

STANDARD OPERATING PROCEDURE

ENVIRONMENTAL ENRICHMENT FOR MACAQUE MONKEYS USED IN RESEARCH AND TEACHING

1.0 PURPOSE:

- 1.1 This standard operating procedure (SOP) describes the methods for environmental enrichment of macaques (*Macaca 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 Animals*, 8th edition, available at <https://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:

Macaque monkeys (particularly the common research species such as *M. cynomolgus*, *m. mulatta*, and *M. nemestrina*) naturally inhabit many parts of southeast Asia, China, and India. In the wild, they are a prey species with social orders. They live in social groups of 2-30. They communicate primarily through vocalizations and olfactory cues. They are very active animals, agile at climbing and leaping. They use their hands and mouths to explore objects and surfaces and can often be quite destructive. They are very intelligent and have a great memory. They are easily frightened and can become aggressive with humans as a defensive measure, even toward familiar caretakers.

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

- 2.2.1 The Natural Behavior and needs of macaques (see above)
- 2.2.2 Social Enrichment – Housing of compatible co specific offers a high level of enrichment. Social housing of social species is the default. If social housing is not possible, animals will 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 is 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 Director or 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.

Some indicators of abnormal behaviors in macaques include:

- Sudden aggression, threat gestures
- Huddled or unusual posture
- Pacing
- Isolation and Lethargy

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 Daily

3.1.1 Food Supplementation

3.1.1.3 Fresh produce (daily).

3.1.1.1.1. The amount of supplementation will depend on the species and weight.

- 3.1.1.1.2. The ratio of fruits to vegetables may vary.
- 3.1.1.1.3. Use a variety of fruits and vegetables throughout the week.
- 3.1.1.1.4. Provide at least one novelty item each week.
- 3.1.1.1.5. See Appendix A for examples of acceptable foods.

- 3.1.1.2 Wash foods in a 2% bleach bath for 5 minutes, rinse well with water, and chop into appropriate size on a clean cutting surface.
- 3.1.1.3 Place chopped food(s) into a labeled bag. If being used that day for enrichment label with “AM En” followed by the day’s date, or “PM En followed by the day’s date. If being used later in the week, label bag with the date the food needs to be used by.
- 3.1.1.4 Distribute to NHPs (Non-Human Primate) or place in a labeled bag/covered container for later use. Produce must remain refrigerated until use.
- 3.1.1.5 Clean and disinfect food prep area with appropriate disinfectant and check all food items for any signs of aging (mold, bad odor, soft/limp appearance, etc.)
- 3.1.1.6 Document the food supplementation on the enrichment calendar in the food prep room and on the enrichment sheet located outside of the NHP room.

3.1.2 Tactile enrichment/manipulanda (continuous)

3.1.2.1 Cage toys

- 3.1.2.1.1. One “vet approved” toy per NHP must be present at all times in each cage. Rotate toys every other week at cage change. Avoid toys that are difficult to sanitize or that can be easily digestible by a NHP.
- 3.1.2.1.2. Vet approved hanging toys may be provided to NHP.
 - 3.1.2.1.2.1. Place toy at the front or rear wall of cage to prevent squeeze back interference
 - 3.1.2.1.2.2. One of the veterinary staff must perform a strangulation assessment on each hanging toy to ensure the NHPs’ safety.
- 3.1.2.1.3. Discard any damaged or broken toys from the cage as soon as possible

3.1.2.2 Challenger Ball or other foraging device

- 3.1.2.2.1. Provide one challenger ball to each NHP cage in such a way that the operation of the cage door and squeeze back is not hindered
- 3.1.2.2.2. Place food in the challenger ball at least once daily. See Appendix A for approved challenger ball food.
- 3.1.2.2.3. Rinse challenger balls with water once daily and send through the cage wash every other week.

3.1.2.3 Mirrors

- 3.1.2.3.1. Provide one hanging mirror for each NHP pair in such a way that the operation of the cage door and squeeze back is not hindered.
- 3.1.2.3.2. Rinse mirrors with water once each day and send through the cage wash every other week.

