The University of Pennsylvania Institutional Animal Care and Use Committee (IACUC) has developed the following policy to clarify the requirements regarding social housing of social species. The policy will reference appropriate ULAR standard operating procedures (SOP) for each species and other institutional documents, as applicable.

Regardless of the specific species, 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 (Guide, p. 51). Experimental reasons must be specifically approved by the IACUC. Social incompatibility will be a decision made by the Attending Veterinarian or designtees (ULAR Veterinarians) in consultation with the research group or as described in this policy. Single housing for clinical reasons will be a decision made by the Attending Veterinarian or designees and coordinated with the research group.

Furthermore, regardless of the type of housing, animals should be added to, removed from, and returned to social groups in this setting with appropriate consideration of the effects on the individual animals and on the group (Guide, p. 55). It may not be possible to socially house all animals in all scenarios.

This policy explains the requirements of and offers guidance for the following topics:

- Key concepts
- Social housing of specific species
- Research-related single housing
- Clinically-related single housing
- Standard Exceptions

**KEY CONCEPTS**

1. **Social housing is the default housing paradigm for all social species.**
2. Housing areas not directly managed by ULAR (e.g. satellite housing and New Bolton Center) are expected to use these ULAR documents as the minimum standards for socially housing animals, when applicable.
3. When available, animals procured from commercial vendors should be obtained as stable pairs/groups and then maintained as pairs/groups.
4. When possible, investigators should consider social housing when designing experiments that may interrupt an animal’s social housing status. For example, if two rats are pair-housed, every effort should be made (when scientifically relevant) to end the study for both animals simultaneously, rather than leave one animal singly housed for an extended period of time.
5. An individual animal’s “incompatibility” will be determined by a ULAR veterinarian (or other authorized veterinarian) and documented in the animal’s clinical record, unless specified by species and scenario within this policy. Incompatible animal may have a permanent exemption from social housing.
6. Temporary single housing (clinical or experimental reasons) should be for the minimum time necessary, and then the animal(s) returned to social housing.
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SOCIAL HOUSING OF SPECIFIC SPECIES
Social housing may involve more creative solutions than simply grouping animals in standard housing. In order to achieve this goal, structural adjustments may be required for social housing (e.g. perches, visual barriers, refuges), and important resources (e.g. food, water, and shelter) should be provided in such a way that they cannot be monopolized by dominant animals (Guide, p. 51). These solutions should afford socially housed animals sufficient space and structural complexity to allow them to escape aggression or hide from other animals in the pair or group (Guide, p. 55).

Cases of severe or prolonged aggression, incompatible individuals need to be separated (Guide, p. 64). Developing a stable social hierarchy will entail antagonistic interactions between pair or group members (Guide, p. 64)—these dominance behaviors should not to be confused with aggression. If animals exhibit aggressive actions towards conspecifics, they will be removed and individually housed.

Mice
Laboratory mice (Mus spp.) will be pair or group housed if animals are compatible and the research aims do not limit social housing. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided nestlets or pressed-paper “shacks” cannot be used as a form of additional enrichment necessary for single housing, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR. For additional guidance on breeding animals and aggressive male mice, please see “Standard Exceptions” below.

Rats
Laboratory rats (Rattus spp.) will be pair or group housed if animals are compatible and the research aims do not limit social housing. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided tubes or chew toys cannot be used as a form of additional enrichment necessary for single housing, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR. For additional guidance on breeding animals, please see “Standard Exceptions” below.

Guinea Pigs and Gerbils
Guinea pigs and gerbils will be pair or group housed if animals are compatible and the research aims do not limit social housing. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be
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approved by ULAR. For additional guidance on breeding animals, please see “Standard Exceptions” below.

Hamsters
Female hamsters will not be group housed and environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Male hamsters (procured in groups or raised as littermates) will be pair or group housed if animals are compatible and the research aims do not limit social housing. If social housing of male hamsters is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR.

Other rodents
At the discretion of ULAR veterinarians on a species-by-species basis, other rodents will be pair or group housed if animals are compatible and the research aims do not limit social housing. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR.

