



Evaluating a New Environmental Enrichment Option For Mice

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Abstract

Providing environmental enrichment is an important practice to improve the health and welfare of laboratory animals. The Pfizer Inc., Cambridge, MA laboratory animal facility uses 90% single use recyclable disposable rodent caging made by Innovive. The animal facility's current enrichment program requires technicians to set up cages and add enrichment during cage changes in the holding room. Innovive has developed an enrichment product that is compact and malleable which allows them to add to their pre-bedded cages without impacting weight or stackability. In an effort to look for operational efficiencies and continuous improvement, Comparative Medicine (CM) evaluated Innorichment™, a new enrichment item, to assess the quality of nests in comparison to other paper products already in use in the facility. In addition, CM wanted to determine if any efficiency could be achieved by using a pre-bedded, pre-enriched cage compared to having to manually add the enrichment at the time of cage change. Using a scoring system published by Hess et al,¹ it was determined that mice enriched with Innorichment™ built nests with an median score of 3.75 and on average it took technicians 3 seconds less per cage using this type of enrichment.

Background

Environmental enrichment is used in laboratory animal facilities to promote and enhance animal welfare. The *Guide for the Care and Use of Laboratory Animals, Eighth edition* states that the primary aim of environmental enrichment is to enhance animal well-being by providing animals with sensory and motor stimulation through structures and resources that facilitate the expression of species typical behaviors.² Species typical behaviors that are commonly observed in rodents include burrowing, nest building, climbing and gnawing. It has been shown that appropriate environmental enrichment can buffer the stress resulting from permanent confinement in artificial living quarters as well as assist with thermoregulation.^{3,4} The use of environmental enrichment promotes the expression of species specific behaviors if applied properly in laboratory animal research. Recent studies have investigated and compared the use of different structures and substrates in laboratory animal housing.⁵ Novel foods, manipulanda, social contact and various nesting materials and boxes are all examples of different modalities of enrichment that have been applied to captive rodent housing.⁵ A study performed by Van de Weerd showed that mice preferred a cage with nesting material over a cage with bedding material alone.⁴ Nesting material allows the animal to control and modify its environment, which allows captive animals to display normal species specific behaviors that maybe inhibited in a research environment. The inability to express normal behaviors could result in the development of abnormal behaviors (stereotypies), increased variability in results, and inhibit replicability of research.⁶ Providing nesting materials allows the expression of natural behaviors, such as nest building and expression of social behaviors. It also promotes thermoregulation while providing escape from perceived threats or aversive stimuli such as light, aggressive cage mates, and stimuli occurring outside of the cage.⁴ Understanding the natural behavior of rodents and providing a mechanism that will allow mice to express those behavior have the potential to result in better research outcomes.

Materials and Methods

All mice were female C57Bl/6 came from Charles River Labs, Wilmington, MA. Mice were housed in individually ventilated Innovive disposable caging with Alpha Dri® bedding (Shepherd Specialty Products). Mice were given food (Purina Labdiet 5053) and water *ad libitum*. Animals were housed in the CM facility which maintains a 12h:12h light cycle with temperature ranging between 64° and 72° Fahrenheit with humidity between 30-70%. All activities were approved by the Institutional Animal Care and Use Committee. On day 1, animals were placed in fresh cages with 4 sheets of the Innorichment™ (Fig 1 a, b). Each sheet equals 2 grams of 100% virgin kraft paper for a total of 8 grams. NOTE : This amount was selected based on a study by Hess et al.¹ Cages were photographed on days 2, 3, 4, 5, 8, 9, 10, 11 and 12. Cages were photographed from the top and side. Nests were evaluated using the scoring system established by Hess et al¹ which incorporated building walls and development of a dome shape (Fig 2a-b). Nests were evaluated based on photographs taken.

Results

The results of this study show that mice built intricate nests with an overall nest score average of 3.75 over a two week period. Scores system is from 0 to 5; depending on the use of the nesting material. Zero being undisturbed nesting material and 5 being a complete dome formed with the nesting material. Nests scored highest on day 9. Overall the Innorichment™ performed better than the current enrichment material Fig 1c (paper strips administered by discs) evidenced by higher overall nest scores. Innorichment™ also resulted in more cohesive nests in which clear egresses were noted, and held together better over the two week period compared to the other paper strip material based on previous pilot work in our facility. Operational efficiencies and financial benefits were also realized by introducing a pre-enriched cage, allowing for reallocation of technicians time. On average it took a technician 3 seconds less per cage when using Innorichment™. This incremental savings adds up quickly considering the facilities rising cage census, estimated at 80hrs/year.



Fig 1a Innorichment sheet side view



Fig 1b Innorichment sheet top view



Fig 1c paper strips in disc form

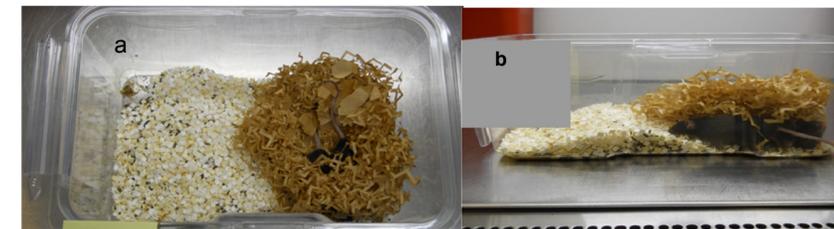


Fig 2a, Top View

Fig 2b, Side View

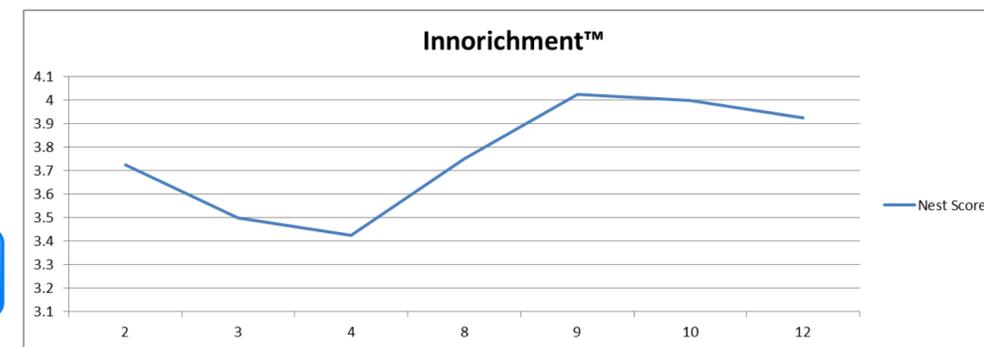


Fig 3: Nest Scores Days 2- 12

Discussion

In this study, CM found that using a pre-enriched cage with Innorichment™ resulted in animals building more complex nests as evidenced by the presence of egresses and tunnels. Nest scores were higher over a two week period, with nests scoring highest on day 9. CM also found a time and labor savings as a result of using pre-enriched caging. These benefits provide support for using the Innorichment™ nesting material in combination with the one-time use recyclable disposable caging.

References

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