



Addressing the environmental enrichment needs of mice: thinking outside the cage

Karen M. Froberg-Fejko, VMD

Environmental enrichment has been an essential consideration for species such as primates and dogs for many years. More recently, however, many institutions are proactively addressing the environmental needs of mice in the research environment. In the *Guide for the Care and Use of Laboratory Animals*, natural behaviors are highlighted as a crucial measure of success for an animal program¹. Environmental enrichment can be defined as altering the living environment of captive animals in order to provide opportunities for them to express more of their natural behavioral repertoire².

Foraging

To provide effective enrichment, we must first understand the normal behavioral needs of mice. In the wild, mice spend the majority of their time foraging for food³. An easy method of providing valuable foraging enrichment is to scatter small treats or crumbs into the bedding so that the animals can spend time searching for it. Bio-Serv manufactures an assortment of highly palatable foraging treats available in many sizes, textures and flavors to accommodate a variety of protocol considerations. Examples include the following: Fruit Crunchies™, a nutritionally complete, purified base formula made into 190-mg pellets; Rodent Foraging Crumbles (Fig. 1), a nutritionally complete, bacon-flavored treat that encourages normal foraging behavior when placed directly into the bedding; Fruity Gems™, a sweet dried fruit treat excellent for operant training; Skinny Mini's™, a low-calorie cherry-flavored treat for overweight mice; Sugar-Free (Calorie-free) Treats, a fiber-rich, piña colada or banana-flavored treat for obese or diabetic mice; Bacon Softies™, a nutrient-dense, soft-textured pellet for anorectic, impaired or disabled mice; and Chocolate or Very Berry Supreme Mini Treats™, highly aromatic, nutritionally complete treats for cannibalistic dams. Many of these treats are Certified (Contaminant Screened), making them suitable for most GLP studies or toxicology studies.

The use of edible enrichment can also be expanded to include delivery of medications or test articles. It is beneficial to both the mice and researchers if the mice willingly consume the drug so that the researchers can avoid using stressful and potentially harmful dosing methods. Bio-Serv manufactures an array of edible products that can be utilized as sole-source medicated diets or medicated treats for all laboratory animals including mice.



FIGURE 1 | Rodent Foraging Crumbles, a nutritionally complete, bacon-flavored foraging treat.

Shelter

Mice are a nocturnal prey species and, therefore, have a strong innate need to seek shelter^{4,5}. A shelter offers mice an opportunity to withdraw from perceived threats both inside and outside the cage. Bio-Serv manufactures many different types and shapes of sheltering devices designed to inherently offer flexibility in satisfying the needs of the mice, the technical staff and the cage design. Polycarbonate shelters such as the Mouse Igloo® (Fig. 2), Mouse Hut™ and Mouse Tunnel™ come in red and amber colors, both of which provide good visibility for daily cage exams. The Mouse Igloo with an attached floor is an excellent option for breeders because it allows the dam with her litter to be moved during cage changes without disturbing them or introducing a foreign scent.

Mice are social animals and form kin groups; however, when mice are crowded, they may establish a dominance hierarchy leading to fighting, especially in males^{4,5}. Because levels of aggression can vary widely in different strains, it can be important to monitor the types of shelter that are

Bio-Serv, One 8th St., Ste. 1, Frenchtown, NJ 08825. Correspondence should be addressed to K.M.F.-F. (kfroberg@bio-serv.com).

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introduced. Sheltering devices can be a solution to aggressive behavior or can exacerbate the situation. A change as simple as using a disposable paper shelter, such as the Bio-Hut™ (Fig. 3) or Bio-Corner Hut™, instead of a non-disposable one, such as a polycarbonate tunnel, hut or igloo, can have a positive result. Other suggestions for reducing aggression include adding an exercise opportunity such as the Fast Trac™ and placing two shelters in the cage to provide places of refuge for both the aggressive and the submissive mice. The main consideration when introducing an enrichment device is to evaluate the response of the mice and respond accordingly.

Mice have touch-sensitive body hairs and are thigmotaxic, meaning that they prefer to stay in close contact with walls or objects⁵. Even in a safe environment, they will hug walls when they move about. Their fur can feel the presence of surfaces against their bodies, and their whiskers are highly sensitive and can detect the slightest tactile changes. Providing them a sheltering device encourages them to move about the microenvironment of the cage. Mice also have an aversion to drafts and to cold and will seek shelter to secure warmth⁵. The *Guide* dictates that the temperature range for rodents should be maintained at 68–79 °F (ref. 1). Mice become thermally stressed at 64–68 °F and will huddle when they are chilled⁶. Providing mice a shelter or nesting opportunity allows for better thermoregulation and reduces stress as a research variable.

Nesting

Several studies have shown that the addition of nesting material to mouse cages is a highly effective form of enrichment⁷. Nest-building is a very detailed activity that includes digging or hollowing the material, warming the substrate with their body heat, hollowing or burrowing, sorting the materials, expanding the substrate and weaving the material methodically^{2,7}. Nesting materials that allow for all these activities are commercially available. Nest building is not only for breeding females who construct nests for their offspring but also for non-breeding rodents, including males. Nesting material allows



FIGURE 2 | Mouse Igloo®, a polycarbonate sheltering device. Photograph courtesy of Stanton Short (The Jackson Laboratory).

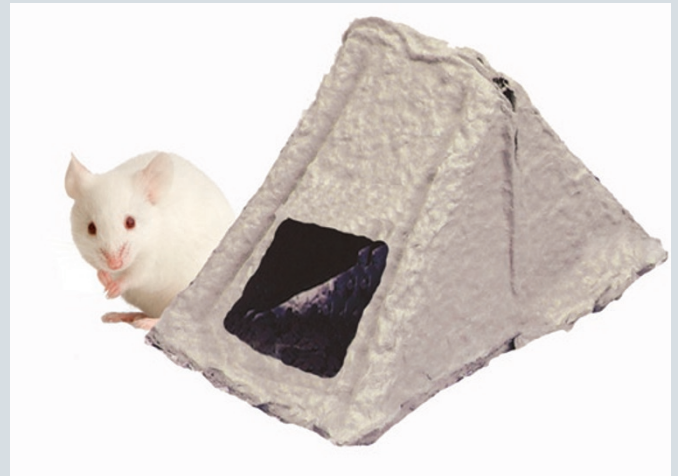


FIGURE 3 | Bio-Hut™, a disposable, certified, paper sheltering device.

the mice to alter their surroundings to suit their needs and offers them a sense of control over their environment, two key objectives in reducing stress with successful enrichment.

The challenge of providing effective enrichment to mice is to ensure that it allows for normal behavioral opportunities. Studies are ongoing to further identify the behavioral needs of mice in the laboratory environment. Bio-Serv offers many innovative choices of environmental enrichment devices and edibles to fulfill the present and future needs of mice and other laboratory animal species.

Company profile

With more than 37 years of experience, Bio-Serv can assist customers in achieving their environmental enrichment and treatment goals. Our well-trained professional staff, which includes two PhD nutritionists and a veterinarian, is available full-time to help our customers meet their specific needs.

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