RODENT HUSBANDRY AND BREEDING

1. PURPOSE

1.1. The purpose of this Animal Care and Use Procedure (ACUP) is to describe the steps involved in providing routine care and husbandry of rodents in Cornell University’s animal facilities. This ACUP is approved by the Cornell Institutional Animal Care and Use Committee (IACUC). Any deviation must be approved by the IACUC prior to its application.

2. SCOPE

2.1. This document applies to all rodent users at Cornell University.

3. INTRODUCTION

3.1. This ACUP describes the basic procedures required for routine rodent care and breeding.

4. MATERIALS AND EQUIPMENT

4.1. Cage cards
4.2. Feed
4.3. Bedding
4.4. Enrichment materials

5. PROCEDURE

5.1. Observation and Care of Animals

5.1.1. Observe all rodents daily (including weekends & holidays) for illness, injury, and general condition.
5.1.2. Provide routine care and husbandry for all rodents (including weekends & holidays).
5.2. Emergencies and Holidays

5.2.1. Make provisions for emergency care by providing contact information so that Principal Investigators (PI’s) and their staff can be reached during and after business hours. Include special requests or instructions as applicable.

5.3. Animal Identification Methods

5.3.1. Identify all cages with a cage card (with barcode for eSirius, if applicable). Include, at a minimum, the following information: species, strain, sex, number of animals in the cage, investigator and protocol number, date of birth or arrival.

5.3.2. Identify individual animals as needed in accordance with ACUP 552 Mouse Identification.

5.3.3. Examples of individual identification methods include: ear punching, ear tags, micro-tattooing, micro-chipping, or toe-clipping.

5.4. Records and Documentations

5.4.1. Refer to ACUP 542 Maintaining Health and Procedure Records for Research and Teaching Animals for record-keeping requirements at Cornell animal facilities.

5.5. Food and water

5.5.1. Feed animals to meet current National Research Council recommendations for rodent nutrition.

5.5.2. Food storage

5.5.2.1. Store feed on pallets off the floor and away from walls, in a vermin-proof storeroom.

5.5.2.2. Store open feed bags in leak-proof containers with tightly fitting lids.

5.5.2.3. Maintain temperature and humidity controls in the storeroom. Avoid temperatures above 70°F and extremes in humidity.

5.5.2.4. Use feed within 6 months of milling date.

5.5.2.5. Stack feed in a manner that allows easy reading of the milling date.

5.5.3. Check automatic watering devices daily for proper operation and cleanliness. Replace empty bottles (if present) with clean ones rather than refilling them. If circumstances require refilling (e.g., medicated water), ensure that each bottle is returned to its respective cage so as to prevent cross-contamination.

5.6. Mouse Breeding Program

5.6.1. House breeders as either a monogamous pair or a trio-breeding group (i.e., one male and two females).

5.6.2. In order to prevent over-crowding, pregnant females in a trio mating group may need to be separated prior to giving birth; see section 9 Appendix Mouse Trio Breeding Guidelines for further details.
5.6.3. Weaning prior to 19 days of age cannot be done without prior approval from a CARE veterinarian.

5.7. Non-mouse Breeding

5.7.1. Consult CARE by e-mail at care@cornell.edu for guidance.

5.8. Social and Environmental Enrichment

5.8.1. Group house rodents whenever possible. Refer to the table in the Appendix for housing density.

5.8.2. Provide environmental enrichment devices for all rodents. Examples of enrichment include, but are not limited to, the following: PVC pipe, nest-lets, autoclaved blocks of wood, paper huts or Nylabones. Refer to ACUP 560 Environmental Enrichment Program for Rodents and Rabbits for further details.

NOTE: Group housing, while an effective enrichment strategy, can sometimes lead to aggression and subsequent injury. Exercise caution when grouping unfamiliar animals, particularly with species or strains known to be aggressive, and allow extra time for observation. Combining male animals older than wean age is also strongly discouraged. Contact CARE at care@cornell.edu for guidance.

5.9. Quarantine Procedures

5.9.1. Quarantine rodents from unapproved vendors until released by a CARE veterinarian. CARE veterinarians will determine the quarantine requirements for each shipment. Refer to ACUP 509 Animal Acquisition, Receiving, and Acclimation and contact CARE for specific quarantine requirements.

