



Duke University
Animal Care & Use Program
Policy



ENVIRONMENT ENRICHMENT PLAN FOR NON-HUMAN PRIMATES

PERFORMANCE STANDARD: Primates will be managed according to a humane and enriched environment.

BACKGROUND: Primates have unique and special requirements to assure well-being and adequate care. These may be defined in a variety of ways, to include:

- **Social Environment:** Non-human primates are housed with other members of their species in a limited number of social contexts. These include small, full-contact groups housed in interconnected cages, pairs with varying levels of social contact, and single cages within sensory contact of other animals. In addition, many of the primates have regular periods of human interaction in training sessions with members of the Principal Investigator's staff, the veterinary staff, and animal husbandry staff.
 - **Singly housed animals:** Wherever possible, non-human primates are socialized with other members of their species; however, some animals may be housed in single cages for a variety of reasons. Animals are generally ineligible for social contact while in quarantine. Exceptions from social housing due to study needs is documented in an approved Institutional Animal Care and Use (IACUC) protocol. Animals may also be deemed temporarily or permanently ineligible from social housing by the attending veterinarian for a medical condition or medical treatment. Animals may also be singly housed due to known aggressiveness towards other members of the same species.

Non-human primates housed singly have visual, auditory and olfactory contact with members of their species. Since social interactions are important for the well-being of non-human primates, cage housed animals also receive daily interaction from human caretakers.

- **Structural Environment:**
 - **Structure and substrate:** The structure and substrate found within each non-human primate housing environment allows for the expression of species typical activities. DLAR provides each owl monkey and marmoset cage with an elevated perch, and a wooden stick for perching and scent marking. Additionally, owl monkeys are maintained in a reverse light cycle to allow for more natural feeding and activity patterns. Single cages for larger non-human primate species have a perch. Activity units have an elevated perching platform. Gang cages have elevated perching platforms and visual blocks within the enclosure.
 - **Manipulanda:** Each non-human primate is provided with manipulanda specific to its housing environment. These include filler toys such as

plastic balls, kong toys, flying saucers and Gumabones®, hanging toys (e.g. tug toys), and may also include additional hanging apparatuses such as mirrors, balls, puzzlefeeders, and foraging boards.

- **Television/Radio:** A television and radio are rotated through primate rooms on a regular basis.
- **Food Items:** Each non-human primate receives a relatively novel food item at least three times weekly. Novel foods are any food other than an animals standard feed, and can include fruits (such as apples, applesauce, bananas, oranges, grapes, raisins, or dry preserved apricots, mango slices, cherries, pineapple bits, etc.), vegetables (such as leafy greens, carrots or sweet potatoes), nuts (such as sunflower seeds or peanuts), manufactured treats (such as Primatreats, foraging crumbles, foraging discs, sweetened cereals, marshmallows), or other treats (such as popcorn).
- **Animal Training:** Certain non-human primates are trained by the Principal Investigators' staff members. These training sessions are focused on cooperation of the non-human primates with regular procedures, treatments, and study related activities. These may include, but are not limited to, activities such as pole and collar training, jumping into transfer boxes or chairs, moving joysticks to align light patterns, and recognition of light patterns. Many of these training protocols are based on IACUC approved positive reinforcement schedules that use liquids and/or food as a reward. These are interactive sessions with the goal of facilitating a research procedure.
- **Documentation:** The Principal Investigators maintain records on individual non-human primates to document daily food and fluid intake (when the animals are on food and/or water restricted regimens), body weights and performance on training procedures. In addition, DLAR maintains permanent individual medical records of all non-human primates and environmental enrichment (as part of the daily room sheets). Copies of completed PI records in regard to surgery, treatments or procedures should be placed in the DLAR records within twenty-four hours.

