Guidelines Preventing Mouse Cage Overcrowding

Background

The 8th edition of the Guide for the Care and Use of Laboratory Animals (*Guide*) recommends a minimum of 51 square inches of floor space for a female mouse with a litter and 15 square inches for adult mice weighing more than 25 grams (p. 57). Standard mouse caging used at VT provides 75 square inches of floor space and a height of 5 inches.

Mouse size varies depending on strain. Mouse pups weigh approximately 0.5 – 1.0 grams at birth and 10 – 12 grams at weaning (~3 weeks of age). Average body weights for some commonly used inbred (Jackson Laboratories: http://jaxmice.jax.org/index.html) and outbred laboratory mouse strains (http://www.taconic.com) are as follows:

Inbred Strain	**Male BWT (grams)**			**Female BWT (grams)**		
	4 weeks	**8 weeks**	**16 weeks**	**4 weeks**	**8 weeks**	**16 weeks**
C57BL/6J	13.6	23.7	30.0	12.3	18.3	22.2
BALB/cJ	17.7	25.4	ND	14.5	20.2	ND
C3H/HeJ	16.1	23.2	29.0	13.5	18.5	23.0
NOD/ShiLtJ	18.8	25.6	30.3	17.1	20.0	23.2
Outbred Strain	**4 weeks**	**8 weeks**	**16 weeks**	**4 weeks**	**8 weeks**	**16 weeks**
ICR	~23	~33	ND	~18	~28	ND
Swiss Webster	~22	~38	ND	~22	~30	ND

It may be beneficial for 2 females to rear small litters of pups (4-6 pups/litter) in the same cage, particularly when one is an experienced, and one an inexperienced, dam. The benefit of this interaction, however, may be outweighed by the negative aspects of cage overcrowding about half way through the lactation period. The risk of maternal cannibalism is also low at this point compared to the immediate post-partum period, so reducing the mouse density in the cage is recommended at this time.

Procedures

Overcrowded Cages

Cages are considered overcrowded because there are too many mice (adults or pups) in the box, litters need to be weaned, or there are too many post-weanling and/or adults in one cage as defined below.

Responsibilities

It is the responsibility of the principal investigator (PI) to adhere to maximum cage density guidelines and to proactively schedule mouse colony management tasks. If a laboratory animal technician observes overcrowded cages, he/she will notify the PI or his/her designated contact person of the situation. The cage will be flagged with a Mouse Overcrowded Cage Notice, and the location of the cage will be sent to the PI or contact person. Once notified, the PI will be given 24 hours to correct the overcrowded cage.

Laboratory animal technicians in all VT vivaria are authorized to correct overcrowded cages when PI action is not timely and to charge the PI technical service fees for the time required to complete these

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tasks. The minimum fee will be for 1 hour of technical time followed by ¼ hour increments for any time spent longer than 1 hour. Technicians will place mice in separate cages to comply with density guidelines and will assign new cards to the cages with the following information: PI name, protocol number, sex, number of mice, date of birth, and parent cage identification. We advise against relying upon this safeguard since research personnel have the best knowledge of the genotype and pedigree information vital to new cage cards.

Maximum Densities

- 5 adult mice per cage
- **Monogamous breeding pairs** (1 male: 1 female)
    a) Pup density is unrestricted until weaning or until a second litter is born of the same dam. When a second litter is born ("pups on pups"), the older pups must be weaned immediately (within 24 hours).
    b) Typical weaning should occur on post-natal day 21 and no later than the end of day 25 (date of birth counting as day 0).
    c) Breeding strategy provides for
        - preventing overcrowding,
        - identifying the dam for the litter,
        - allowing extended nursing time for inbred strains known to be small and slow growing, and
        - maximizing female productivity by utilizing post-partum estrus.
- **Breeding trios** (1 male: 2 females)
    a) Pup density is unrestricted when all pups are less than 12 days of age. Cage density must be reduced to a maximum of 12 pups per cage when one or more pups reaches 12 days of age by distributing dams and pups to separate cages.
    b) Weaning should occur on post-natal day 21 (date of birth counting as day 0).
    c) Breeding strategy provides for
        - pairing experienced and inexperienced dams, and
        - maximizing female productivity by utilizing post-partum estrus.
- **Breeding harems** (1 male: 3-4 females)
    a) **No pups may be born** into a harem cage.
    b) The first visibly pregnant females (2 in a cage of 4 females; 1 in a cage of 3 females) must be removed before any pups are born, leaving a breeding trio in the original cage.
    c) Breeding strategy allows
        - increasing colony numbers rapidly, and
        - maximizing the progeny of an individual male, but
        - does not use post-partum estrus in all females.

Exemptions

If larger cages providing more floor space are available, exceptions may be made on a case-by-case basis depending on calculated equipment capacity.