

# Guidance for the housing density of mice and rats

NCI at Frederick investigators are required to comply with the space requirements for housing mice and rats as recommended in the 8<sup>th</sup> edition of the *Guide for the Care and Use of Laboratory Animals*. The *Guide* recommends the following caging density for mice and rats:

## **MOUSE:**

<b>Animals</b>	<b>Weight, g</b>	<b>Floor Area/Animal, in.<sup>2</sup> (cm<sup>2</sup>)</b>	<b>Height, in. (cm)</b>	<b>Comments</b>
Mice in groups	<10	6 (38.7)	5 (12.7)	Larger animals may require more space to meet the performance standards. Other breeding configurations may require more space and will depend on considerations such as number of adults and litters, and size and age of litters.
	Up to 15	8 (51.6)	5 (12.7)	
	Up to 25	12 (77.4)	5 (12.7)	
	>25	≥15 (≥96.7)	5 (12.7)	
Female +litter		51 (330) (recommended space for the housing group)	5 (12.7)	

## **RAT:**

<b>Animals</b>	<b>Weight, g</b>	<b>Floor Area/Animal, in.<sup>2</sup> (cm<sup>2</sup>)</b>	<b>Height, in. (cm)</b>	<b>Comments</b>
Rats in groups	<100	17 (109.6)	7 (17.8)	Larger animals may require more space to meet the performance standards.
	Up to 200	23 (148.35)	7 (17.8)	
	Up to 300	29 (187.05)	7 (17.8)	
	Up to 400	40 (258.0)	7 (17.8)	
	Up to 500	60 (387.0)	7 (17.8)	
	>500	≥70 (≥451.5)	7 (17.8)	
Female +litter		124 (800) (recommended space for the housing group)	7 (17.8)	Other breeding configurations may require more space and will depend on considerations such as number of adults and litters, and size and age of litters.

The table below has been provided as an example to outline the maximum number of animals that may be housed in a single cage based on the *Guide* provisions.

<b>Species</b>	<b>Number of animals</b>	<b>Cage Type</b>
<b>Mice*</b>	2 adults (>25g)	Thoren #15 Duplex (33 sq. in)
	4 adults or 1 female + 1 litter	Conventional (65 sq. in)
	5 adults or 2 adults + litter (see exemption)	Conventional (65 sq. in) in Germ Free isolator
	5 adults or 2 adults + 1 litter	Thoren #5 Expanded (78 sq. in)
		Innovive (81 sq in)
		Super Mouse 750 (75 sq. in)
12 adults or 3 adults + 2 litters (Litters must not be more than 5 days apart in age)	Super Mouse 1800 (180 sq. in)	
<b>Rats</b>	1 female + 1 litter	Static, Ventilated (140, 142 sq. in)
	4 adults (< 300g)	
	2 adults (>300g)	

\*Adult weights – mice (>25g)

Commonly used breeding schemes:

Monogamous: 1 male : 1 female in a cage

Trio breeding: 1 male : 2 females in a cage

Harem breeding: 1male : up to 4 females in a cage

Due to difficulties in some breeding colonies [i.e., litter survival rates, inbred and transgenic strains with small litter sizes and/or poor mothering traits, short breeding window, need for generation of a large experimental cohort etc.], the ACUC recognizes that there may be circumstances that require exemption to these recommendations. Therefore, an investigator may request an exemption to the Guide space recommendations by providing the following information for review and approval by the ACUC:

1. *All exemptions must be justified in writing and submitted electronically to the ACUC Office;*
2. *Scientific justification for maintaining more than two adults and one litter in a single cage must be provided unless a super mouse cage is used; strain information for which the exemption is requested, as well as past data, including performance indices used to assess the adequacy of housing, such as the animal(s) health, reproduction, growth, behavior, activity, and the use of space must be included as part of the justification.*
3. *The maximum number of adult males, adult females, and pups that will be permitted in a single cage [with associated body weights and the cage size utilized] must be outlined; and*

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4. *If approved, cage cards or room doors should bear a label indicating "Guide housing density Exemption" as well as the strain information and maximum number of adults and pups permitted in a single cage.*

It is important to note that neither the LASP nor the ACUC are involved with assigning or monitoring an investigator's cage allocation. All investigators are required to ensure that his/her animal colony is managed in accordance with the assigned allocation and that an adequate number of empty cages are readily available to permit timely separation and weaning.

To ensure that authorized Guide exemptions do not result in overcrowding or adverse cage conditions that could compromise the health and welfare of animals, the following factors should be considered:

**Litter size:** The average litter size for outbred strains is 10-12. Therefore, caging density exemptions may be obtained for strains that have litter sizes of 5 pups or less; if maintaining multiple litters in a cage, the combined litter size should not be more than a single litter size.

**Age difference between litters:** For two litters housed together in a cage, the age difference between the litters should not be more than 5 days to avoid trampling of the younger litter by the older animals.

**Trio/harem breeding:** If using these breeding schemes and a female has a litter, one of the remaining adults must be separated. If both females have litters and the combined litter size is greater than 12, one dam and her litter must be separated.

**Post-partum estrus:** For prolific-breeding strains and strains requiring late weaning, it is recommended that the post-partum estrus be not used in order to avoid having multiple litters.

**Weaning:** Should be done at 21 days of age if the female is visibly pregnant. Unless an exemption is obtained, the older litter must be immediately weaned upon the birth of the younger litter.

References:

*Guide for the Care and Use of Laboratory Animals*, 8th Edition 2011  
Trio Breeding (AAALAC FAQ), 2012.

## **Germ Free Isolator Housing Exemption**

<b>Species</b>	<b>Number of animals</b>	<b>Cage Type</b>
<b>Mice*</b>		
	4 adults (>25g) or 1 female + 1 litter	Conventional (65 sq. in)
	5 adults (>25g) or 2 adults + litter	Conventional (65 sq. in) in Germ Free Isolator

### **As per the Guide**

- Space needed for 5 adults (up to 25 g) is 60 sq in.
- Space needed for 5 adults (>25g) is 75 sq in.
- Space needed for 2 adults + 1 litter is 66 sq in.

### **Justification:**

- Allows higher housing density per germ free isolator and thus reducing the risk of contamination.
  - 18 Conventional cages (65 sq in) vs only 12 Thoren cages (78 sq in) can fit in a large germ free isolator.
- Germ free mice have lower breeder productivity due to enlarged cecum.
  - Average litter size = 6 pups/litter
- Germ free mice are relatively smaller in size.
  - Average adult female (8 weeks old) B6/Tac germ free – 21.1 grams; N=5
  - Average adult male (12 weeks old ) B6/Tac germ free – 26.5 grams; N = 9

### **References:**

Smith AL, Mabus SL, Stockwell JD, Muir C. Effects of housing density and cage floor space on C57BL/6J mice. *Comp Med.* 2004 Dec; 54(6):656-63.

- C57BL/6J mice as large as 29 g may be housed with 5.6 in<sup>2</sup> of floor space per mouse. This area is approximately half the floor space recommended in the Guide. Housing density did not affect a variety of physiologic parameters.

Sarah L. Mabus, Abigail L. Smith, Jason D. Stockwell, and Cameron Muir. Effects of Housing Density and Cage Type on Young Adult C57BL/6J Mice. *The Development of Science-based Guidelines for Laboratory Animal Care: Proceedings of the November 2003 International Workshop.*

- Male and female B6 mice between the ages of 4 and 12 weeks can be housed with 5.6 in<sup>2</sup> of floor space per mouse without ill effect.