I. **Purpose:** In accordance with the Animal Welfare Act and the *Guide for the Care and Use of Laboratory Animals*, the primary goal of this policy is to provide for the psychological well-being in conjunction with the physiological health of all nonhuman primates at Brown University. Veterinary staff, animal care technicians, and laboratory personnel all play an important role in implementation of the program.

II. **Procedures:** Environmental enrichment is a key feature to ensure the psychological well-being of nonhuman primates (NHPs). The following enrichment procedures have been developed to provide for the social needs of NHPs and enrichment of the physical environment in order to encourage and enable expression of beneficial behaviors.

III. **Environmental Enrichment:** Creating a complex environment for NHPs helps to promote species-typical behaviors and reduce boredom and stress that may result in abnormal behaviors. Enrichment techniques fall under the following categories: physical, nutritional, sensory, social, and occupational. Key concepts to environmental enrichment are novelty, complexity, and control. Novel, or new, objects, foods, and other items increase attention and use. Because novelty may quickly wear off, rotation of objects helps to maintain higher levels of interest and the use of complex objects results in a longer latency to habituation. Offering NHPs choices in their daily lives enhances their ability to control the environment. Items which can be moved, manipulated, changed, and used to cause a desired effect can provide a level of control, which has positive effects on behavior.

1. **Physical Enrichment**
   Physical enrichment includes additions to, and variety in, the physical environment of the animal. These items promote species-typical manual manipulation and locomotor patterns, and also provide visual barriers for privacy. They can include both manipulable enrichment and structural enrichment.
   a. **Manipulable Enrichment**
      i. **Manipulable objects:** Durable manipulable objects such as plastic balls and toys and variously shaped rubber toys are available to all macaques. Smaller toys are attached to the enclosure with short chains to provide opportunities for manipulation without the possibility of them being washed down the drain. Animals 0-3 years of age receive at least 3 different devices per animal and animals 3 years and older receive 2.
Manipulanda are rotated and sanitized regularly.

ii. Mirrors: Plastic or stainless steel mirrors can be attached to the outside of some cages or hung from chains. Macaques may handle the mirror and use it to watch areas otherwise out of view.

b. Structural Enrichment
   i. Cages: Cages can be divided horizontally or vertically to promote climbing behaviors and allow for variation in cage configuration.
   ii. Perches: All NHP cages have at least one permanently fixed perch that increases utilization of available cage space.
   iii. View boxes: All NHP cages are equipped with view boxes, which provide enhanced visual access by allowing them to see additional animals and provide a different perspective of their environment.
   iv. Visual barriers: Cages have partial visual screens or solid partitions to provide barriers, an important environmental feature for territorial species.
   v. Play cages: A large play cage with multiple toys and structures for perching and climbing is available to the animals on a rotating basis. The schedule varies and is determined by training, working, and clinical procedures.

2. Nutritional Enrichment
   Nutritional enrichment includes novel food items approved by veterinarians and presented in a variety of ways that increase the diversity of the animals’ diets. These items are provided as long as the animal’s diet is not restricted due to health concerns or Institutional Animal Care and Use Committee (IACUC) approved study restrictions. Enrichment logs are filled out whenever nutritional enrichment is provided to an animal or group of animals.
   a. Fresh fruits and vegetables: A variety of fresh fruits and vegetables are provided to primates on a regular basis. Whole pieces of fruit or vegetables with peels still intact encourage the same sort of manipulation and processing prior to consumption that a primate would have to exhibit in the wild. Produce can also be cut up into unique shapes or pieces of varying size to increase novelty and prevent the animal from becoming bored.
   b. Novel food items: A diverse assortment of novel food items is supplied by the Animal Care Facility (ACF) and lab staff to increase the variety of the animals’ diets, including but not limited to: shelled peanuts, dried fruits and vegetables, fruit-flavored gelatin, PRIMA-Treats®, Fruity Bites™, etc.

3. Sensory Enrichment
   Sensory enrichment includes items that promote auditory and visual stimulation. This can include television and music.
   a. Radios: For added auditory variety, radios are available in most holding areas. Volume is kept at a reasonable level. Radios can be played for one to eight hours per day, but they are turned off at the end of the day.
b. Televisions: Televisions with built-in DVD players are available in all macaque holding areas to add auditory and visual stimulation. There are a variety of children’s and nature DVDs available and they are rotated regularly. The televisions can be operated by the care staff and remain on for one to eight hours each day, but are turned off at the end of the day.

4. Occupational Enrichment
Occupational enrichment includes feeder devices to stimulate problem-solving, motor skills, and coordination. Also included is positive reinforcement training to provide animals with a way to occupy their time, to reinforce positive human interactions, and to minimize the stress of handling and other routine procedures on both animals and humans.
   a. Feeder devices: A number of feeding and foraging devices are available. They are usually filled with grain, treats, or sticky substances and hung on the outside of the primate’s cage.
   b. Positive reinforcement training: Whenever possible, positive reinforcement is used to shape a primate’s behavior and encourage cooperation in research procedures. Animals are rewarded for performing desired behaviors, which builds a more positive relationship with the caregiver and provides goal-directed, enriching activities. Training provides a sense of control and predictability for the animals, minimizes environmental stressors, and reduces time and labor for care staff. All of the primates currently at Brown University are involved in neuroscience research, and positive reinforcement training is done on a regular basis for all animals actively participating in research.

