# MICE

Mus musculus

## VARIETAL RANGE DIFFERENCE

There are over 330 species of mice in the world, but only the house mouse (Mus muscularis) should be kept as a pet in Australia. There are over 40 different types of domestic house mouse and they display a wide variety of coat colours and fur types, including long hair and curly hair.

## PHYSICAL CHARACTERISTICS

* **Size\*:** overall length from nose to tail tip: 140mm-180mm; approximate length from nose to tail base: 70mm - 90mm; approximate length of tail: 70mm - 90mm
* **Weight\*:** adult male: approximately 20g - 40g; adult female: approximately 18g - 35g
* **Age at adult size:** 10 - 12 weeks
* **Average life span:** 2 years; range 1 - 3 years; maximum reported 6 years
* **Weight at birth:** 1.0 g - 1.5g
* **Gestation period:** 19 - 21 days
* **Number of offspring:** 4 – 14
* **Weaning age:** 21 days
* **Range of breeding ages:** mice are sexually mature from 5 - 7 weeks of age. Female mice can, however, have their first oestrus cycle from 25 to 28 days of age. The recommended breeding age for mice is from 2.5 months to 12 months. The interval between births for mice can be as short as 3.5 - 6 weeks
* **Body temperature:** 37.1C - 37.4C
* **Heart rate:** 310 - 840 beats/minute
* **Respiration rate:** 160 breaths/minute (range 94 - 163)

\* Some types of fancy mice can be heavier and larger than traditional pet house mice.

## General biology

When caring for and developing comfortable housing for mice, it is important to consider the following:

* mice are social animals and can be kept in groups. Females will generally do well in single-sex **groups, even when introduced together as adults. Male mice can be kept together if introduced at weaning and provided with enough room. Males will generally fight if placed together as adults. Males and females housed together are likely to breed quickly, often producing large litters**
* **smell is very important to mice, so, when cleaning their housing or handling them, avoid generating strong odours such as those produced by deodorisers or perfumes. Ideally, mice should not be kept in the same environment/room as rats (which are natural predators of mice), as their odour can cause mice to exhibit fear/stress responses**
* **mice are sensitive to sudden loud noises, so noise levels should be considered when deciding on cage placement**
* **mice have good vision (similar to that of humans), but as they are predominately nocturnal, they avoid brightly-lit areas. Refuges, such as bedding and hiding places, should be provided in well-lit areas**
* **touch is important to mice and they prefer contact with solid surfaces as opposed to wire floors and avoid open spaces. When travelling from one area to another, mice will remain in contact with the wall. The provision of dividers in their cages decreases fearful and anxious behaviour**
* **mice in the wild eat a wide range of foods and ideally pet mice fed a diet of commercial pellet food should be provided with a variety of supplementary foods.**

## Normal behaviour

Healthy mice are alert, active and inquisitive. They have bright, clear, open eyes. Their ears stand up straight and their fur is dense and sleek. The behaviour of mice in a laboratory depends on how many are caged together, the size and type of cage, and the environmental conditions.

Mice are very agile acrobats and normal caged behaviour includes running, jumping, standing on their hind legs and climbing. They are social animals and should not be kept alone. If they are not being used for breeding, they should be placed in single-sex groups shortly after weaning.

Mice are nocturnal. They feed predominately at night and are far more active in low light, although they can have periods of activity at various times during the day. During daylight hours, it is normal behaviour for them to huddle together to conserve body heat. Healthy mice sleep in the foetal position and extension at rest is considered to be a sign of ill-health.

Some strains of mice are aggressive and are not suitable for use in the classroom. Most are not aggressive but will bite if frightened. Cannibalism is rare but it does occur, most commonly when nesting females are disturbed shortly after the young are born. It can also be an indication of inadequate diet or poor maintenance.

During the breeding period, it is normal behaviour for males to nibble the females’ heads or bodies and to examine their anogenital areas before copulation. Pregnant females show nest-building activity before giving birth and during lactation.

## Environment

Mice should not be housed with other species. They should be kept in stable groups of at least two animals to provide for social interaction. Cage designs vary and when selecting a cage it is important that it meet the standards required for safety, security, ease of cleaning and animal comfort and allow student observation. A cage or nesting place should be seen as the animals’ home or domain and disturbed as little as possible. It must be remembered that the environmental requirements of small mammals are complex and imperfectly understood.

Pet shops can supply plastic mouse cages that are well designed or an unused aquariums with wire mesh lid, makes an excellent container. Mice see red as black and thus opaque red plastic houses can be used to shelter in whilst still being observable.