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THE PLAN:

Socialization of Non-human Primates

1. All non-human primates being considered for socialization are assessed for the following criteria (in order):
 - Exemption status
 - Species of animal
 - Viral status (SRV, SIV, STLV1, HERPES B, HERPES papio)
 - Current protocol
 - Age, weight, and sex of animal
 - History of social/individual housing
 - Current health status
 - Behavioral Observations
2. The Principal Investigator and/or their staff, DLAR Operational manager, and DLAR veterinarian will all be consulted before any non-human primate socialization.
3. Non-human primate socialization will be coordinated with tuberculin testing and cage wash schedule where possible.
4. Formation of pairs, trios, and other cage-housed groups:
 - Socialization is conducted in five steps, with the goal being continuous pair-housing for as many animals as possible. If possible, different combinations of animals may be tried to find the best partner for each animal and to maximize the number of individuals that can be pair-housed. Animals are allowed to advance to subsequent steps in the procedure as long as they exhibit consistent, directional dominant/subordinate behavior towards one another, as measured by approach/retreat interactions and threat/submission gestures. Pairs are considered incompatible if one partner continually attempts to escape from the other, the aggression is severe and does not decrease, or, in later stages, the dominant animal exhibits inadequate food sharing. The timeframe for moving animals to subsequent levels is determined on a case-by-case basis. Pairs that cannot safely proceed to the next step and cannot be paired with any other individuals may be halted indefinitely at one level in order to provide those pairs with the most socialization possible without endangering the animals. In addition, pairs that have reached advanced stages may be demoted to an earlier stage if they have been separated for long periods of time or if they exhibit incompatibility.

The steps:

- a. Observation of animal personality and social interactions: Personnel observe animals as they interact with each other through their cage walls. Animals have no physical contact during this time.
- b. Limited-contact familiarization: Animals can touch one another through a partition but can retreat if they feel threatened.

- c. Supervised pairing: Animals are allowed physical access to one another while personnel monitor them continuously. A net, glove, or hose is readily available to separate the animals in case severe aggression occurs. In order for the animals to establish dominance, some aggression is tolerated at the discretion of the person monitoring.
 - d. Pairing with intermittent supervision: Animals are paired for part of the day and are checked periodically.
 - e. Continuous pairing: Refers to pairing animals 24 hours a day (minus the time an animal is taken out of its cage for research/medical purposes) or for entire weekends. Animals are checked at least once daily, and compatibility is reevaluated on a regular basis.
5. The staff will observe any new socialization continuously for at least one hour after the animals are first given contact and then periodically throughout the day. The behavior staff will then monitor the socialization closely for at least one week.
 6. The staff will post a notice indicating the date and applicable animal numbers on the door of any room in which a new socialization has been formed.
 7. If severe fighting or wounding occurs during a socialization, animals are separated and the DLAR veterinary staff is notified of any injuries. A baseline chart of compatible pairs and those in progress will be maintained.
 8. The staff will make an entry in the permanent medical record of any non-human primate socialized, including the identification numbers of those with whom it has been socialized.
 9. When experience on data are inadequate to determine the effects of the socialization procedure on the psychological or physical well-being for a given species, the socialization process may be more gradual and guarded. In these cases, a specific socialization plan will be reviewed by the IACUC and the plan will be included as an addendum to this environmental enrichment plan.

Behavioral Record Keeping for Non-human Primates: A monthly behavioral management tracking form will be maintained for each nonhuman primate (figure 2A). This form will contain the non-human primate number, name, sex, date, time observed, and normal & abnormal behaviors observed. The abnormal behaviors observed will then be rated mild, moderate, or marked. The severity of these abnormal behaviors coincides with the Behavioral Response Plan sheet (Figure 2AB) which gives a planned outline of activities in order to help combat the abnormal behaviors. The response plan will commence after communication with the clinical veterinarian and the lab staff. Each individual medical record will be used to chart any behavioral problems that are observed. The record will contain the date the abnormal behavior is noted, the health status by observation, and any recommendations for improvement of the behavior as it coincides with the behavioral response plan. The medical records will be updated on a regular basis until the abnormal behavior has abated. The record will be kept 'open' if a

behavior is an ongoing problem. Any problem noted will be brought to the attention of the veterinary staff and the lab staff. Both parties will be in agreement of the behavior modification. This modification may include: more manipulanda, foraging boards, pair housing if possible, more sensory contact, or other treatments that are agreed on.

Exemptions from the DLAR Enrichment Plan:

Note: In accordance with 9 CFR § 3.81, Environmental enhancement to promote well-being, a non-human primate may be exempted from some or all of an environmental enrichment plan for health or experimental reasons.

