

Social Housing of Macaques

Handouts

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3 Aug 13

CLASS/POLA

- Methods of Socialization by Species

- Social Housing and Environmental Enrichment Policy Example

- NHP Socialization Record Example

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EXAMPLE: NONHUMAN PRIMATE SOCIALIZATION RECORD

Date of Observation/ Time	NHP ID Number	Sex	Initials of Observer	Type of Contact	Observations	Assessment	Plan

Comments:

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ABBREVIATION KEY

Type of Contact	Behavior Observations		Assessment	Plan
	Positive	Negative		
V= Visual P= Protected F= Full	G= Groom L= Lipsmack M= Mount PD= Passive Displace P= Present PR= Proximity SP= Social Play	TT= "Tandem" Threat T= Touch V= Ventral/Close E= Eating O= Other, explain in comments	AB= Abnormal AG= Aggression C= Chase F= Fear FG= Fear Grimace FL= Flee TH= Threat	C= Compatible IC= Incompatible O= Open S= Separate D1-3= Observe daily 1-3 times W1-4= Observe weekly 1-4 times M1-3= Observe monthly 1-3 times SA= Semi-Annual

EXAMPLE: NONHUMAN PRIMATE SOCIALIZATION RECORD

Positive behaviors to indicate pairing success:

Behavior	Operational Definition
Groom	Manipulation of the hair of another individual(s) with hands and/or mouth. <i>Can be initiated or received.</i>
Lipsmack	Facial expression involving rapid movement of lips. May be done by one individual towards the other, with no negative behavior received, or by both individuals towards each other at the same time.
Mount	One individual grasps the hindquarters of another individual and/or places partial or all of its body above or behind the receiving individual.
Passive Displace	One individual leaves or avoids another individual(s) promptly upon being approached by the other without displaying any fear behavior. This may indicate that an appropriate dominance hierarchy has been established within the pair.
Present	One individual poses with its hindquarters in close proximity to another individual, with no negative behavior received.
Proximity	The individuals are within arm's length of each other, with any part of the body. This usually occurs when one individual gets onto the perch next to the other and no negative behavior ensues.
Social Play	Social interactions that are characterized by apparent low tension; may be accompanied by a "play face" (facial gesture in which mouth is open and facial features are relaxed). May include any of the following: <i>grunting, wrestling, sham-biting, jumping on, jumping over, chasing, fleeing, hiding</i> .
"Tandem" Threat	Both individuals threaten the observer at the same time, usually while in close proximity.
Touch	The individuals are in physical contact with each other, or attempt to make physical contact with no negative behavior ensuing.
Ventral/Close	Huddling and/or close stationary contact other than grooming.
Eat	The individuals are able to eat in the presence of one another.

Negative behaviors to indicate incompatibility:

Behavior	Operational Definition
Abnormal	One individual may start or engage in atypical behavior; may include any of the following: <i>stereotypy, self-bite, coprophagy, floating limb</i> . The observer can determine whether this behavior is due to an acute response to being paired (which should cease), or may be indicative of incompatibility.
Aggression	May include any of the following of different intensities: <u>Rough Behavior</u> involving slight physical contact without facial or vocal components (may include: <i>nipping, grabbing, kicking, pulling, pushing, poking, slapping, pulling hair, butting, shoving</i>); <u>Bite</u> , during which the skin/limb of another animal is grasped with the teeth; may be accompanied by <i>head shaking</i> .
Chase	Behavior that involves pursuit past the location the recipient maintained at the start of the interaction.
Fear	An individual displays excessive shyness or fear of the other individual, usually involving pressing their body against one side or corner of the cage and not moving.
Fear Grimace	One individual bares their teeth, either shortly after removing separation slide or in response to the other individual's behavior.
Flee	One individual rapidly and constantly moves away from the individual; may be in response to aggression or threat.
Threat	Expression containing facial, vocal, or physical components (may include <i>head thrusting, open-mouth threat, scream, raised eyebrow, ground beating, lunge</i>). If one individual is threatening the other and receiving a negative response (repeated fear grimace) this may be indicative of incompatibility.

Methods of Socialization by Species:

MACAQUES:

Macaques: Enrichment for Nonhuman Primates by Kathryn Bayne, OLAW 2005.

Sample Pair Housing SOP -- Macaques

Pair Housing: Following are descriptions of the five different pair housing combinations and the procedure for pairing each combination. It should be noted that on-going, vigilant monitoring is necessary to the successful social housing program. As animals mature, their relationship may change, necessitating separation of the animals and identification of new partners.

