Do Mice Benefit from Prefabricated Dwellings?: A Discussion by the Laboratory Animal Refinement and Enrichment Forum

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"Mice seem to have a stronger urge to build their own dwellings than rats. There are a number of commercial plastic shelters/houses/igloos available. Do mice actually sleep in these prefabricated, artificial homes? Do they need to have access to proper nesting material so that they can build 'their' nests in these plastic structures and then sleep in them? Or, do they only hide in them" (Reinhardt)?

"We always supply nesting material along with a shelter and our guys drag the material into the shelter. We mostly use cardboard shelters rather than plastic ones. Probably 95% of our mice use the shelter to nest in. If you give them a tube without nesting material, they tend to just use that to hide and 'play' but they will not sleep in it" (Barley).

"We have tested a variety of prefabricated potential nest structures made of different materials along with paper tissues.[1] Most mice will not sleep inside a metal or plastic box regardless of its shape. When given a choice between a paper-based box and a plastic or metal one, mice will ALWAYS choose the paper box. They will almost always sleep inside this box, and when they are given paper tissues will drag them inside and build a nest. The mice are strongly inclined to gnaw the walls of paper-based boxes thereby converting them into nesting material, which they will then use to build their own nest. This has led us to believe that it is more appropriate to let the mice build their own nest according to their microclimatic needs rather than furnishing their cages with prefabricated nest boxes or shelters" (van Loo).

"Thanks for the endorsement of what has been said unscientifically by animal technicians for a long time: Mice have little use for prefabricated nests but have a strong need to build their own nests. This applies to singly caged mice and to monogamous breeding pairs. We use paper-based Shepard shacks for our breeders along with shredded paper. The speed at which the mice convert the shacks to bedding and nesting material is incredible. The animals do this even when they have adequate paper bedding to manipulate" (Francis). "No wonder mice are classified as *Rodentia* = gnawers. They have a biologically inherent need to gnaw in order to produce suitable nesting material and to process food stuff" (Reinhardt).

"There is a great variety of nest boxes, shelters and enrichment items on the market, and more are likely to follow. I assume that many animal facilities and researchers buy these items in order to comply with regulations prescribing that enrichment should be provided. However, nobody checks whether the animals actually use these items the way they are intended" (van Loo). "Many inspectors will accept any object especially when it is colorful that is placed into primary enclosures as enrichment" (Reinhardt). "Companies regularly ask us to test the enrichment items after they have put them on the market. Until recently, we enthusiastically did so, but I get more and more reservations about this. I think, companies should first investigate more thoroughly the published information available, then develop a prototype of a new gadget and test it before it is put out on the market. This would save a lot of money wasted for useless enrichment items" (van Loo).

"At my previous institution, we used different commercial plastic `mouse houses' for pretty much all of the singly caged animals with good success. Each mouse also received a ¼ piece of a nestlet, which was invariably used to construct a little hideaway inside the houses. The mice seemed to really enjoy this addition to their cages. They used their houses regularly for resting/sleeping, not just for hiding during alarming situations. If the house was not in the cage, they would still shred the nestlet and convert it into a nest" (Walsh).

"The situation is different for group-housed mice, especially males. Males are territorial, and the most dominant male of the group will defend `his house' or any other object that stands out as a territorial marker by attacking and possibly injuring other males who dare to come close. If the `house' is made of paper-based material, aggressive escalation can be avoided because the animals can gnaw its walls thereby turning the whole structure into nesting/bedding material that no longer can be used as a territorial marker and monopolized by a dominant male.

Pascalle demonstrated in her doctoral thesis very clearly that aggression among male mice increases when an indestructible shelter is provided but decreases when nesting material is provided.[2,3] Nesting material such as paper tissues, shredded paper, cardboard pieces and cornhusk unlike a plastic shelter give subordinate mice the option to keep out of sight and if needed to escape, so the dominant male of the group has no good reason to be aggressive. For group-housed mice nesting material is a necessity not a luxury, i.e., enrichment" (Reinhardt).

"We use paper-based `igloos' for our breeding mice and group-housed male mice. The animals climb on them, chew holes in them and impregnate them with urine. This gives a personal touch to their homes. Transferring their igloos to the new cage seems to make the animals more quiet and less aggressive.

We also tried plastic `mouse houses'. Some females with babies didn't like these houses. If you placed them in such a home, they would inevitably move out with their whole litter. And if you added paper tissues or wood-wool to the cage, these females would not hesitate to construct their nests with this material right in front but not in the houses. Obviously, they preferred building their own dwellings according to mice-specific microclimatic needs" (Weilenmann).

Figure 1: When given the choice mice – here C57BL/6 female mice will build their own nest and sleep in it rather than make us of a prefabricated, indestructible `mouse house' (photo by Pascalle van Loo, Utrecht University).

"Has anybody of you tried paper-based egg cartons as environmental enrichment and potential nesting material" (Reinhardt)?

"We use cardboard cartons and similar products made of paper pulp for all our rodents. For some toxicology type studies we purchase GLP quality products, but otherwise we give most of our animals egg cartons and cardboard boxes brought from home by both my own staff and by users. All the re-used cartons and boxes are autoclaved before the animals are exposed to them. It often raises a smile to see a gang of mice using an empty cat food box as a house. Who said animal techs don't have a sense of humour? We like to think we are being 'green' by not wasting paper" (Barley). "This shows that species-adequate environmental enrichment does not need to be expensive. I dare say that this holds true not only for rodents but also for all the other animals kept in labs. Animal care personnel with some imagination and insight into the species-typical needs of their animals can make a big difference for their charges with very little investment" (Reinhardt).

"I conclude from our discussion that commercial prefabricated dwellings for mice are useful only if they are made of GLP-accepted material that the animals can readily gnaw and convert into nesting and bedding material. Since mice have a biologically inherent need and show a strong preference to build their own nests, it is advisable to provide the animals with suitable nesting material, such as paper tissues or re-used autoclaved paper pulp products, rather than enclosed plastic structures that are not only relatively expensive but also require some nesting material to make them habitable for the animals" (Reinhardt).

REFERENCES

1 **Van Loo, P.L.P., Blom, H.J.M., Meijer, M.K.** and **Baumans, V.** (2005). Assessment of the use of two commercially available environmental enrichments by laboratory mice by preference testing. *Laboratory Animals* Vol 39, 58-67

2 **Van Loo, P.L.P.** (2001). Male Management - Coping with aggression problems in male laboratory mice (Doctoral Thesis). University of Utrecht, Diest, Belgium

3 **Van Loo, P.L.P., Kruitwagen, C.L.J.J., Koolhaas, J.M., Van de Weerd, H.A., Van Zutphen, L.F.M.** and **Baumans, V.** (2002). Influence of cage enrichment on aggressive behaviour and physiological parameters in male mice. *Applied Animal Behaviour Science* Vol 76, 65-81

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