

Turn off the big light! Keeping in mind our animals needs throughout everything they experience with us

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Introduction

Observation of mice on study experiencing stress related responses led to increased consideration of how to alleviate environmental differences between what they experience in their home cage in situ on the home rack and when the cage is open on a bench top for procedures and observation.

Reduction of lux levels in the procedure room and placing the open cages in a small, shaded area showed positive changes in the animals' behaviours and recovery.

This led to further innovation to provide a larger area with light levels closer to what the animals are accustomed to whilst allowing the cage to remain open, accessible and fully observable without the need for large furniture.

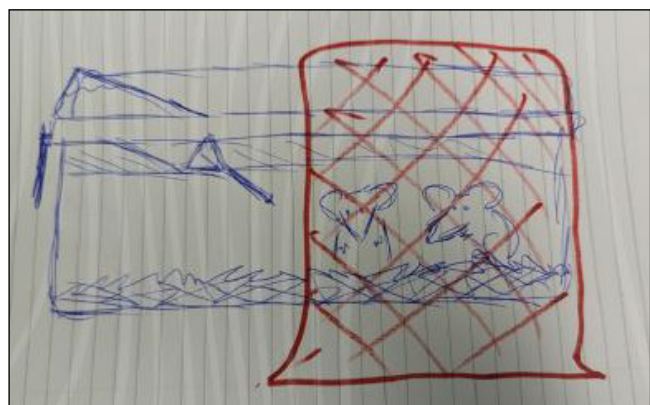


Figure 1. Not just a doodle but the original idea that became standard practice.

The design and use of a cage shelter prototype have resulted in further improvements in behaviours and welfare for our animals (Figure 1).

Background

Study or surgery days can mean having to move animals to a new location. Exposure to new sights, sounds, smells and experiences in quick succession or for prolonged periods can cause increased stress levels and potentially affect how animals react and recover.

Looking at what animals experience from their perspective can help us identify ways to offer improvements, reducing the potential effects on Animal Welfare and study results.

Mice are nocturnal and have adapted to see best in very low light levels, so lighting should be below 60 lux for pigmented strains and 25 lux for albino strains. Reducing light levels is extremely important for good mouse welfare, especially for albinos and may reduce stress caused by husbandry and experimental procedures.¹

Our experience

As a standard, acclimatisation handling² and restraint is performed as well as health checks and cage change where necessary.

Study day usually involves:

- bodyweight recording and tail marking in animal room
- movement to procedure room
- single administration of test substance orally or intravenously
- single or multiple periods in heat chamber (~5 mins at 38°C each time)
- single or multiple saphenous or tail vein bleed

The stress-related responses occasionally observed are usually seen when the animals experience multiple events within a short period and can include:

- avoidant behaviour e.g. hiding, evading handling
- in-cage fighting/aggression
- squinting and ears flattened
- reduced activity
- increased respiration
- increased urination
- freeze response
- seizure (rare)
- sudden death (rare)

Process

Needing the cage open and accessible for repeated handling and observation of animals means prolonged exposure to light levels they are not used to.



Figure 2. Taking lux levels to validate the theory.

Some animals showed a freeze response with increased respiration, followed by reduced activity which subsided quickly once the animals were quietly moved to a shaded area whilst on study.

Lux levels were reduced in the procedure room and placing the animals in the shaded area while we needed immediate access became standard practice (Figure 2). Following this, animals were seen to recover quickly on return to their cage and were more active, interacting with each other and their immediate surroundings.

The cage shelter idea was conceived and a prototype produced to provide the animals with a larger shaded area whilst the cage remained open and the animals were immediately accessible and observable.

Cage shelter's use (Figure 3) was then implemented regularly on studies, whilst gathering comparative data to demonstrate the difference in lux levels, mouse behaviour and welfare.



Figure 3. Seeing the difference.

Results

By using the cage shelter, animals can experience lux levels in the cage closer to what they experience at home on the rack.

During both high frequency and more spread-out periods of handling, warming and procedures, use of the cover appears to show benefits to the animals' behaviour compared to animals observed under similar circumstances without the use of the cover – particularly with interactions between each other and their home cage surroundings.

Lux levels (C.A. 1110 light meter-Chauvin Amoux group)			
Location			Lux
Animal Room	N/A	On home rack, front of cage	32.5
		On home rack, rear of cage	6.0
Procedure Room	Without Cage Cave	Open bench top, centre of cage	133.1-263.3*
		Under cupboard shaded area on bench top, rear of cage	48.3-50.6
		Under cupboard shaded area on bench top, centre of cage	194.4-209.2
		Under cupboard shaded area on bench top, front of cage	223.8-225.6
	With Cage Cave	Open bench top, rear of cage	9.2-29.0*
		Open bench top, centre of cage	31.7-47.1*
		Open bench top, front of cage	111.3-204.3*
Phantom Animal Transfer Station	Without Cage Cave	Light on, centre of cage	419.0
		Light off, centre of cage	41.6
	With Cage Cave	Light on, centre of cage	101.5
		Light off, centre of cage	25.5
Aria Bio safety cabinet	Without Cage Cave	Maximum light level, centre of cage	1124.0
		Minimum light level, centre of cage	163.6
		Light off, centre of cage	45.4
	With Cage Cave	Maximum light level, centre of cage	186.1
		Minimum light level, centre of cage	49.7
		Light off, centre of cage	31.9

* Variations dependent on position in procedure room & location of light banks in ceiling (All readings taken in mouse cage base with lid and grid removed, with exception of 'on the home rack' when cage is complete).