NOTE: Quarantine of rodents from approved vendors is not required. An acclimation period of 7 days is strongly recommended for maximal adjustment. Experimental procedures conducted less than 72 hours after arrival must receive IACUC and veterinary approval.

5.10. Euthanasia and Disposal of Dead Animals

5.10.1. Euthanize rodents according to ACUP 301 Rodent Euthanasia.

5.10.2. Dispose of dead animals by placing bagged carcasses in the designated carcass refrigerator for that floor/facility. Hazardous carcasses are to be labeled as such and disposed of in designated hazardous carcass refrigerators.

NOTE: In special cases rodent carcasses are fed to raptors or snakes. The carcasses utilized for food must be from healthy, non-transgenic rodents, which were euthanized with carbon dioxide.
5.11. Pest Control

5.11.1. Refer to ACUP 538 Vermin Program for a description of the vermin control program.

5.12. Environment and Environmental Control

5.12.1. Maintain room temperatures between 64° and 76° F. Refer to the Guide for species-specific temperature ranges.
5.12.2. Maintain relative humidity between 30% and 70%.
5.12.3. Maintain a daily log of room temperature and humidity.

**NOTE:** Daily logs may be maintained physically or electronically, depending on the facility.

5.13. Bedding

5.13.1. Use wood chips, shredded paper products, or chopped corn cobs as bedding materials in solid-bottom cages.
5.13.2. Use enough bedding to keep the rodents clean and dry until the next scheduled change.

5.14. Lighting

5.14.1. Provide a regular diurnal lighting cycle unless otherwise required by protocol.

**NOTE:** Lights are controlled by timers set at a photoperiod of 12 to 14 hours of light. Check the timer performance routinely.

5.15. Space Requirements

5.15.1. Provide cages that are appropriate in size for the species and/or number of rodents housed in them. Refer to the recommendations set in the Guide for the Care and Use of Laboratory Animals.

5.16. Cleaning of Cages and Water Bottles

5.16.1. Change cages and water bottles (if present) once every two weeks at a minimum.
5.16.2. Change cages and water bottles (if present) more frequently if needed to keep the animals clean and dry and to provide a healthy environment.
5.16.3. Supply fresh bedding with each cage change with the exception of the sentinel cages.

**NOTE:** See facility-specific SOPs for more frequent changing recommendations.
5.17. **Cleaning and Sanitation of Equipment**

5.17.1. Clean and sanitize equipment at least every two weeks, or more frequently if needed (e.g., cage change stations, biosafety cabinets).

**NOTE:** See facility-specific SOPs for more frequent cleaning recommendations.

5.18. **Waste Management**

5.18.1. Deposit non-regulated or non-infectious medical waste and soiled materials in dumpsters.

5.18.2. Regulated (or infectious) medical waste is processed by the CVM Waste Management Facility.

6. **PERSONNEL SAFETY**

6.1. Medical Emergencies: **CALL 911.**

6.2. When working with animals, wear appropriate PPE, observe proper hygiene, and be aware of allergy, zoonosis, and injury risks. Refer to the CARE Occupational Health and Safety webpage for more information.

7. **ANIMAL RELATED CONTINGENCIES**

7.1. Post contact information for emergency assistance in a conspicuous location within the animal facility.

7.2. Non-emergency veterinary questions and requests for care, email CARE veterinary staff at care@cornell.edu.

7.3. Emergency veterinary care is available at all times including after working hours and on weekends and holidays by calling the CARE pager at 1-800-349-2456.

8. **REFERENCES**


8.5. CARE Zoonoses web page: http://ras.research.cornell.edu/CARE/zoonoses.html

8.6. CARE Allergens Prevention web page: http://ras.research.cornell.edu/Care/documents/OHS/AllergyPreventionFactSheet.pdf