Dogs
Dogs will be pair or group housed if animals are compatible and the research aims do not limit social housing. Dogs benefit from positive human interaction (Guide, p. 63). If social housing is not possible, then environmental enrichment and human socialization are required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Socialization will be provided as per ULAR SOP 7.32 Dog Exercise and Enrichment. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR. For additional guidance on breeding animals, see “Standard Exceptions” below.

Cats
Cats will be pair or group housed if animals are compatible and the research aims do not limit social housing. Cats benefit from positive human interaction (Guide, p. 63). If social housing is not possible, then environmental enrichment and human socialization are required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and
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replacement procedures when applicable. Additional enrichment items must be approved by ULAR. For additional guidance on breeding animals, see “Standard Exceptions” below.

Rabbits
Male rabbits will not be group housed and environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Female rabbits will be pair or group housed if animals are compatible and the research aims do not limit social housing. Rabbits benefit from positive human interaction (Guide, p. 63). If social housing is not possible, then environmental enrichment and human socialization are required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR.

Sheep
Sheep will be pair or group housed if animals are compatible and the research aims do not limit social housing. Mature rams should be group housed if castrated. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR.

Swine
Female and pre-pubertal male swine (<6 months) will be pair or group housed if animals are compatible and the research aims do not limit social housing. Mature hogs should be group housed if castrated. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR.

Aquatic species
Schooling fish (e.g. zebrafish, trout) will be pair or group housed if animals are compatible and the research aims do not limit social housing. Xenopus will be pair or group housed if animals are compatible and the research aims do not limit that type of housing. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR veterinarian or withheld for research reasons as approved by the IACUC. Enrichment will be provided as per ULAR SOP 7.90 Enrichment for Laboratory Animal Species. If ULAR-provided enrichment cannot be used, then other enrichment items will still be required and will be the responsibility of the laboratory to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable.
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Nonhuman Primates
Like all social animals, nonhuman primates should normally have social housing (Guide, p. 58), if animals are compatible and the research aims do not limit social housing. Because of the severity of injuries which may occur when configuring pairs of nonhuman primates, numerous species-specific factors such as age (e.g. juveniles vs. adults), behavioral repertoire (e.g. history of aggression), and sex (e.g. males tend to be more difficult to pair than females) should be taken into consideration when forming a group (Guide, p. 59). Please see ULAR SOP 7.62 Nonhuman Primate Enrichment and the IACUC policy on Social Housing of Nonhuman Primates for more information to purchase, place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Additional enrichment items must be approved by ULAR or other authorized veterinarian.

Agricultural Animals Housed in a Farm-like Setting (New Bolton Center only)
Agricultural animals are social by nature and social isolation is a stressor (Ag Guide, p. 21). As social animals, agricultural animals should be housed in compatible pairs or larger groups of compatible animals (Guide, p. 60). 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 (Ag Guide, p. 22).

Isolation or temporary isolation is sometimes required for an animal’s safety (e.g. during recovery from surgery, housing young claves in hutches to minimize disease transmission), but the animal should be returned to a social setting as soon as possible (Ag Guide, p. 22). Additional environmental enrichment should be provided to isolated animals where opportunities for social interactions are not available (Ag Guide, p. 30). Additional enrichment items must be approved by ULAR or other authorized veterinarian.

In specific scenarios, one species can be used as a companion for another species (e.g. goats and horses) (Ag Guide, p. 22), assuming that appropriate biosecurity measures are preserved.

RESEARCH-RELATED SINGLE HOUSING
Social animals should be housed in stable pairs or groups of compatible individuals unless they must be housed alone for experimental reasons (Guide, p. 51). These experimental reasons must be approved by the IACUC prior to initiating solitary housing. The description of the solitary housing should be described in an ARIES Exemption, by selecting “single housed animals” from the list of options. Alternatively, the requirement for solitary housing may be described in a “Special Housing and Husbandry Procedures” in the ARIES protocol.
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Appropriate social interactions among members of the same species (conspecifics) are essential to normal development and well-being (Guide, p. 64). Solitary housing of social species should generally be limited to experiments and/or animal models in the following categories, although other justifications will be considered by the IACUC:

- Studying isolation stress
- Individual feed or water intake monitoring
- Activity monitoring (e.g. beam break, etc.)
- Tethered recording equipment
- Avoiding cross contamination for infectious disease models, vectors, test articles, etc.

