

STANDARD OPERATING PROCEDURE

ENVIRONMENTAL ENRICHMENT FOR MICE USED IN RESEARCH AND TEACHING

1.0 PURPOSE:

- 1.1 This standard operating procedure (SOP) describes the methods for environmental enrichment of mice (*Mus* spp.) used for research and teaching purposes.
- 1.2 These methods are intended to improve the well-being of these animals by increasing species-specific behaviors and reducing maladaptive behaviors.
- 1.3 This SOP is part of the UGA Environmental Enrichment Program that fully complies with the requirements of the National Research Council, *Guide for the Care and Use of Laboratory Animal*, ed8 available at <http://grants.nih.gov/grants/olaw/Guide-for-the-Care-and-Use-of-Laboratory-Animals.pdf> and the Animal Welfare Act and Regulations: Public Law 99-198 – The Improved Standards for Laboratory Animal Act available at <http://www.nal.usda.gov/awic/legislat/awa.htm> .

2.0 STANDARDS:

2.1 Natural Behavior:

Mice (*Mus* spp.) are highly social rodents and their social structures may include dominance hierarchies. Fighting may occur among individuals, most often among males, during establishment of hierarchies or territorial defense. Mice are nocturnal, burrowing and nesting mammals that prefer to seek shelter near walls or by hiding behind structures. (Suckow et. al., 2001) Mice naturally build complex nests to provide shelter from the elements and predators, but also as a way to compensate for changes in external temperatures. Therefore, nests provide external insulation and create a less thermally stressful habitat. (Garner et al., 2012) Mice are omnivorous and granivorous. Mice primarily use olfactory and auditory cues for communication. (Suckow et al., 2001)

2.2 Environmental enrichment must be evaluated by taking into account the following:

- 2.2.1 The Natural Behavior and needs of mice (see above)
- 2.2.2 Social Enrichment – Housing of compatible co specific offers a high level of enrichment. Every effort will be made socially house social species. If social housing is not possible, animals should be housed in a manner that allows for as much tactile, auditory, visual or olfactory contact as possible. Social housing is a recognized and important part of the Environment Enrichment Program but should not be viewed as the sole means of meeting the enrichment needs of animals.
- 2.2.3 Physical Enrichment (devices, toys, etc) – Physical enrichment can be an important part of the Environmental Enrichment Program. However the selection of physical enrichment should take into account the safety of the device, its ability to stimulate and maintain the animal’s interest and its impact on the research being conducted. Physical enrichment should be carefully monitored to assess its impact of the goals of increasing natural behaviors.
- 2.2.4 Activity/Food Enrichment – Activity/food enrichment can be an important part of the Environmental Enrichment Program. However, the selection of activity/food enrichment should take into account the health of the animal, the limitations of its confines and its impact on the research being conducted. Any activity/food enrichment should be planned in consultation with the Attending Veterinarian (AV) and the Principal Investigator (PI).

- 2.3 The enrichment program is carried out by University Research Animal Resources (URAR). Specific needs and requirements should be communicated to the Assistant Director of the Animal Resources (AR) Unit.
- 2.4 Unless specifically justified by the PI in the Animal Use Proposal (AUP), all animals will receive enrichment. It is recognized that animal enrichment can be a research variable. In caring for the psychological well-being of animals, it is important to recognize limitations and use a balanced approach in providing the best possible care and allowing for the expression of species-typical behavior within a functioning research environment.

2.5 Abnormal Behaviors:

The Environmental Enrichment Program is a dynamic process. Ongoing evaluation is a necessary component to meeting the goal of more species-specific natural behaviors. University Research Animal Resources (URAR) will regularly monitor all enrichment, in part, by looking for stereotypical behaviors that might indicate animal stress or maladaptation to the laboratory environment.

Abnormal behaviors in mice include:

- fighting, especially among dominant males
- food grinding
- dermatitis
- infanticide
- route tracing, jumping or pacing

When these behaviors are observed, URAR will evaluate the need for additional environmental enrichment. All changes to enrichment will be approved by the AV and the PI. Enrichment changes will be made for all animals on study, in order to minimize research variability, even if all of the animals are not showing the stereotypical behavior.

3.0 PROCEDURES:

- 3.1 Social Enrichment – As a social species, mouse social housing will be considered the default method of housing unless otherwise justified based on social incompatibility resulting from inappropriate behavior, veterinary-related concerns regarding animal well-being, or scientific requirements approved by the UGA Institutional Animal Care and Use Committee.
- 3.2 Physical Enrichment - in order of preference (All enrichment materials will be autoclaved for SCID/Nude Mice or others requiring sterile technique.)
- 3.2.1 Solid bottom caging with multi-substrate nesting material (paper drinking cone + tissue or Nestlet®)
- 3.2.2 Mouse houses (Paper or plastic)
- 3.3 Activity/Food Enrichment
- 3.3.1 Food treats mixed with bedding (e.g., 1 dry-roasted, unsalted peanut/mouse/week; 3—4 unsalted sunflower seeds/animal/week)
- 3.3.2 Running wheel

4.0 RECORDS:

The Animal Care Staff will log provision of enrichment daily according to their facility specific documentation records.

5.0 DEFINITIONS AND REFERENCES:

5.1 Definitions:

- 5.1.1 Animal Use Proposal (AUP): a detailed written description of the procedures involving the use of animals in a research or instructional project.
- 5.1.2 Attending Veterinarian (AV): the veterinarian responsible for the health and well-being of all laboratory animals used at the institution
- 5.1.3 Enrichment: a method of providing animals with the opportunity to behave as they do in the wild, playing, foraging, grooming, and interacting in other ways with one another.
- 5.1.4 Principal Investigator (PI): the scientist who plans and coordinates all phases of the research or instructional work and the protocol.
- 5.1.5 Standard Operating Procedure (SOP): a set of standardized instructions for dealing with routine laboratory procedures

5.2 References:

Animal Welfare Act and Regulations: Public Law 99-198 – The Improved Standards for Laboratory Animal Act (<http://www.nal.usda.gov/awic/legislat/awa.htm>)

Garner et al., (2012). *Heat or Insulation: Behavioral Titration of Mouse Preference for Warmth or Access to a Nest*. PLOS One

National Research Council, *Guide for the Care and Use of Laboratory Animals*, ed 8 available at <http://grants.nih.gov/grants/olaw/Guide-for-the-Care-and-Use-of-Laboratory-Animals.pdf>

Suckow, M.A., Danneman, P. and Brayton, C. (2001). *The Laboratory Mouse*. CRC Press