Section 9 CFR § 3.81, Environmental enhancement to promote psychological well-being states: "(e) Exemptions:

1. The attending veterinarian may exempt an individual non-human primate from participation in the environment enhancement plan because of its health or condition, or in consideration of its well-being. The basis of the exemption must be recorded by the attending veterinarian for each exempted non-human 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.
2. For a research facility, the Committee may exempt an individual non-human primate from participation in some or all of the otherwise required environment enhancement 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 as determined by the Committee, but not less than annually.
3. Records of any exemptions must be maintained by the dealer, exhibitor, or research facility and must be made available to USDA officials or officials of any pertinent funding Federal agency upon request.
4. Approved exemptions and changes to exemption status are filed with the protocol.
5. The behavior staff reviews and documentation of exemptions annually."

Figure 1

DLAR Non-Human Primate Enrichment Log

Room _____

Week of _____

Animal ID	<u>Monday</u>	<u>Tuesday</u>	<u>Wednesday</u>	<u>Thursday</u>	<u>Friday</u>

All NHP's will automatically have a perch, visual contact with other NHP's, and auditory stimulation provided by a radio or TV. There should be at least one item of manipulanda available daily and some interactive treat given daily (variety). With daily feed a pre-determined fruit or vegetable is given by the caretaker.

Manipulanda: T1-kong, T2-Dental Device/Chew, T3-Budda/Space Ships, T4-jingle ball, T5-Tug toys, CS-chew stick, CB-challenger ball, PZ-puzzle feeder, M-mirror, R-rattle, SG-swing, FB-foraging board, DB-Dumbbell, JB-jolly ball, Group housing-G, Play cage-PC1- Large baboon play cage, PC2-double decker macaque cage; Interactive treats (vet tech or PI):DF-Dried Fruit, V-Vegetable, PT-Prima treat, CD-crumble disk, PN-peanuts, FF-Frozen fruit pop, SW-Shredded wheat, VW-Vanilla wafer, GC-Graham cracker, C-Cereal, MM-marshmallow, J-Jell-O cup, FC-foraging crumbles, YR-yogurt raisin, TR-triscuit, F-fruit, WT-wheat thin, WM-watermelon

Figure 2

Quarterly Evaluation Worksheet

Primate Name & ID# _____

Date: _____

<u>Enrichment Description/Item</u> ¹	<u>Usage Score</u> ^{1a}	<u>Initials</u>

<u>Abnormal Behavior</u> ²	<u>Severity</u> (Mild, Moderate, Severe)	<u>Initials</u>

¹ Enrichment Device i.e. = Kong, Dental Chew, Chew Sticks, Mirror, Jingle Ball,

^{1a}Usage Score over a week (0 to 5, 0=none, 5=frequent)

² No Abnormal Behavior Observed (NAB)

Floating Limb (FLT), Hair Loss (HLS), Huddle (HDL), Locomotor Stereotypy (LS),
Masturbate (MBT), Penis Suck (PSK), Regurgitate (RG), Salute (SL), Self Grab (SGB),
Self

Mouth (SMT), Self-Directed Display (SDD), Self-Injurious Behavior (SIB), Abnormal
Environmental Manipulation (AEM)

APPENDIX A

GUIDELINES AND DEFINITIONS

Definitions of Abnormal Non-human Primate Behavior

How to Conduct Non-human Primate Behavioral SOAPs

Definitions of Abnormal Non-human Primate Behavior

Floating Limb (FLT)

While sitting passively, one limb or tail is observed beginning a slow, upward movement. This apparently goes unnoticed at first by the animal. Scored using two components: context in which the behavior occurs and level of response by the animal to the limb.

Scored: Mild, Moderate, or Severe

		Context	
		Specific	Non-Specific
Response	Non-Aggressive	Mild	Moderate
	Aggressive	Moderate	Severe

Context:

Specific: Behavior only occurs under stressful circumstances (e.g. only when someone stares directly at the animal)

Non-Specific: Behavior occurs under many different circumstances, may not appear to be stimulus cued

Response:

Non Aggressive: Animal ignores floating limb or notices limb but does not react by attacking the limb

Aggressive: Animal attacks the floating limb

Hair Loss (HLS)

Not a behavior in itself, but the symptom of an underlying problem. Scored using two components: percentage of body missing hair and pattern of hair loss.

