POSTER PRESENTATIONS

Originally presented at:
IAT Congress 2023

An assessment of rat hammocks as enrichment

MEGAN HICKMAN, LORRAINE MILLER and RUTH MACDONALD

Animal Sciences and Technologies, AstraZeneca UK

Correspondence: Megan.hickman@astrazeneca.com

Abstract

Research has shown there are numerous welfare and scientific benefits to housing rats in more enriched and environmentally complex housing opposed to conventional housing. With the aim of increasing environmental complexity providing opportunities for climbing and exploring and providing additional cover, a hammock prototype was designed to implement into the double decker rat cages. The hammock was trialled in a group of female rats to assess durability, impact on behaviour and preference over other shelter enrichment items:

- tunnels
- rat corner homes

The number of observed enrichment interactions indicated a strong preference for the bottom tier of the hammock, suggesting the hammock is a successful enrichment item.

Introduction

Providing laboratory rats with appropriate cage enrichment is important to accommodate core needs, provide mental stimulation and allow rats to express species-specific behaviours. The current enrichment provided at our facility in double decker rat cages follows conventional housing recommendations consisting of a play tunnel, two woodblocks and sizzle nest. However there is significant evidence to suggest that housing rats in more enriched caging has many benefits.

Numerous studies have shown that rats maintained in enriched cages demonstrate a higher level of exploratory activity and lower anxiety compared with rats housed in conventional caging, resulting in animals that are calmer and easier to handle.[1,4]

It has also been shown to reduce obesity which is a recognised problem in laboratory rats with some strains achieving a fat mass that accounts for 30 to 50% of bodyweight.

Spangenberg *et al* (2005) investigated the effects of housing rats in large pens furnished with enrichment (inverted wire grid, a towel hammock, an inverted opaque plastic box and cage divider) compared with rats housed in standard cages containing only a black plastic tube and found that enriched pen housed rats weighed 17% less than the standard housed rats and displayed a wider behavioural repertoire.

Providing adequate shelter is important to allow rodents to retreat from perceived threats, bright lights and ambient temperatures thus reducing stress. Studies have shown that rats have a strong preference for enclosed nest boxes over open end tunnels which provide better cover and an additional elevated resting surface (3).

A prototype rat hammock (figure 1) was designed with the aim of providing additional shelter increasing cage complexity and providing opportunities for climbing and exploring. The hammocks were constructed from old lab coats, made of 65% polyester, 35% cotton following a honey comb design with two layers which provides an enclosed lower level and top level for climbing and resting on. Hammocks were connected to the cage roof using a beaded chain which loops through the filter holes in the cage lid and the metal eyelets of the four corners of the hammock.

Figure 1. Hammock prototype.

Method

The hammocks were trialled in a group of 4 female rats to assess durability, impact on behaviour and preference over other shelter enrichment items which were tunnels and rat corner homes.

Rats were observed over a 4 day period following the schedule in Table 1, days 1 to 2 were used to acclimatise the rats to the new enrichment items and the preference test carried out on days 3 to 4.

At approximately 8:00 each morning enrichment items were added to the cage with rats given 1 hour to acclimatise to the enrichment prior to recording observations.

Animals were observed at hourly intervals between the hours of 09:00 to 15:00.

At each interval the location or enrichment item that the animal is in contact with was recorded (hammock, tunnel, corner home, cage floor or balcony).

An ethogram created by NC3Rs was used to record the behaviour of each animal at each timepoint (table 1).

DAY	LEFT SIDE OF CAGE	RIGHT SIDE OF CAGE
Day 1		Play Tunnel
Day 2		Rat Corner Home, Hammock
Day 3	Rat Corner Home, Hammock	Play Tunnel
Day 4	Play Tunnel	Rat Corner Home, Hammock

Table 1.

Results

When housed in the enriched cage and given access to all 3 enrichment items, the number of observed enrichment interactions indicated a strong preference for the bottom tier of the hammock (Table 2).