Juveniles: Two juveniles (three years of age or younger) of the same sex are paired together. *Place the animals in an appropriate size cage. Check the animals every hour for the first four hours and at least three times per day for the first week.*

Adult with Infant or Juvenile (a): An adult (four years of age or older) of either sex is paired with a weaned infant or juvenile (eight months to three years) of either sex.

Adult Females (b): Two adult females (generally cynomolgus monkeys, four years of age or older) are paired together, with their unweaned infants (less than one year of age), if applicable.

Adult Male and Female (c): An adult male (five years of age or older) is paired with an adult female (four years of age or older), for either breeding purposes or enrichment purposes.

For a, b, and c: Place the animals in a double cage with a clear Plexiglas® panel between them. If there are no signs of aggression after one hour, open the panel. Alternatively, if a Grooming-Contact (G-C) bar divider is available, use this first. Check the animals at least every hour for the first four hours and at least three times per day for the first week. Initially, the animals may be separated at night, until a compatible relationship is established.

Adults Males: Two adult males (four years of age or older) are paired together. *Place the males in a double cage with a clear Plexiglas® panel between them. Alternatively, if a G-C bar divider is available, use this first. If there are no signs of aggression after twenty-four hours, move the animals to a new double cage (to avoid territorial aggression) without a panel. Ensure that the males do not have visual contact with any breeding pairs. Check the animals at least every hour for the first four hours and at least four times per day for the first week. Initially, the animals may be separated at night, until a compatible relationship is established.*

AFRICAN GREENS:

There is currently nothing published or posted in regards to successful pair housing in AGM. The following are excerpts from an email conversation with Kate Baker from Tulane, October 2011.

We indeed have only about a 60% success rate, no bias toward one sex or the other, all in protected (grooming) contact. Some of them could have been housed in full contact but because of aggression during our attempt to provide full contact, we backed off to protected contact and the pair was able to stay together in that fashion (barrier had a large number of 1"X2" oblong holes).

We see notably lower levels of social interaction both during intros and long-term, and positive behaviors during introductions were not predictive of a good outcome as they of course are in macaques. Relaxed proximity to the panel was a good sign though. We had no animals that developed new abnormal behaviors or signs of distress in stable protected contact housing, so at least we think that pairs that display no signs of improved wellbeing don't show signs of reduced wellbeing.

And you need to be prepared for later incompatibility to a greater degree in this species than in macaques (thought compatible pairs may suddenly have a bad fight after years of successful pairing)

The only other tidbit I might pass on is that this species seems more affected by human presence in the room (more of a prey species) so videotaping would be particularly helpful.

They also seem more prone to fight after waking up from ketamine (we keep everyone apart until they are FULLY awake, of course, but the macaques don't have a problem). Difficult species to pair.

MARMOSETS:

Eckert, Katherine. Same Sex Pairing of Marmosets: A Discussion, Laboratory Primate Newsletter, VOLUME 39 NUMBER 2 APRIL 2000.

Same-Sex Pairing of Marmosets: A Discussion

Katie Eckert writes: Several weeks ago I posted a query to several Internet lists regarding a situation at our facility where we were anticipating breaking up several heterosexual pairs of common marmosets (*Callithrix jacchus jacchus*). The pairs had been together for over a year and had not yet reproduced, so the investigators were planning to put them in line to be subjects for an experimental allergic encephalitis protocol. In an effort to conserve space, we were considering re-pairing the animals in same-sex pairs to avoid the risk of pregnancy prior to going onto a study. However, after taking the matter into serious consideration, those involved in the decision opted not to try to re-pair the animals. What follows is a summary of 15 responses I received on the subject, with the major points emphasized. I would like to thank everyone who took the time to write to me on this issue; I think there are several valuable pieces of information here.

First and foremost, same-sex pairing of this species is a tricky business and probably should not be attempted unless it is absolutely necessary to do so. It can introduce a variable which investigators may find undesirable. Marmosets being family-oriented animals, they tend to be very aggressive with strangers. An animal's ability to be paired successfully depends a great deal on its environment and individual temperament. Here are a few generalities gleaned from the responses to my inquiry:

1. **Where possible, try to pair related individuals.** Five of the respondents who reported success with same-sex pairing recommended same-sex twins, or parent/offspring matches.
2. **Monitor pairs carefully.** As one person mentioned, if a pair is not going to work you will usually know within the first four hours. Some people reported that pairs who were fine for

several years suddenly erupted in fights that in one case led to a fatality. Watch for squabbling and bickering, and keep an eye on the weight and general health of the animal. Other trouble signs to watch out for include: food domination, one animal spending a disproportionate amount of time on the ground, and animals keeping their distance from each other. If injuries are seen, separate the animals immediately.