Figure 4. From red to green, lux level reading comparisons.

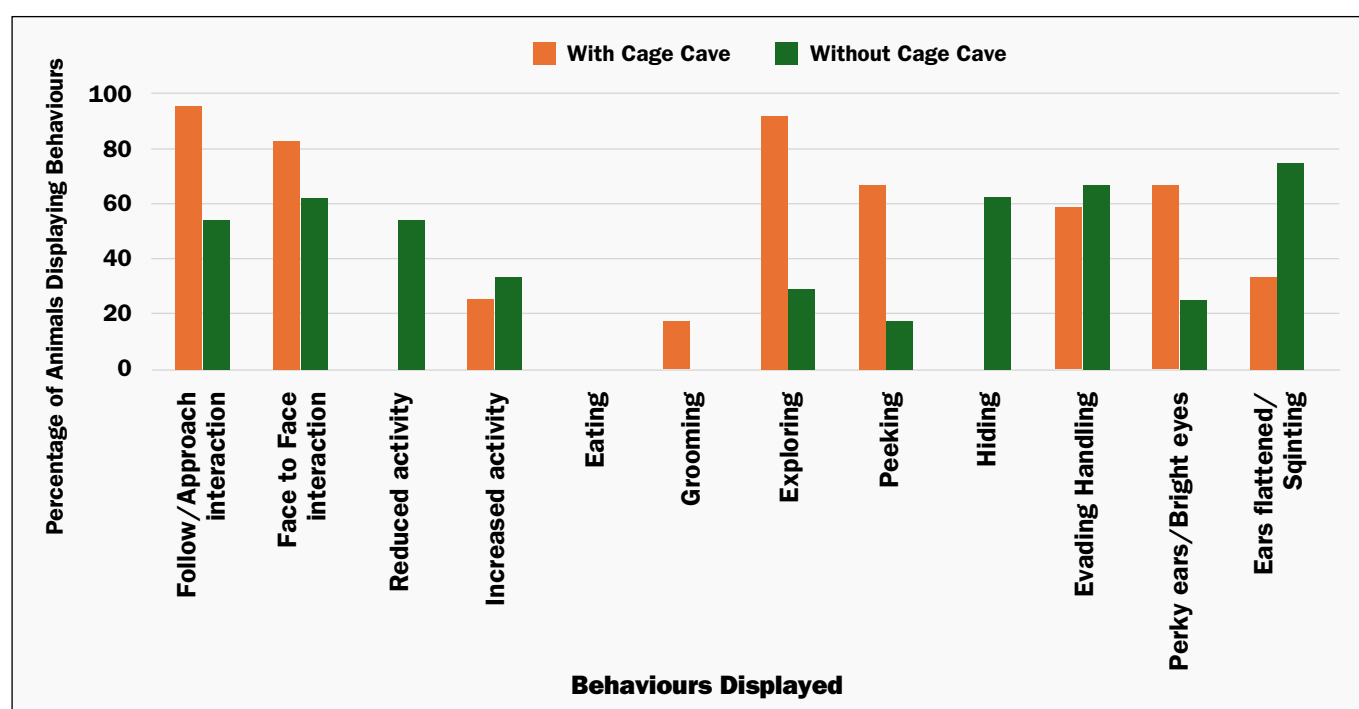


Figure 5. Comparing behaviours with and without the cage cave.

It is worth noting that behavioural benefits can vary with different strains. For example, NSG mice remain overactive and avoidant with and without the shelter but do show increased interaction with their cage mates and exploring of their cage area under the cage shelter.

Conclusion

Acclimatisation only goes so far, particularly when the animals are moved to a new area for procedures. Reducing the extent of change they are suddenly exposed to can alleviate some of the stress the mice experience.

The renamed cage cave allows for light levels closer to what the mice are accustomed to whilst the cage remains open, accessible and observable and without the need for racking or large items of furniture (Figure 3).

Although the benefits can be strain dependant, it has been shown to reduce the signs of stress observed across the board, allowing for better welfare and potentially better scientific results with reduced effects from stress hormones.

Going forward

Further investigation of light diffusing possibilities for our animals outside of the home cage i.e. similar covering systems for bench-top metabolism caging.

References

- ¹ Mice: Good Practice for Housing and Care. Research Animals Department, RSPCA 2nd edition – April 2011.
- ² [The 3Hs Initiative](#)