Scored: Mild, Moderate, or Severe

		Percentage of Body with Hair Loss		
		1-33%	34-66%	67-100%
Pattern of Hair Loss	Thinning/Mottled	Mild	Mild	Moderate
	Patch /Bald	Moderate	Severe	Severe

Pattern of Hair Loss:

Thinning: Hair is evenly but sparsely distributed

Mottled: Areas of hair intermixed with small patches of thin or missing hair that is most often observed on the limbs

Patchy: Areas of hair intermixed with large patches of missing hair

Bald: Well defined areas of missing hair

Huddle (HDL)

Crouching or curling up while hugging oneself or a cohort. Can include rocking while in this position.

Scored:

Mild: Animal huddles in specific contexts (e.g. only when someone first enters room, only during feeding or distribution of novel food), and is easily interrupted.

Moderate: Animal huddles intermittently in various contexts, and is not easily interrupted. Severe: Animal huddles for the majority of daily activity budget, stopping infrequently and for short periods of time. A video recording can be used to make this determination.

Locomotor Stereotypy (LST)

Moving in a repetitive, ritualized pattern that serves no obvious function (i.e., is not a part of play, sex, grooming, etc). Subcategories can include pacing, circling, flipping, non-huddled rocking, and head tossing.

Scored:

Mild: Animal engages in locomotor stereotypy in specific contexts (e.g. only when someone first enters room, only during feeding or distribution of novel food), and is easily interrupted. Moderate: Animal engages in intermittent locomotor stereotypy in various contexts, and is not easily interrupted.

Severe: Animal engages in locomotor stereotypy for the majority of daily activity budget, stopping infrequently and for short periods of time. A video recording can be used to make this determination.

Masturbate (MBT)

Manipulating one's genitals with one's hands or feet. This behavior will be noted if directly observed or inferred by the presence of seminal fluid.

Scored: Y/N

Penis Suck (PSK)

Observed sucking on one's own penis. Subcategories can include urine drinking or sexual stimulation.

Scored: Y/N

Regurgitate (RGT)

Expelling food through the mouth at any point during digestion including food that has been chewed but not swallowed. This behavior will be noted if directly observed or inferred by the presence of partially digested food in or on the enclosure.

Scored: Y/N

Salute (SLT)

Observed holding one's hand or finger against one's eye or eyebrow. Can include eye

poking.

Scored:

Mild: Animal salutes in specific contexts (e.g. only when someone first enters room, only during feeding or distribution of novel food), and is easily interrupted.

Moderate: Animal salutes intermittently in various contexts, and is not easily interrupted.

Severe: Animal salutes for the majority of daily activity budget, stopping infrequently and for short periods of time, or to the point of self-injury. A video recording can be used to make this determination.

Self Grab (SGB)

Observed clasping a part of one's own body with hands and/or feet. This does not include self-hugging, which is scored as huddle (see above).

Scored:

Mild: Animal engages in self-grabbing in specific contexts (e.g. only when someone first enters room, only during feeding or distribution of novel food), and is easily interrupted.

Moderate: Animal engages in self-grabbing intermittently in various contexts, and is not easily interrupted.

Severe: Animal engages in self grabbing for the majority of daily activity.

Self Mouth (SMT)

Observed sucking or resting one's open mouth on any part of one's own body other than genitals.

Scored:

Mild: Animal engages in self-mouthing in specific contexts (e.g. only when someone first enters room, only during feeding or distribution of novel food), and is easily interrupted.

Moderate: Animal engages in self-mouthing intermittently in various contexts, and is not easily interrupted.

Severe: Animal engages in self mouthing for the majority of daily activity budget, stopping infrequently and for short periods of time, or to the point of self injury. A video recording can be used to make this determination.

Self-directed Display (SDD)

Observed mouthing oneself vigorously while looking directly at an observer or cohort. Commonly referred to as sham biting.

