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 designees (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 this policy as the minimum standards for socially housing animals, when applicable. Scenarios not covered by this policy should have an IACUC exemption.
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. A USDA animal’s “incompatibility” will be determined by a ULAR-authorized veterinarian and documented in the animal’s clinical record, unless covered by an exception within this policy.
6. Non-USDA incompatible rodents are covered by the a). standard exceptions in this policy, b). an exemption approved by the IACUC, or c). ULAR veterinarian-approved exemption.
7. Temporary single housing (clinical or experimental reasons) should be for the minimum time necessary, and then the animal(s) returned to social housing.
IACUC Policy
SOCIAL HOUSING

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–authorized 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 enrichment necessary for single housing, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. For 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-authorized 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 enrichment necessary for single housing, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. For 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-authorized 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, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. For additional guidance on breeding animals, please see “Standard Exceptions” below.
IACUC Policy

SOCIAL HOUSING

Hamsters
Female hamsters will not be group housed and environmental enrichment is required unless withheld for clinical reasons by a ULAR-authorized 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-authorized 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, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable.

Other animals
At the discretion of ULAR-authorized veterinarians on a species-by-species basis, other animals 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-authorized 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, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable.

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 is required unless withheld for clinical reasons by a ULAR-authorized 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, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. For additional guidance on breeding animals, see “Standard Exceptions” below. Situations resulting in dogs housed in isolation (room by itself with no auditory, visual or olfactory contact with conspecifics) should be rare and limited to the shortest time possible. Under this situation dogs will be provided socialization as per ULAR SOP 7.32 Dog Exercise and Enrichment.

Cats
Cats 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-authorized 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, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. For additional guidance on breeding animals, see “Standard Exceptions” below. If a cat is isolated (room by itself with no auditory, tactile or olfactory contact with conspecifics), it will be provided additional enrichment, such as safe and positive
IACUC Policy
SOCIAL HOUSING

interaction with the animal care staff; periodic release into larger enclosures; supplemental enrichment items, etc.

Rabbits
Male rabbits will not be group housed and environmental enrichment is required unless withheld for clinical reasons by a ULAR-authorized 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. If social housing is not possible, then environmental enrichment is required unless withheld for clinical reasons by a ULAR-authorized 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, enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. If a rabbit is isolated (room by itself with no auditory, tactile or olfactory contact with conspecifics), it will be provided additional enrichment, such as safe and positive interaction with the animal care staff; periodic release into larger enclosures; supplemental enrichment items, etc.

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-authorized 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 enrichment items will still be required and will be the responsibility of the laboratory to purchase (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. Alternative enrichment items must be approved by ULAR. If a sheep is isolated (room by itself with no auditory, tactile or olfactory contact with conspecifics), it will be provided additional enrichment, such as safe and positive interaction with the animal care staff; periodic release into larger enclosures; supplemental enrichment items, etc.

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-authorized 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 (with ULAR’s approval), place, and coordinate with ULAR for sanitation and replacement procedures when applicable. If a pig is isolated (room by itself with no auditory, tactile or olfactory contact with conspecifics), it will be provided additional enrichment, such as safe and positive interaction with the animal care staff; periodic release into larger enclosures; supplemental enrichment items, etc.

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. Environmental enrichment strategies for many aquatic species are not well established (Guide, p. 83). Enrichment for aquatic animals will be evaluated by the ULAR veterinarian on a species-by-species basis, and provided as described in species-specific ULAR SOPs (e.g. 7.84, Daily Husbandry and Care of Fish; 7.85, Daily Husbandry and Care of Frogs).

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 the IACUC policy on Social Housing of Nonhuman Primates and the ULAR SOP 7.62 Nonhuman Primate Enrichment for more information on the specific steps taken to address the needs of NHP’s in research at the University of Pennsylvania.

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).

In specific scenarios, one species can be used as a companion for another species (e.g. goats and horses) (Ag Guide, p. 22, 32), 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. Exemptions must be approved for housing USDA species alone for more than 12 hours and for non-USDA rodents greater than 24 hours.
IACUC Policy
SOCIAL HOUSING

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.)
- Experimental instrumentation
- 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) subsequently considered by the Compliance Subcommittee

CLINICALLY-RELATED SINGLE HOUSING
ULAR-authorized veterinarians may modify animal care provisions, including an animal’s social housing status, for any issue related to animal health or well-being. The animal’s social housing status must then be regularly re-evaluated unless detailed below by specific “Standard Exceptions” that are approved by the IACUC with approval of this policy.

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) 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), roosters, bulls (Ag Guide, p. 85), and stallions (Ag Guide, p. 32); adult male mice (Guide, pp. 53, 64); adult male rabbits (Kalagassy, et al. 1999); female hamsters (Guide, p. 64). Consideration will be given to socially house these animals if neutered.

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.
IACUC Policy

SOCIAL HOUSING

Non-breeding animals. Intact males and females of the same species should not be group housed 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. Female mice may be singly housed after litters are weaned and subsequent breeding schemes are being coordinated.

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 animals. Fighting animals other than mice may have attempts at repairing under the oversight of the ULAR-authorized veterinarian. Mice that have been separated due to fighting will remain in single housing (unless male mouse is being introduced to female for breeding). 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 via applicable SOP for evaluation and appropriate treatment.

Single animals remaining on study. The experimental design may necessitate that a single animal remaining from a cohort is housed alone after cage mates are used for study. Also, in some scenarios a pairmate is euthanized for clinical reasons and the remaining animal is alone. Attempts should be made to re-group these animals as soon as possible in consult with the ULAR-authorized veterinarian if the solitary animal’s experimental endpoint is expected to be longer than 30 days. 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, etc. until removed, i.e. 7-14 days. Single housing of animals after removal 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.

Standard Agricultural Practices. Animals at New Bolton Center, involved in agricultural based research, are housed in a farm-like setting according to the Ag Guide and/or standard agricultural husbandry practices. In each of these instances, the animals will have visual, auditory, olfactory, and/or protected tactile contact with conspecifics. Species specific examples of approved single housing for standard agricultural practices include dairy calves in hutches to minimize disease transmission, post-partum dairy cows in a special area for frequent observation before rejoining the herd (Ag Guide, p. 78), sows in breeding stalls (up to 10 days) during estrous to prevent unsafe mounting of penmates, horses in individual box stalls in barns, and laying hens in row cages.