Exemptions are not needed for scenarios described below in “Standard Exceptions”.

Exemptions will be reviewed by the IACUC at appropriate intervals, which include:

- Significant changes in regulations, guidance, or policies
- Every three years, on cycle with standard protocol “3-year renewals”
- Annually, on cycle with USDA-species protocol “continuing reviews”
- Post-approval monitoring visits (OAW review)

CLINICALLY-RELATED SINGLE HOUSING

ULAR veterinarians may modify animal care provisions, including an animal’s social housing status, for any issue related to animal health or well-being.

- If the removal of a USDA-covered species from social housing is expected to be a temporary arrangement, then the ULAR veterinarian will document the need for solitary housing in the animal’s permanent health record. The animal’s social housing status must then be regularly re-evaluated (NHPs must be re-evaluated at least every 30 days) unless detailed below by specific “Standard Exceptions” that are approved by the IACUC with approval of this policy.
- For non-USDA species (e.g. mice, rats, etc.) the ULAR veterinarian will document the need for solitary housing on the treatment record.

Other veterinarians authorized by the AV may also modify and document 30-day clinical-based exemptions to social housing.

STANDARD EXCEPTIONS

There are various scenarios in which single housing is the acceptable housing paradigm; justified based on social incompatibility resulting from [likely] inappropriate behavior, [and] veterinary concerns regarding animal well-being (AAALAC). There is no need for ULAR veterinary approval (or documentation within the medical record every 30 days) or an IACUC exemption to this policy for these scenarios. The IACUC approves these scenarios with approval of this policy.

Asocial animals. Not all members of a social species are necessarily socially compatible; social housing of incompatible animals can induce chronic stress, injury, and even death (Guide, p. 64). All research and teaching animals currently used are considered social animals, except: adult boars (Ag Guide, p. 30), rooster, bulls, and stallions; adult male mice (Guide, pp. 53, 64); adult male rabbits (Kalogassy, et al. 1999); female hamsters (Guide, p. 64). Consideration will be given to socially house these animals if neutered.
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Male Breeders. Intact male breeders of any species separated for breeding should not be reintroduced into a group of other intact male animals.

Pregnant Females. Pregnant females may be singly housed during the last third of gestation to minimize stress prior to and during parturition.

Non-breeding animals. Intact Males and females of the same species should not be group housing with members of the opposite sex unless breeding is approved by the IACUC, and then only when breeding is needed as part of the research activities.

Male mice. In some mice, standard caging may induce overt aggression in groups of males, resulting in social stress and injury (Guide, p. 53). While groups of young male mice delivered in a group or raised together as littermates should continue to be group housed, male mice separated for experimental studies or for breeding should not be reintroduced into a group of other male mice.

Fighting mice. Mice that have been separated due to fighting will remain in single housing. Every attempt will be made to remove only the mouse that seems to be the “aggressor” while leaving the remaining group intact. Injured animals should be reported according to ULAR SOP 4.00 Animal Health Observation Procedures (or other applicable SOP) for evaluation and appropriate treatment.

Single animals on study. The experimental design may necessitate that a single animal is housed alone while waiting its experimental time point. Attempts should be made to re-group these animals if the solitary animal will be singly housed for greater than 30 days from being ungrouped. When possible, investigators should consider social housing when designing experiments that may interrupt an animal’s social housing status.

Post-operative animals. In many cases, bandages and sutures will serve as a nidus for cagemates’ attention and may compromise the recovery of the post-operative individual. While whenever possible, post-surgical animal should be group housed, it is acceptable to singly house animals with sutures, staples, bandages, or external instrumentation until the device is removed, i.e. 7-14 days. Single housing of animals after removed of these devices will require IACUC approval and/or ULAR approval as described in the applicable portion of this document depending on the reason for continued single housing.