changes to be equal between tunnel and standard tail-handling (hands or forceps) routines.

Habituation (staff and animals) to tunnel handling: Observations reported to us, point to preferences in introducing tunnels to the animals already in breeding facilities such that all animals (breeders and pups) become habituated early on. Also, observations point to advantages in progressive implementation of the use of tunnels (e.g. first on few cages, then on a rack, then on an entire room, and then on several rooms). Allowing a progressive learning phase for the staff as well as the animals may facilitate larger scale implementation. Introducing tunnel handling in experimental setting will require of facility managers to communicate with researchers such that current research projects are not impacted.

Measuring implementation success: Different measures of success in the implementation should be considered, like animal staff satisfaction, time spent on cage changing and cleaning, effect on hygiene, as well outcome on animal welfare. However, at this stage, standardized outcome measure for success in tunnel handling implementation remain to be defined.

Results from animal care-taker survey

An anonymous survey with 24 questions was sent to staff that have experienced tunnel handling specifically. A total of 20 participant’s responses were gathered. **Satisfaction rate** on several aspects of the received training (T), health inspection and health care (H), animal welfare (AW), and overall grade (OG), was assessed on a Likert scale of 10 (10 being the greatest satisfaction and 1 complete dissatisfaction). Proper education seems necessary for an improved implementation. Indeed, animal caretakers were mildly satisfied with the initial training and education material they received (average grade of 6.6 (standard error of the mean/sem: ± 0.6) and 6.2 (± 0.63) respectively, **Figure 1**).

Animal caretakers were satisfied of the benefits of tunnel handling over tail handling for performing complete health checks (6.45 ± 0.66), facilitate scruff handling (6.7 ± 0.6). However, health checks after a transfer on hand did not differ from tail handling techniques (4.75 ± 0.58). While satisfaction with regards to the time required to transfer mice to another cage was moderately improved (6.4 ± 0.61), transfer of mice from one cage to another was more challenging for young mice (4.6 ± 0.51) than for adult mice (7.0 ± 1.05) (**Figure 1**).

From an animal welfare perspective, animal caretakers acknowledged that tunnel handling decreased aggression among mice (6.5 ± 0.46), as well as stress (7.3 ± 0.61), and improved the interactions between the handler and the animals (6.6 ± 0.57). **Overall, animal caretakers graded the use of tunnel handling at (7.1 ± 0.61), and recommended tunnel handling over tail handling with a score of (7.6 ± 0.61).**

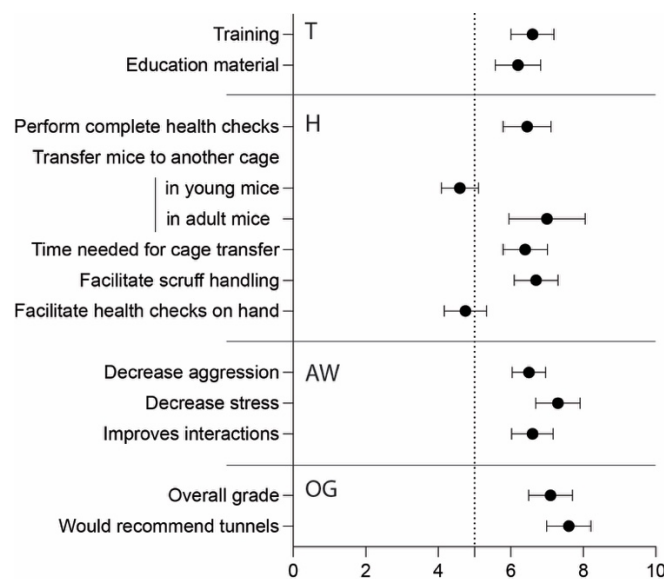


Figure 1. Degree of satisfaction from animal caretakers on various aspects of tunnel handling use when compared to tail handling. Dot plot with likert scales from 1 to 10 – 5 being neutral, and the 10 the highest satisfaction. Data are mean \pm sem (n=20). T = training; H = health; AW = animal welfare; OG = overall grade.

The Swiss 3RCC is thankful for the active participation of all partners in the collection of data to help gathering this information.

Practical tips on the actual handling technique are available on our website:
<https://swiss3rcc.org/training-videos>