Scored:

Mild: Animal engages in a self-directed display in specific contexts (e.g. only when someone first enters room, only during feeding or distribution of novel food), and is easily interrupted. Moderate: Animal engages in a self-directed display intermittently in various contexts, and is not easily interrupted.

Severe: Animal engages in a self-directed display for the majority of daily activity budget, stopping infrequently and for short periods of time, or to the point of self injury. A video recording can be used to make this determination.

Self-injurious Behavior (SIB)

Observed biting or scratching oneself without looking at an observer or cohort, or any apparently self inflicted injury of indeterminate cause, or any observed self inflicted pain or injury not directly caused by one of the above listed behaviors. Scored using two components: frequency of behavior and severity of wounds.

Scored: Mild, Moderate, or Severe

		Frequency		
		Once in a month	More than once in one month	More than in one week
Severity	No harm, bruising, pin pricks, or abrasions	Mild	Mild	Moderate
	Surface lacerations	Mild	Moderate	Severe
	Subcutaneous wounding	Moderate	Severe	Severe

Abnormal Environmental Manipulation (AEM)

Observed licking cages or manipulating cages (e.g. rocking) in a fashion that would indicate abnormal behavior.

Mild: Animal licks or manipulates cage infrequently.

Moderate: Animal licks or manipulates cage almost daily.

Severe: Animal licks or manipulates cage to a degree that that has stained teeth, sores on mouth/ gums or has received injury from cage manipulation.

How to Conduct Non-human Primate Behavioral SOAPs

- Subjective:** This is a detailed description of any abnormal behavior an animal displays. The description should include the wording from the behavior definitions (i.e. Thin, mottled, patchy, or naked for HLS), and should be clear enough that relative statements such as "HLS better" or "LST worse" are supplemental but nonessential information. The note should begin with this description of behaviors and conclude with any extra notes (e.g. "Patchy HLS on limbs. LST easily interrupted. Aggressive toward neighbor"). Extra notes may include observed behavior that justifies a particular Plan (e.g. "Aggravated by other animals in room." for an animal that might be treated with a visual block). For follow-up evaluations, each abnormal behavior noted in the original observation should be addressed.
- Objective:** This should list each abnormal behavior observed, including cases where the behavior will not be treated or where "hair loss" is suspected not to be caused by psychological distress. This should also include the severity level of each applicable behavior (all behaviors except "masturbate," "penis suck," and "regurgitate" have severity levels). This severity level should be determined strictly from the criteria in the behavior definitions (e.g. any patchy or bald "hair loss" must be at least moderate, and will be severe if it covers more than 33% of the body).
- Assessment:** This is a subjective distress score (1-4) that measures the psychological distress of an animal. In most circumstances, the score will match the highest behavior severity level (i.e. 2 for an animal with only a mild behavior, 3 for moderate, and 4 for severe). An animal will receive a score of 1 (mild or anticipated distress) when it displays "no abnormal behavior" or a pattern of "hair loss" that is determined with certainty not to be caused by psychological distress (e.g. a long-tailed animal with "hair loss" only on the same last inch of its tail that sticks through its cage floor). All other animals with any abnormal behavior noted will be assessed will receive a score of 2 or higher. The score may be higher than the most severe behavior in cases where there are multiple low-level behaviors (e.g. an animal with moderate "hair loss," moderate "locomotor stereotypy," and moderate "self-injurious behavior" would likely receive a score of 4). The score can be lower for animals with "hair loss" that is suspected not to be related to psychological distress (i.e. old animals with severe age related "hair loss" may receive a score of 2).
- Plan:** The plan should be a clear and concise path of action for the treatment of psychological distress and should be based on the Assessment. Animals receiving a distress score of 1 or 2 are not typically placed on behavior treatment due to their low levels of distress. Animals receiving a distress score of 3 may be placed on behavior treatment at the discretion of the DLAR staff veterinarian or behavioral consultant. Animals receiving a distress score of 4 should be placed on behavior treatment. The plan may include justification for a particular treatment (i.e. "Place BLK because

aggravated by other animals."). Behavior treatment may include anything from videotaping the animal, moving it in the room, adding a supplemental enrichment device to its cage, socializing it, or monitoring its behavior.