The minimum cage size for two or three mice is a height of 125mm and floor area of 500cm2 per pair or three. A suitable cage size for two mice is a length of 600mm, depth of 300mm, and height of 250mm.

Mice are very active animals. While everyday activities give mice adequate exercise, they seem to enjoy exercise equipment if it is available. A running wheel is usually very well utilised. Elevated boxes and tubes made of either cardboard or polycarbonate, make excellent exercise areas.

Mice prefer a temperature range of 18C - 24C and should be provided with good bedding and shelter during environmental extremes. Avoid large fluctuations in temperature.

Good natural lighting or artificial lighting of 45 - 60 lux should be provided. Cages should be kept out of direct sunlight and contain areas of shelter to which the mice can retire out of the light. Cycles of 12 - 14 hours of light and 12 - 10 hours of darkness are ideal.

Good, draught-free, natural ventilation is required. Mice should not be housed outdoors.

Litter should be non-toxic to mice, highly absorbent, dust free, splinter free, economical and easily disposed of, inedible and uncontaminated by pesticides or chemicals. To encourage natural behaviours such as nest building and burrowing, bedding could include wood shavings, clean shredded paper, soft cardboard, rice hulls or absorbent paper pellets. Toilet rolls and shredded tissue can also be used.

Daily removal of droppings, soiled bedding and uneaten food is recommended. Cages should be cleaned thoroughly at least twice a week. Dirty bedding should be removed and disposed of and the cage washed with a suitable cleaner and dried thoroughly. As mice scent mark their territory with urine, a small amount of bedding should remain each time the bedding is changed. Mice should be returned to the same cage in the same site, as change can induce stress in them.

Commercial nesting materials are available, but hay, straw, shredded paper, paper towel and paper tissues are also suitable. Avoid cottonwool, as this may trap newborns, wrap around the limbs of young mice and cause injury.

## Food and water

Commercially-prepared mice pellets or cubes are recommended, as they provide a nutritionally-balanced diet. Refer to the manufacturer’s instructions for quantities.

As a general guide, mice eat 15g of food per 100g of body weight, although this varies with their environment and physiological status. Lactating females need approximately four times the amount of food and water required by an adult mouse. Demand feeding often provides the best alternative, provided that the weight of the mice is monitored to ensure that there is no excessive gain. As mice prefer fresh food, it is better to purchase small amounts on a regular basis. Mice enjoy variety and their diet can be supplemented with small quantities of fresh fruit and vegetables and suitable seeds in small amounts.

Fresh, clean water must be provided at all times. An adult mouse needs about 4 - 7mL and a lactating female up to 14mL per day. As mice contaminate water in dishes and bowls, suspended water bottles with metal tubes are recommended.

The provision of a chewing block in the form of unpainted, untreated non toxic wood or commercially produced blocks will assist in the prevention of dental problems.

## Handling

Mice need to be handled calmly and with care to prevent distress and injury to the animals and their handlers. Well-designed refuges assist in catching. If mice hide under structures, such as elevated shelves or nest boxes, they can be easily caught without struggling. Mice should be conditioned to be handled from a young age so they are well prepared for handling by students. They are fragile and students must be supervised while handling them.

In order to condition a mouse for handling by students, it must be handled for increasingly longer periods of time each day. This should be done until the mouse sits on a person’s hand without showing stress such as biting or fleeing. The designated mouse carer should perform this task in advance of any students handling mice. Initially mice will tolerate only a few seconds of handling but after a few tries they should tolerate many minutes. Mice should be rewarded when they are handled. Sunflower seeds are a suitable reward. It may take a few days for mice to become adequately conditioned.

Only mice that are accustomed to handling should be used. All handling should be gentle and unhurried. Sudden, loud noises and jerky movements must be avoided at all times. Adult mice may be safely lifted by the base of the tail but never by the tip or the middle of its tail. After being lifted, the mouse should be placed immediately onto a firm surface such as the back of the hand or a table, while still being held but not dangled in the air.

Mice can also be picked up by closing the hand almost completely around them. Handle mice gently to avoid any accidental injury. A mouse can be grasped by the scruff of the neck to immobilise it or enable examination underneath. The only way to adequately restrain a mouse is to grasp the skin on the back of the neck firmly and with the other hand, or the third and fourth fingers of the hand holding the scruff, hold the base of the tail.

## Weaning

If breeding mice, once mice are weaned the litter should be separated into same sex groups to avoid early breeding between littermates. As mice are able to breed from six weeks of ages the separation of the litter will need to occur well before this at around three weeks of age.

## Weighing of animals

Mice should be placed in a small container such as a beaker for weighing. The weight of the beaker can then be subtracted from the combined weight of the beaker and mouse.