The number of observations of rats sleeping on the cage floor or balcony reduced from 11 on Day 1 to 0 on Day 4 when given access to additional shelter enrichment. Sleeping/resting out in the open is a very unnatural behaviour in rats suggesting that a play tunnel is not suitable shelter enrichment.

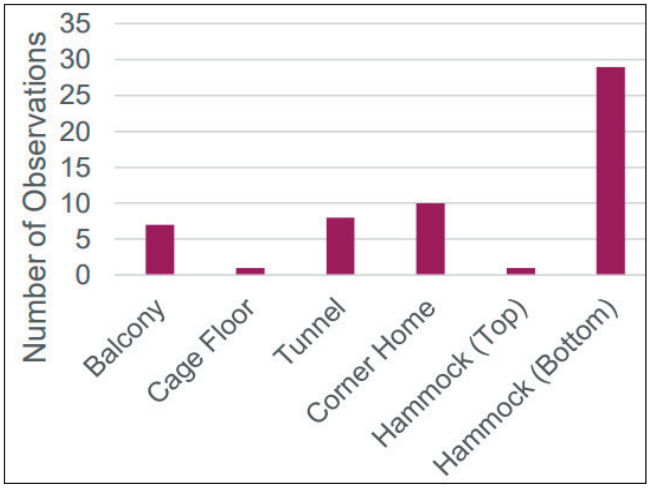

Table 2. Location Preference Test.

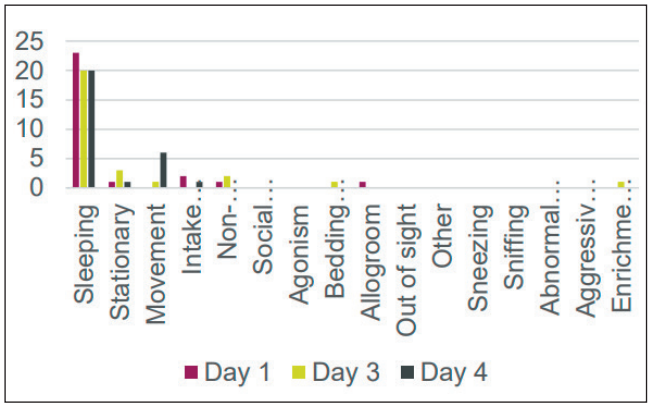

Table 3. Number of observed behaviours.

The rats spent a large proportion of the observation period sleeping (Table 3) so an additional behaviour study carried out during the dark light cycle period would give a better understanding on whether the increased cage complexity provided by the hammock encourages more physical activity and natural behaviours (climbing, exploring) compared to conventional housing. At the end of the study the hammock was still in good condition other than some slight fraying around the corners. Exploring more durable fabric alternatives that can be washed and reused could be a more sustainable way of implementing them.

Conclusion

The data indicates the hammock is the most preferred place to rest/sleep out of the 3 enrichment items, suggesting that the inclusion of hammocks in rat enclosures is an effective way of providing shelter however an additional study carried out in the dark cycle would be needed to determine the effects on behaviour and activity levels.

References

1 **Buchheister, S.; Bleich, A.** Health Monitoring of Laboratory Rodent Colonies – Talking about (R) evolution. Animals 11.5 (2021), 1410.

1 Exploratory activity of rats in three different environments. **Genaro, G., Schmidek, W.R.;** Ethology (2000).

2 Housing-related activity in rats: effects on bodyweight, urinary corticosterone levels, muscle properties and performance. **Spangenberg, E.M.F., *et al.*** Laboratory Animals. (2005).

3 The cage preferences of laboratory rats. **Patterson, K., *et al.*** Laboratory Animals. (2001).

4 Long-term effects of the periadolescent environment on exploratory activity and aggressive behaviour in mice: social versus physical enrichment. **Pietropaolo, S., *et al.*** Physiol. & Behav. (2004).

5 https://nc3rs.org.uk/sites/default/files/documents/Evaluating Environ mental Enrichment/General%20ethograms.pdf