3. **Isosexual rooms.** Isolating males from females in separate rooms was recommended by six of the respondents. Males can apparently sense when females are ovulating, and the presence of unfamiliar males may stimulate ovulation. This can lead to a great deal of tension, so the more olfactory and auditory isolation the sexes have from each other, the better the chances of success for same-sex pairs.

4. **Isolate animals before re-pairing.** Two people indicated that this would increase the chances of success. Giving the animals some time on their own (a couple of days, perhaps) before introducing them to a new animal will reduce tension. If you can keep the animals in contact with the same neighbors they are used to, this also will reduce the potential for strife.

5. **Best age/sex combinations: there are none.** This topic had by far the greatest disparity of experience. Some found male/male pairs to be more successful, others found female/female. Two people indicated that pairing one juvenile with an older animal seemed to work better, but I stress that there are no generalities and any pairing attempt should be carefully monitored. It is a good idea to consider the temperament of individuals: generally, mild tempered animals should do well together.

6. **In the cage: two is better than three; nestboxes all around.** Two people reported difficulties with having three animals together, following the logic that two will probably gang up on a weaker third party. Visual barriers such as nest boxes are important, and it may facilitate things if animals each have their own box to get away to, though animals will frequently sleep together. If you are pairing a juvenile with an adult, one person recommended that you bring the younger one into the adult's cage.

7. **Birth control?** Two persons recommended birth control in lieu of same-sex pairs (if it doesn't interfere with your study). There is a technique for vasectomizing males described by T. H. Morris and C. L. David ["Illustrated guide to surgical technique for vasectomy of the common marmoset", *Laboratory Animals*, 1993, 27, 381-384], and prostaglandin was recommended for females.

Finally, two recommended resources: "An experimental analysis of social interaction in the common marmoset (*Callithrix jacchus jacchus*)", by A. G. Sutcliff & T. B. Poole (*International Journal of Primatology*, 1984, 5, 591-607); and D. Seelig's index of LPN articles on pairing: <www.brown.edu/Research/Primate/enrich.html#pair>.

Please use caution with this information, as there are no rules that hold true for all marmosets in all situations. Be careful as well of applying it toward other species, particularly other callitrichids, because, as we all know, the social dynamics of different species can vary significantly. It is intended solely to give a few generalities for safe pairing, based on the anecdotal accounts of several people with marmoset experience. Good luck! - *Katherine Eckert, UCSF Lab. Animal Resource Center, 513 Parnassus Ave, Box 0564, San Francisco, CA 94143-0564 [e-mail: KatieE@larcmail.ucsf.edu]*

Other Resources:

For a list of articles that relate to socialization see:

<http://www.nal.usda.gov/awic/pubs/Primates2009/macques.shtml>

More articles are in the LABORATORY PRIMATE NEWSLETTER Articles on Environmental Enrichment and Psychological Well-Being visit:

<http://www.brown.edu/Research/Primate/enrich.html#pair>

Baumans, Vera Et Al. Making Lives Easier for Animals in Research Labs; Discussions by the Laboratory Animal Refinement and Enrichment Forum. Animal Welfare Institute, 2007.

Carlson, Jodi. Safe Pair Housing of Macques. Animal Welfare Institute, 2008.

Novak, Melinda and Andrew Petto. Through the Looking Glass: Issues of Psychological Well-Being in Captive Nonhuman Primates. APA Science Volume Series, 1991

Reinhardt, Viktor and Annie Reinhardt. Comfortable Quarters for Laboratory Animals, 9th Edition. Animal Welfare Institute, 2002.

Reinhardt, Viktor. Taking Better Care of Monkeys and Apes; Refinement of Housing and Handling Practices for Caged Nonhuman Primate. AWIC, 2008.

Reinhardt, Viktor and Annie Reinhardt. Environmental Enrichment and Refinement for Nonhuman Primates Kept in Research Laboratories: A Photographic Documentation and Literature Review, 3rd Ed. Animal Welfare Institute, 2008.

Wolfensohn, Sarah and Paul Honess. Handbook of Primate Husbandry and Welfare. Blackwell Publishing, 2005.

Committee on Well-Being of Nonhuman Primates, Institute for Laboratory Animal Research, Commission on Life Sciences, National Research Council. Psychological Well-Being of Nonhuman Primates; 1998

Disclaimer: Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the US Army.