Addendum 1. Baboon Socialization and Pair Housing Plan

Justification

A survey of experts on baboon behavior and housing around the country revealed a wide range of opinions concerning the feasibility of pair housing baboons. No precedent was found where adult male baboons were successfully pair-housed. Because of the uncertainty of the feasibility of pair housing baboons, and to protect the health and well being of our baboons, we plan to take a stepwise approach with the goal of pair-housing these animals. Documentation of the effects of measures taken on the behavior of the baboons will occur throughout the process. The documentation will occur on the Nonhuman Primate Socialization Log. This approach is outlined in the three stages below:

Stage 1

Baboons will be paired based on historical behavior and an attempt will be made to establish pairs with a definite dominant-submissive relationship. Baboons will initially be singly housed in the large playpens in the same room. These pens (or cages) allow full visual contact between the baboons. After a period of adaptation to the cages (at least three days), braces will be affixed between the cages where the cages will remain at a predetermined distance from each other. The distance from the cages will gradually be decreased over a period of time. This process will slowly acclimate the baboons to close contact and will include an approximate distance of separation starting at one and one-half feet, followed by a decrease in distance by approximately four inches until the cages are close enough for the baboons to have the opportunity to finger touch. The time that the cages remain at a set distance will be determined based on the behavior of the baboons, as they react to one another, but not less than three days. If aggressive behavior toward one another is exhibited, the distance will be maintained for a longer period until the aggressive behavior abates. If the aggressive behavior is of the severity or duration that, in the opinion of the veterinary staff, the health and well being of the baboons is jeopardized, the baboons will not be paired.

After the baboons are close enough to finger touch the cages will initially be left together only under supervision and separated when not under supervision. Depending on the behavior of the baboons the time that finger touching is permissible will be extended and the baboons will be allowed to finger touch without supervision (e.g. over nights and weekends). While the cages are close enough to allow finger touching at least three pairs of baboons will be tested for their ability to maintain normal social behavior for a period of at least three weeks. Pairs of older and pairs of younger baboons will be tested.

Stage 2

If after Stage One at least fifty percent or more of baboons were amenable to finger touching or close proximity without undue aggressive behavior, two baboon cages used for singly housing baboons (not the playpens) will be modified for pair housing. These cages will not need to be purchased since we already have them in-house. The cages will be modified so that various panels for separating the baboons can be employed (e.g. solid panels that the baboons can not see through, panels for visual contact only, panels for finger touching, and panels for grooming). The cages will also have the ability to allow the baboons full contact. The time that a particular panel is allowed to remain in place will be determined based on the behavior of the baboons. The proposed socialization will be conducted in five steps. Animals are allowed to advance to subsequent steps in the procedure as long as they exhibit consistent, directional dominant/subordinate behavior towards one another, as measured by approach/retreat interactions and threat/submission gestures. Pairs are considered incompatible if one partner continually attempts to escape from the other, the aggression is severe and does not decrease, or, in later stages, the dominant animal exhibits inadequate food sharing. The timeframe for moving animals to subsequent levels is determined on a case-by-case basis. The procedure for pair housing is defined below:

- 1) Observation of animal personality and social interactions: Personnel observe animals as they interact with each other through their cage walls. Animals have no physical contact during this time.
- 2) Limited-contact familiarization: This step can have several increments including visual contact in close proximity, finger touching, and grooming only.
- 3) Supervised pairing: Animals are allowed physical access to one another while personnel monitor them continuously. A net, glove, or water hose for spraying is readily available to separate the animals in case severe aggression occurs. In order for the animals to establish dominance, some aggression is tolerated at the discretion of the person monitoring.
- 4) Pairing with intermittent supervision: Animals are paired for part of the day and are checked periodically.
- 5) Continuous pairing: Refers to pairing animals 24 hours a day (minus the time an animal is taken out of its cage for research/medical purposes) or for entire weekends. Animals are checked at least once daily, and compatibility is reevaluated on a regular basis.

At least three pairs of baboons will be tested in this manner. After this process is complete the pair-housing plan will move to Stage Three.

Stage 3

If, after Stage Two, pair housing to establish stable baboon pairs appears to be achievable, additional cages for pair housing will be obtained. These cages may involve the modification of existing cages or the purchase of new cages as appropriate.