8.7. ACUP 301 Rodent Euthanasia: http://ras.research.cornell.edu/CARE/documents_k/ACUPs/ACUP301.pdf
8.8. ACUP 509 Animal Acquisition, Receiving, and Acclimation:  
http://ras.research.cornell.edu/care/documents_k/ACUPs/ACUP509.pdf
8.9. ACUP 538 Vermin Program  
http://ras.research.cornell.edu/CARE/documents_k/ACUPs/ACUP538.pdf
8.10. ACUP 542 Maintaining Clinical Records for Animal Research Models  
http://ras.research.cornell.edu/CARE/documents_k/ACUPs/ACUP542.pdf
8.11. ACUP 547 Animal Transport Outside Animal Facilities  
http://ras.research.cornell.edu/CARE/documents_k/ACUPs/ACUP547.pdf
8.12. ACUP 552 Mouse Identification  
http://ras.research.cornell.edu/CARE/documents_k/ACUPs/ACUP552.pdf
8.13. ACUP 560 Environmental Enrichment Program for Rodents and Rabbits  
https://ras.research.cornell.edu/care/documents_k/ACUPs/ACUP560.pdf
8.14. ACUP 606 Mice Quarantine Program  
http://ras.research.cornell.edu/CARE/documents_k/ACUPs/ACUP606.pdf
8.15. CARE Occupational Health and Safety webpage:  
http://ras.research.cornell.edu/care/OHS.html

9. APPENDIX

9.1. Mouse Trio-Breeding Guidelines

9.1.1. Background

9.1.1.1. Trio-breeding is the preferred breeding method for breeding certain strains and lines of mice. Its benefits include:

9.1.1.1.2. More adult animals to assist with rearing of progeny and more females who may serve as foster mothers.
9.1.1.1.3. Conservation of animal resources - one male can service two females.

9.1.1.2. Trio-breeding, when not managed properly, can lead to increased pup mortality, decreased reproductive efficiency, decreased pup growth rate, or negatively altered parental or pup behavior. This is particularly true in the following cases:

9.1.1.2.1. For strains or stocks that produce large litters.
9.1.1.2.2. When excessive waste accumulates between routine static microisolator cage changes.
9.1.1.2.3. When disparities between litter ages put younger litters at risk due to marked differences in pup activity.

9.1.1.3. The following guidelines are designed to maximize the benefits of trio-breeding. They apply for the following cage type:

9.1.1.3.1. Cage size 66-74 in\(^2\), located in Cornell barrier mouse facilities, in IVC racks that are changed once per week.
9.1.1.4. Any deviations from these guidelines, including use of a different cage type, should be described in the animal use protocol and approved by the IACUC before implementation.

9.1.2. Guidelines

9.1.2.1. If the median litter size per female is (or is expected to be) >6 pups: The breeder female must be removed to a separate cage when identified as pregnant. The other female can stay with the male as a pair. This will prevent overcrowding of the cage.

9.1.2.2. If the median total litter size (from both females) is >9 but <12: The male should be removed to a separate cage when pups are 14 days old.

9.1.2.3. If the median total litter size (from both females) is 9 or less: Trio breeding can continue without removal of any parent.

9.1.2.4. Because female mice can breed during post-partum estrus, a female may have a suckling litter at the same time that they give birth to a new litter. The PI and/or lab staff must remain vigilant and wean the older litter within 24 hours of the younger litter’s birth but not before day 19.

9.1.2.5. In the rare event that a large litter is born unexpectedly (e.g., a litter of 10 is born to a female with median litter size of 5), it may not be necessary to separate the litter and mother, provided that there is no deleterious effect to the pups of either litter. This determination must be made with approval by a CARE vet.

9.1.3. Litter Size Monitoring

9.1.3.1. The Principal Investigator (PI), his/her research staff, or the CARE breeding coordinator should maintain records on median litter size. This information provides the basis for guideline recommendations 1, 2, & 3 presented above. If any problems or concerns arise with litter size or separating mice, please contact CARE veterinary staff at care@cornell.edu.

9.1.4. References


9.2. Mouse Housing Density Table

<table>
<thead>
<tr>
<th>Type of Housing</th>
<th>Weight (grams)</th>
<th>Required Floor Space per Animal (inches²)</th>
<th>Maximum Number of Mice in Standard Mouse Cage*</th>
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<td>Group</td>
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<tr>
<td>&lt;10</td>
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<td>12</td>
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<td>Up to 15</td>
<td>8</td>
<td>9</td>
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<tr>
<td>Up to 25</td>
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<td>6</td>
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<tr>
<td>&gt;25**</td>
<td>≥15</td>
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* Standard mouse cage floor space at Cornell University is 75 inches²

** Larger mice may require more space

10. HISTORY

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