

ENVIRONMENTAL ENRICHMENT GUIDELINES

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Purpose

In accordance with the *Guide for the Care and Use of Laboratory Animals (Guide)*, research facilities must provide appropriate environmental enrichment for all animals. The principal goal of this 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 and promote psychological well-being through physical exercise, manipulative activities, and cognitive challenges according to species-specific characteristics” (*Guide*; pg. 52-3).

The Office of Laboratory Animal Care (OLAC) recognizes the importance of behavioral enrichment to the well-being of captive animals. Enrichment strategies are based on attempts to address the expression of species-typical behaviors and allow animals some control over their immediate environment. Veterinary staff, animal resource managers, animal technicians, and laboratory personnel all play a role in the development and provision of appropriate behavioral enrichment approaches.

General Considerations

- All social animals are pair/group housed. Exceptions must be described and scientifically justified in the Principal Investigator (PI)'s Animal Use Protocol (AUP) and approved by the Animal Care and Use Committee (ACUC). Exceptions may also be based on veterinarian-approved medical exemptions.
- Any auditory enrichment provided will not exceed normal conversational volume level (approximately 60 dB). Music with strong beats or talk radio with loud voices (screaming, arguing) should be avoided.
- Addition of any new specialized species will initiate review of species-specific enrichment opportunities at the time of animal care Standard Operating Procedure (SOP) development.

Enrichment by Species

Nonhuman Primates (*Macaca mulatta*)

Animal Welfare Regulations (9§CFR 3.81) state that "...research facilities must develop, document, and follow an appropriate plan for environmental enhancement adequate to promote the psychological well-being of nonhuman primates".

A. Social grouping

1. As per the regulations, the environment enhancement plan for nonhuman primates (NHPs) must include specific provisions to address the social need of NHPs of species known to exist in social groups in nature.
2. OLAC veterinary staff ensures that all NHPs have visual, auditory, olfactory, and, where feasible, tactile contact with con-specifics. The caging currently available for housing macaques provides visual as well as potentially grooming contact through removable stainless steel grid dividers. OLAC will pair house NHPs whenever possible and appropriate. Animals will be purchased as compatible pairs whenever possible. If OLAC's Attending Veterinarian determines that an animal is incompatible with pair housing, that status will be documented. When AUPs require individual housing, NHPs will have visual, auditory, or olfactory contact with each other whenever possible. Individual housing must be described and scientifically justified in the PI's AUP and approved by the ACUC.

B. Structure and substrate – Primary enclosures must be enriched by providing means of expressing non-injurious species typical activities. All OLAC NHP cages have at least one permanently fixed perch that increases utilization of available cage space. Cages can be divided horizontally or vertically to promote climbing behaviors and allow for variation in cage configuration.

C. Foraging opportunities and manipulanda

1. NHPs are offered a variety of foods by animal caretakers as enrichment provided they are not limited by research protocol or veterinary advice. In addition, food items may be provided in coordination with lab members as part of positive reinforcement training in the lab. These food items include a variety of wet and dried fruits, nuts, seed mixes, popped corn, etc. Task-

oriented feeding methods are introduced in an attempt to prolong the useful enrichment time of particular food items and to help satisfy species-specific foraging behaviors. Specifically, these include puzzle feeders, foraging boards, tube feeders, Kong toys, etc. These foraging devices are in addition to activities associated with experimental manipulation.

2. Manipulanda are objects that can be moved, used, or altered in some manner by the primate's hands. OLAC NHPs are offered a variety of manipulanda on a daily basis. These include Kong toys, oak sticks, raw coconuts, nylon dog bones, mirrors, etc.
 3. Manipulanda and foraging items are rotated regularly.
- D. Other enrichment –
1. Audio or video enrichment will be provided at least three times per week.
 2. In instances where long-term (more than 12 hours) restraint is required, nonhuman primates will be provided the opportunity daily for unrestrained activity for at least one continuous hour during the period of restraint, unless continuous restraint is required by the research proposal approved by the Animal Care and Use Committee.
- E. Special Considerations – Any evidence of psychological distress observed by the animal care staff or others will be recorded in the daily health report and brought to the attention of the veterinary staff. Observations made by the veterinary staff are noted in the appropriate medical record and the need for a more individual environmental enrichment plan, or modification, will be assessed for that animal by the veterinarian.
- F. Exemptions – According to the AWR, “the attending veterinarian may exempt an individual NHP from participation in the environmental enrichment plan because of its health or in consideration of its well-being” (9§CFR 3.81,e). The basis of the exemption must be recorded by the attending veterinarian for each exempted nonhuman primate. Unless the basis for the exemption is a permanent condition, the exemption must be reviewed at least every 30 days by the Attending Veterinarian. For a research facility, the ACUC may exempt an individual NHP from participation in some or all of the otherwise required environmental enrichment plans for scientific reasons set forth in the research proposal. The basis of the exemption shall be documented in the approved proposal and must be reviewed at appropriate intervals by the ACUC, but not less than annually. Records of any exemptions must be maintained by the research facility and must be made available to USDA officials or officials of any pertinent federal funding agency upon request.
- G. Recordkeeping – Written records will be kept on each animal documenting the environmental enrichment available, as well as any noted problems and action taken. A daily enrichment log will be maintained for each animal.