5. Social Enrichment
Social housing is recommended for naturally socially-living NHPs, like macaques. A social partner is perhaps the most important and basic environmental variable because it provides constantly changing stimuli and challenges the animal’s social and cognitive functioning. Forming social pairs of NHPs is not without risks; however, the benefits of social housing usually outweigh the risks. Additional benefits of social housing can include a reduction in abnormal behavior such as self-injurious behavior, regurgitation, and locomotor and other stereotypies.

Macaques are bought and received from the vendor in established pairs whenever possible. The ACF makes every attempt to keep animals pair housed. Individual primates may be exempted from social housing while recovering from an illness or injury, when taking part in an IACUC approved research project, prior to shipment to another facility, during quarantine upon arriving at the facility, or due to behavioral incompatibility. All singly housed primates have auditory, visual, and olfactory contact with conspecifics and, occasionally, provided with tactile contact via grooming/contact bars.
If there are two singly housed primates eligible for social housing that are potentially compatible, an attempt will be made to pair house them. Compatibility of nonhuman primates will be determined in accordance with generally accepted professional practices and actual observations, as directed by the Attending Veterinarian (AV) or his/her designee, to ensure that the NHPs are in fact compatible. Attempts to pair house will use methodologies delineated in referenced materials (Enrichment for Nonhuman Primates - Macaques, NIH Pub No. 05-5744).

Human interaction: Positive human interaction is important to develop rapport and good relations with the primates, especially those being handled frequently. They are visited at least twice daily by ACF staff and once daily by the veterinary staff, who are encouraged to talk to them and hand out enrichment. Additionally, animals are frequently visited by lab personnel who also interact with them via talking, enrichment, and training.

IV. Special Considerations

1. Any evidence of psychological distress, such as excessive autogrooming or hair-pulling, self-injurious behavior, and/or stereotypical behaviors and movements (circling, pacing, somersaulting, saluting, ear-pulling), 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 AV or his/her designee.

2. If an approved study involves the use of restraint devices, the veterinary staff, in consultation with the IACUC and PI, will develop guidelines for these animals in accordance with the Animal Welfare Act. In instances where long-term (more than 12 hours) restraint is required, NHPs 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 IACUC.
V. **Exemptions from Social Housing**: Nonhuman primates may be housed singly under specific circumstances. Single housing may be approved for the following reasons:

1. **Experimental reasons**: A primate on an approved active research protocol cannot be housed with another animal because of the experimental design or its infectious status in relation to other animals. This exemption must be approved by the IACUC.
2. **Incompatibility**: A primate may not be able to be housed with another animal due to behavioral incompatibility as determined by high levels of aggression or submission, weight loss due to monopolization of food, or evidence of physical injury to either animal. Attempts will be made to find compatible partners, however there may be some cases in which this is not possible.
3. **Health**: A primate may be temporarily singly caged due to severe illness or injury.
4. **Quarantine**: A primate may be singly caged after arrival at the facility for quarantine purposes. Individuals awaiting shipment to another facility may also be held in single cages for short periods of time.

VI. **Exemptions from Environmental Enrichment**: The plan provides for the following exceptions to environmental enrichment:

1. **The AV may exempt an individual NHP from components of the environmental enrichment procedures outlined above because of its health or condition, or in consideration of its well-being. The basis of the exemption will be recorded by the veterinary staff for each exempted NHP. Unless the basis for the exemption is a permanent condition, the exemption will be reviewed at least every 30 days by the AV or his/her designee.**
2. **The IACUC may exempt an individual nonhuman primate from all or parts of the environmental enrichment procedures for scientific reasons set forth in the IACUC-approved research protocol. The basis of the exemption will be documented in the approved protocol and must be reviewed at appropriate intervals as determined by the IACUC but not less than annually.**
3. **Records of any exemptions will be maintained and will be made available to USDA officials or officials of any pertinent funding agency upon request.**

VII. **Record Keeping**: 

1. **Medical Records**
   
   The animal’s clinical history for the current year is in the animal health records that are maintained within the animal holding room. Any diagnostic results are also maintained in the animal’s medical record. Clinical records, including results of diagnostic and semiannual testing, from previous years are maintained by the veterinary staff in the veterinary technician office.

2. **Enrichment Records**
   
   There is a primate enrichment log that is filled out daily by the ACF and the lab staff and posted on the door to each animal holding room. For the ACF staff, it includes confirmation that the minimum required enrichment is present, additional enrichment given, an area for comments and observations to include animals with strong likes and/or dislikes, and the caretaker’s initials. For the lab staff, it allows them to record when supplemental enrichment has been given, what it was, what the animal’s response was,
and their initials. These are collected and filed monthly.

VIII. References