3.1.3 Perches

- 3.1.3.1 All NHPs will have a stainless steel perch in the cage

3.1.3.2 If space permits, additional resting areas may be provided (hammocks, slings, etc.)

4.0 At least Twice Weekly

4.1 Audio/visual enrichment (at least twice weekly)

4.1.1 Provide up to 5 days a week

4.1.2 Show DVDs for up to 2 hours per day

4.1.3 Play Radio/CDs during the working hours of the facility. Play only soft, classical sounds/music.

4.1.4 Set the volume so that it is not audible outside of the NHP housing room.

5.0 Four Times Weekly

5.1 Provide foraging enrichment and destructibles on different days so that NHPs receive one or the other 4 days each week

5.2 Foraging Enrichment

5.2.1 Provide each NHP with a foraging opportunity at least twice each week in addition to the daily food supplementation.

5.2.2 Do not provide foraging and destructible enrichment on the same days

5.2.2.1 Place a handful (approx. 1/4 cup) of foraging mix or alternative (such as popcorn, granola, sunflower seeds, etc.) in the floor of each CLEAN.pan. If the pan is dirty, clean it first.

5.2.3 Document the type of forage opportunity on the enrichment sheet located outside of the NHP room.

5.3 Destructibles

5.3.1 Provide destructibles twice each week to each NHP. See Appendix B for approved destructibles.

6.0 Food rewards (for training or for vet/research purposes)

6.1.1 Keep a bag of reward food in the feed bucket in the NHP room

6.1.2 Label the bag with the expiration date.

6.1.3 No more than a handful (approx. 1/4 cup) should be given to a single NHP in one training session/vet visit/research procedure.

3.1 When presenting reward, never put fingers/hand inside the cage. Allow NHP to retrieve reward through the caging or place in a location where the reward is accessible to the NHP.

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>)
http://txbiomed.org/pdf/Manual_07-26-06.pdf
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>
- 5.3 Appendix

Appendix A- Approved NHP Enrichment Food

Produce (Weekly)

- Bok Choy (one medium sized leaflet per NHP)
- Grapes (3 to 5 per NHP)
- Apples (1/2 per NHP)
- Kiwis (1/4 per NHP)
- Celery (1 leafstalk per NHP)
- Cucumbers (1/4 per NHP)

- Banana/granola/yogurt cups (1/5 banana, 1 tablespoon of yogurt, 1 tablespoon of granola)
- Avocados (1/8 per NHP)
- Dried Fig Slices (2 per NHP)

Snacks (Weekly)

- Granola (1/4 cup per NHP)
- Oatmeal (1/4 cup per NHP)
- Animal Crackers (One per NHP)
- Vanilla Wafers (One per NHP)
- Sunflower Seeds (1/4 cup per NHP)
- Peanut Butter (Tablespoon per NHP)
- Yogurt (Tablespoon per NHP)

Foraging Opportunity (\geq Twice Weekly)

- Popcorn (1/4 cup per NHP)
- Sunflower seeds (1 tablespoon per NHP)
- Granola (1 tablespoon per NHP)

Challenger Ball (Daily)

- Peanuts (one per NHP)
- Unsalted Pretzels (one per NHP)
- Bananas (1/5 per NHP)
- Cucumbers (1/6 per NHP)
- Kiwis (1/6 per NHP)
- Celery (1/3 per NHP)
- Carrots (one whole baby carrot per NHP)

Reward Items (Daily, amount given based behavior and interactions)

- Cheerios
- Trail Mix
- Noodles
- Peanuts
- Banana Chips
- Unsalted Pretzel

Novelty/Specialty Foods (Once Weekly)

- Coconuts (One per NHP)
- Corn (1/2 per NHP)
- Peaches (One per NHP)
- Apples with Peanut Butter and granola (1/2 apple per NHP)

- Appendix B- Approved NHP Destructibles

Twice weekly

- Paper (one sheet per NHP)
- Bag Surprise (One bag per NHP)
- Toilet Roll (One per NHP)
- Glove Box (One per NHP)
- Plastic Bottles (One per NHP)