Domestic Cats (*Felis catus*)

- A. Social housing – Cats are housed in small compatible groups or as pairs, unless the requirements of the research protocol or animal health concerns make this impossible.
- B. Structure and substrate – Primary enclosures with increased vertical space and perches placed at various heights.
- C. Manipulanda/toys – Commercially available, cat enrichment is provided daily in the form of scratch boards, balls, wands, etc.
- D. Other enrichment – Cats have daily positive social interactions with animal care staff.
- E. Recordkeeping – Written records will be kept documenting the environmental enrichment available, as well as any noted problems and action taken. A daily enrichment log will be maintained in the animal room.

Rabbits (*Oryctolagus cuniculus*)

- A. Social housing – Whenever possible, young rabbits are housed in groups or pairs unless the requirements of the research protocol, animal health concerns, or compliance with federal floor space requirements make this impossible. Rabbits assigned to protocols requiring individual housing may be presented with regular “play time” with other rabbits in the room. This involves placing rabbits in an empty plastic child’s pool or portable canine exercise pen on the floor along with other socially compatible rabbits.
- B. Manipulanda/toys – Rattles, whiffle balls, plastic barbells, etc. are provided on a daily basis.
- C. Food enrichment – Timothy hay cubes, carrots, lettuce, apple, etc. are offered on a daily basis.
- D. Other enrichment – Auditory enrichment in the form of music is provided on a regular basis.
- E. Recordkeeping – Written records will be kept documenting the environmental enrichment available, as well as any noted problems and action taken. A daily enrichment log will be maintained in the animal room.

Guinea Pigs (*Cavia porcellus*)

- A. Social housing – Whenever possible, guinea pigs are housed as compatible pairs or as breeding groups unless the requirements of the research protocol, animal health concerns, or compliance with federal floor space requirements make this impossible. Guinea pigs housed in breeding groups will be housed in circular tubs that comply with floor space regulations.
- B. Structure and substrate – A PVC (or other material) hide structure may be placed in each primary enclosure. Guinea pigs are housed on wood shavings which allow them to express burrowing and nesting behaviors.
- C. Food enrichment – Hay, hay cubes, lettuce, etc. are offered on a regular basis.

- D. Other enrichment – Guinea pigs have regular positive interactions with animal care staff.

Rats (*Rattus norvegicus*)

- A. Social housing – Rats are pair or group housed unless the requirements of the research protocol, animal health concerns, or compliance with floor space requirements make this impossible.
- B. Structure and substrate – Additional nesting materials, such as virgin pulp bedding or strips of paper fibers may be offered.
- C. Manipulanda/toys – Nylabones, wooden, or other chew toys may be provided.

Mice (*Mus musculus*)

- A. Social housing – Mice are pair or group housed unless the requirements of the research protocol or animal health concerns make this impossible. Adult males may require single housing due to aggression.
- B. Structure and substrate – Paper nest building material (nestlet) is provided. This allows for the expression of nesting behaviors. Additional nesting materials, such as virgin pulp bedding or strips of paper fibers and/or plastic or paper housing structures to hide in are offered at the discretion of the Animal Resource Manager or if specifically requested by the Investigator (eg. for some breeding females).
- C. Manipulanda/toys – Plastic huts, running wheels may be provided.

Hamsters (*Mesocricetus sp.*)

- A. Social housing – While hamsters are not generally considered a social species, compatible individuals may be pair or group housed unless the requirements of the research protocol or animal health and welfare concerns make this impossible.
- B. Structure and substrate – Hamsters are provided with virgin pulp bedding or wood shavings which allow them to express burrowing and nesting behaviors. Wooden chewing enrichment is also offered on an as-needed basis for animals requiring additional chewing opportunities to maintain dental health.

Voies (*Microtus spp.*)

- A. Social housing – Compatible individuals are pair housed unless the requirements of the research protocol or animal health concerns make this impossible.
- B. Structure and substrate – Voies are housed on wood shavings. Paper nest building material (“nestlets”) and/or structures to hide in, such as jars or huts, are also provided.

Tuco tuco (*Ctenomys sociabilis*)

- A. Social housing – Compatible individuals are pair or group housed unless the requirements of the research protocol, animal health concerns, or compliance with federal floor space requirements make this impossible.

- B. Structure and substrate – Animals are housed on wood shavings in a tube and nesting box system designed to emulate natural burrow systems. Additional nesting materials, such as virgin pulp bedding or strips of paper fibers, may be offered at the discretion of the Animal Resource Manager or if specifically requested by the Investigator (eg. for some breeding females).
- C. Food enrichment – Corn, carrots, and lettuce provide a variety of water sources.