Social Housing and Environmental Enrichment Policy (Example Only)

1. Purpose. To define the social housing and environmental enrichment policy for all animal species.

2. Background: List your institutions SOP's here

3. Definitions and key concepts. Note that some of these terms are defined by one or more major animal care and use references; some are used without strict definition, and in these cases a generally-accepted common definition is provided.

a. Environmental Enhancement Plan (from 9 CFR, Sec 3.8). This term is not used in any other reference and will not be used in this policy. Instead, we use the term "Behavioral Management Plan" and define it in the same way as 9 CFR. "Those actions taken to promote the psychological well-being of non-human primates." The 9 CFR states that "The Environmental Enhancement Plan, at a minimum, must address each of the following:

1. Social grouping
2. Environmental enrichment (see below)
3. Restraint devices
4. Exemptions – either by veterinarian (temporary, reviewed at least every 30 days) or by IACUC (permanent, reviewed at least annually)
5. Special considerations – for infants, great apes and other special cases

b. Behavioral Management: Encompasses social and non-social enrichment, training, operational procedures and facility design to benefit animal psychological well-being.

c. Environmental Enrichment [From 9 CFR, 3.81 (b)]: "[Provision of] a means of expressing non-injurious species-typical activities...Examples... include providing of perches...and other increased cage complexities; providing objects to manipulate; varied food items; using foraging or task-oriented feeding methods; and providing interaction with the caregiver or other familiar and knowledgeable persons consistent with personnel safety precautions." From the Guide for the Care and Use of Laboratory Animals (2011, National Research Council) (Guide), page 52: "The primary aim...is to provide animals with sensory and motor stimulation...that facilitate expression of species-typical behaviors and promote psychological well-being."

d. Social Environment: An animal's environment as defined by activities of other animals within sensory contact of that animal (sight, sound, smell). The Guide, page 64: "Appropriate social interactions among members of the same species (conspecifics) are essential to normal development and well-being (Bayne et al. 1995; Hall 1998; Novak et al. 2006)...An understanding of species- typical natural social behavior...is key to successful social housing".

e. Psychological Well-Being: (Practice Standard). A state of healthy psychological adjustment of an animal to its surroundings, resulting in a minimum of psychological stress. Psychological well-being is manifested as expression of species-typical behavior of normal frequency and intensity and an absence of maladaptive behaviors (e.g., species-typical behavior manifested at an abnormal frequency or intensity, or patently abnormal behaviors).

f. Social Animal: An animal that exhibits social behavior...that is beneficial to one or more of the group. Examples of social animals include certain species of NHPs such as macaques, female BALB/c mice, certain avian species such as finches, and other laboratory animal species such as goats. The Guide, page 51: "Social animals should be housed in stable pairs or groups of compatible individuals unless they must be housed alone for experimental reasons or because of social incompatibility." The Guide, page 58: "Like all social animals, NHPs should normally have social housing."

4. References.

a. Animal Welfare Act (AWA) and Animal Welfare Act Regulations (AWAR). Animal Welfare Act implementing regulations are set forth under the Regulations and Standards in the Code of Federal Regulations (CFR) Title 9 CFR, Chapter 1, Subchapter A – Animal Welfare, Parts 1, 2 and 3.

b. Requirements for the psychological well-being of primates are set forth under section 13(a)(2)(B) of the AWA (7 USC, 2143). The standards for environmental enhancement to promote psychological well-being in primates are set forth under 9 CFR, Chapter 1, Subchapter A - Animal Welfare, Part 3, Section 3.81. Environmental enhancement to promote psychological well-being (Section 3.81). Research facilities must follow an appropriate plan that addresses the following:

1) Social grouping (3.82(a) (3)). The facility must address social needs of NHP species known to exist in social groups in nature. Exceptions include aggressive animals, contagious animals, or incompatible animals.

2) Environmental Enrichment (3.81(b)). The enclosure for the nonhuman primate must be enriched by providing means of expressing non-injurious species-typical activities. Species differences are to be considered when determining the type or methods of enrichment. Examples are provided in the reference.

3) Special Considerations (3.81(c)). Certain nonhuman primates must be provided special attention regarding enhancement of their environment, based on the needs of the individual species and in accordance with the instructions of the attending veterinarian, or designee. Nonhuman primates requiring special attention are the following: infants and young juveniles; those

that show psychological distress; those on IACUC-approved restricted activity; individually-housed NHPs that cannot see and hear other NHPs of their own or compatible species; great apes weighing over 110 lbs.