Bats

The University of California, Berkeley (UCB) may house multiple bat species, including *Rousettus aegyptiacus* and *Phyllostomus discolor*. The natural history and behavior of the species being maintained is reviewed by lab and animal care staff in order to develop a species-specific behavioral enrichment plan.

- A. Social housing – Bats are pair or group housed unless the requirements of the research protocol, as approved in an ACUC protocol, or animal health concerns, as documented by veterinary medical records, make this impossible.
- B. Structure and substrate – Flight rooms contain stainless steel mesh grids attached to several locations in the perimeter of the ceiling and in several locations near the center of the ceiling to allow roosting locations and allows bats to cling onto it (hanging head---down) and to huddle in groups.
- C. Manipulanda/toys – Flight rooms may be equipped with silk plants, ropes, baskets, and nets.

Birds

UCB houses a variety of avian species, including those listed below. The natural history and behavior of the species being maintained is reviewed by lab and animal care staff in order to develop a species-specific behavioral enrichment plan.

A. Finches (*Poephila guttata*)

1. Social Housing – Zebra finches are housed as pairs or in small groups unless the requirements of the research protocol or animal health concerns make this impossible.
2. Structure and substrate – Finches are provided with nest boxes, wooden perches of various thicknesses, paper nesting material and weekly access to a “bird bath”.
3. Manipulanda/toys – Cages are equipped with items, such as small mirrors, plastic rings, rope perches and swings.
4. Food enrichment – Greens, cooked egg, and various seeds are scattered about the cage to provide foraging opportunities on a regular basis.

B. Starlings (*Sturnus vulgaris*)

1. Social housing – Starlings are housed in small to medium-sized groups in large, walk-in, naturalistic, outdoor aviaries.
2. Structure and substrate – Aviaries contain fresh tree branches and sheltered areas.

C. Poultry and game birds

1. Social housing – Based on research and/or animal health requirements, birds are group housed by species whenever possible.
2. Structure and substrate – Ducks are provided with regular access to pools for swimming and floating enrichment.
3. Food enrichment – Chickens are provided with scattered food and occasional meal worms. Live or dried meal worms and/or dried shrimp, and greens (lettuce, collards, or cabbage) are also provided daily. Partridges are provided with live or dried meal worms daily.

D. Hummingbirds

1. Social housing – While hummingbirds are not generally considered a social species, compatible individuals may be pair or group housed unless the requirements of the research protocol or animal health and welfare concerns make this impossible.
2. Food enrichment – Hummingbirds are offered their regular daily nectar in hanging plastic flower-shaped devices in order to mimic the way that they obtain food in the wild.

Reptiles

UCB houses a wide variety of reptile species, including snakes and lizards. The natural history and behavior of the species being maintained is reviewed by lab and animal care staff in order to develop a species-specific behavioral enrichment plan.

- A. Social housing – Based on research and animal health requirements, social species are housed as pairs or in small groups when possible.
- B. Structure and substrate – Arboreal species are provided with increased vertical space and perches to allow for the expression of climbing behaviors. Terrestrial species are often provided with a substrate which promotes burrowing and ovipositing behavior. Visual contact is allowed for some species, while hide boxes or hanging visual hides are provided for other species as appropriate.
- C. Other enrichment – Bowls of water for soaking are provided to animals that express this behavior.

Amphibians

UCB houses a wide variety of amphibian species. The natural history and behavior of the species being maintained is reviewed by lab and animal care staff in order to develop a species-specific behavioral enrichment plan.

- A. Social housing – Axolotls, salamanders, and *Xenopus laevis* are housed in groups of similar-sized animals unless the requirements of the research protocol or animal health concerns make this impossible.
- B. Structure and substrate – Terrestrial species are often provided with a substrate which promotes burrowing behavior. Hide boxes are often provided. PVC tubes are placed in larger tanks to provide hiding places. Floating rubber balls are provided to *Xenopus tropicalis*.

- C. Other enrichment – Bowls of water for soaking are provided to animals that express this behavior.

Fish

- A. Social housing – Fish are housed in social or breeding groups at an appropriate stocking density.
- B. Structure and substrate – Gravel, rocks, or plastic plants may be provided if requested by the Investigator to improve breeding success.

References

- Institute of Laboratory Animal Research (ILAR). National Research Council (2011). *Guide for the Care and Use of Laboratory Animals* (8th edition). Washington, D.C.: The National Academies Press.
- Committee on Well-Being of Nonhuman Primates. National Research Council. (1998). *The Psychological Well-Being of Nonhuman Primates*. Washington, D.C.: The National Academies Press.
- Animal Plant Health Inspection Service (APHIS). United States Department of Agriculture (USDA). “*Specifications for the Humane Handling, Care, Treatment, and Transportation of Nonhuman Primates*”, *Code of Federal Regulations*, Title 9, Chapter 1, Part 3, Subpart D. 2010 ed.