4) Restraint devices (3.82(d)). Nonhuman primates are not to be maintained in restraint devices unless required for health reasons as determined by the attending veterinarian or by a research proposal approved by the Committee. Maintenance under restraint must be for the shortest period possible. In instances where restraint over 12 hours is required, the nonhuman primate must be provided the opportunity for daily unrestricted activity for at least one continuous hour during the period of restraint, unless continuous restraint is required by the research proposal approved by the Committee.

5) Exemptions (3.81. (e)). Exemptions to some or all provisions of the environmental enhancement program may be approved by the IACUC for scientific reasons, (reviewed at least annually) or by the attending veterinarian for health or well-being considerations (reviewed at least every thirty days). Exemption reviews must be documented.

c. Guide for the Care and Use of Laboratory Animals (2011, National Research Council).

1) PHS Policy requires OLAW-Assured institutions to follow the Guide. The Guide states “that social animals should be housed in stable pairs or groups of compatible individuals unless they must be housed alone for experimental reasons or because of social incompatibility.” “Single housing of social species should be the exception and justified based on experimental requirements or veterinary related concerns about animal well-being. In these cases, single housing should be limited to the minimum period necessary, and where possible, visual, auditory, olfactory, and tactile contact with compatible conspecifics should be provided. In the absence of other animals, enrichment should be offered such as positive interaction with animal care staff and additional enrichment items or addition of a companion animal in the room or housing area. The need for single housing should be reviewed on a regular basis by the IACUC and veterinarian.”

2) The Guide discusses environmental enrichment and states that the aim of environmental enrichment is to enhance animal well-being. Additionally, the Guide states “Enrichment programs should be reviewed by the IACUC, researchers, and veterinarians on a regular basis to ensure they are beneficial to the animal well-being.”

d. The Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (January 2010, Federation of Animal Science Societies). Primary concepts are addressed on pages 16,17 (Ch. 3, Environmental Requirements and Stress) and pg. 21 (Social Environment). “Animal well-being has both physical and psychological components. There is consensus that multiple integrated indicators

provide the best means of assessing well-being: behavioral patterns; pathological and immunological traits; physical and biochemical characteristics; and reproductive and productive performance” (pg.17). “Agricultural animals are social by nature and social isolation is a stressor. Agricultural animals that normally live in herds or flocks... that are used in research and teaching should be housed in pairs or groups when possible...If social housing is not feasible because of experimental protocols or because of unpreventable injurious aggression among group members, singly housed animals should be provided with some degree of visual, auditory, and (or) olfactory contact with other members of their species...Temporary isolation is sometimes required for an animal’s safety (e.g., during recovery from surgery), but the animal should be returned to a social setting as soon as possible” (pg.21).

5. Policy.

a. General:

1) The Behavioral Management Plan, to include environmental enrichment, for all species will be implemented through applicable VMD SOPs. These SOPs shall be reviewed annually and updated versions provided to the IACUC IAW SOP.

2) All animals will be socially housed as appropriate by species. All socially housed animals will be either pair- or group-housed by gender unless provisions to prevent unwanted breeding are in place (e.g. vasectomized males or ovariectomized females). Breeding animals are the exception to this rule.

6. Procedures:

a. The Behavioral Management Plan will be followed unless exemptions are expressly granted.

b. Two types of exemptions to the Behavioral Management Plan are authorized. The IACUC may exempt animals from social housing based on scientific necessity. The Attending Veterinarian or their designee may exempt animals from social housing based on social incompatibility of animals, animal health issues, or animal well-being concerns.

1) IACUC Exemptions

a) For IACUC exemptions to social housing, the PI must provide a scientific justification in new animal proposals. For singly housed animals that are the sole animal room occupant or the sole animal in the cage, an additional justification shall be provided.

b) The timeframe or length of the exemption should be clearly stated and should encompass as short a time period as possible.

c) Proposals and addenda that include exemptions to social housing will be reviewed IAW SOPs.

d) IACUC exemptions to this policy are required to be included in all new animal proposals reviewed and/or approved at the next full IACUC meeting after the policy's approval date. Protocols and addenda approved prior to this meeting will not require an IACUC exemption from social housing.

2) VMD Exemptions: Refer to VMD SOPs for VMD exemption procedures based on species - specific information.

3) Personnel safety may serve as approved reason for exemption and requires IACUC review and approval of the hazard identification and risk assessment.

4) Exemption from social housing does not exempt the animal from environmental enrichment such as food enrichment IAW VMD SOPs.