Electronic scales are suitable as quick results are obtained and this minimizes the time that mice are subjected to the procedure.

## Disease prevention

Disease control methods and internal and external parasite control programs should be developed in consultation with veterinarians. All activities must be documented in the appropriate records.

## Signs of illness

The first sign noticed is often a change in the animal’s natural demeanour: it may be listless or lethargic. Closer examination may show:

* a reluctance to move
* an unkempt, erect coat
* a discharge from the eyes, nose or urinary or genital organs
* coughing and sneezing
* constant scratching
* lack of balance, stumbling or stiff-legged gait, soft faeces with an unpleasant smell
* loose skin, which is a possible indication of weight loss
* prostration or extension
* any lumps that could indicate possible growths or abscesses

Mice with any of these symptoms should be isolated from the other animals immediately and their cages disinfected fully.

A failure to thrive or grow is another sign of illness.

If unable to identify or correct the cause of ill-health, assistance should be sought from a veterinarian who is familiar with mice. Any illnesses or injuries and the treatment given should be documented in the appropriate records.

## Aggressive mice

Mice that are incompatible may be aggressive towards each other and display the following signs:

* hair loss
* wounding
* weight loss
* harassment

If these signs are evident, mice should be temporarily separated and reintroduced after a few days. If aggression continues it will be necessary to replace the mice with another pair. If serious wounding of mice occurs, veterinary advice should be sought.

## Stress reduction

If mice show signs of stress such as extreme reluctance to being handled, hunched posture, sitting in one position with eyes squinted, lack of appetite or dehydration during handling, they should be returned to their enclosure and moved to a quiet area. Mice should not be handled more than twice per day by students and this should be monitored by the designated mouse carer.

## Euthanasia

In the case of a mouse becoming so sick, diseased or injured that recovery is unlikely or undesirable, on humane grounds euthanasia must be arranged with a veterinarian or a person competent in the technique for mice.

A record of deaths is required for the annual report to VSAEC.

## Obtaining mice

Mice must be purchased from a licensed supplier. The enclosure the mice will be housed in should be taken when collecting the mice from the supplier. Bedding and adequate food and water should be provided. As mice can become stressed during transport, a sheet can be placed over the enclosure and the noise level should be kept to a minimum. Mice should not be left unattended in a vehicle, especially on warm to hot days. Litters and late pregnant females should not be transported for extended periods, if at all.

## Fate plan

Before obtaining mice for use in the classroom, a fate plan must be created. Mice can sometimes be returned to their place of purchase. Check with the supplier beforehand. Alternatively, students may wish to adopt a mouse as a pet. In this case, teachers need to ensure that students have a secure mouse enclosure at home, can arrange for appropriate collection and transport from school and have written (6.4.1 Australian Code of Practice) parental permission to adopt a mouse. As one female has the potential to produce 12 young, it is necessary to arrange homes for this number in addition to the two parents before obtaining the mice.

## Designated mouse carer

One person should be responsible for the overall management of mice at the school. This person should complete the following daily:

* check health of mice
* monitor and allocate the use of mice by classes according to above requirements
* check that nutritional food and clean water is provided
* clean enclosure as necessary
* communicate relevant information about the mice to staff and students
* maintain husbandry records
* maintain records of animal use

## Where to keep mice

Mice should be kept in a quiet room with adequate ventilation, lighting and heating. When needed for classes mice can be brought in to the science room. Mice should not be left in the classroom for extended periods. Mice should be attended to on weekends and school holidays by a designated carer. If students are to care for mice on weekends or holidays then a written note from parents or guardians giving permission is to be obtained.

## Veterinary care

It may be necessary to consult a vet should mice become ill or injured. Before purchasing mice, locate a vet who is able to provide this service.

## Student involvement

Prior to animal use, students should be instructed on how to behave so to avoid stressing the animals. The following should be observed when using mice in the classroom:

* noise level to be kept to a minimum
* move slowly around the room when are in the room
* the handling of mice should be kept to a minimum
* students should not feed mice any food other than that provided

Students should be instructed on how to safely catch and handle the mice. Some students may not want to handle the mice for various reasons. This should be respected. Mice can sometimes defecate or urinate when handled. Students should be informed of this possibility and be instructed to act calmly in this situation.

Hand washing facilities must be provided for students. Students should be encouraged to take responsibility for the cleaning of enclosures when needed.

## More information

* [American Society for the Prevention of Cruelty to Animals (ASPCA)](https://www.aspca.org/)
* [Australian and New Zealand Council for the Care of Animals in Research and Teaching](http://awionline.org/store/catalog/animal-welfare-publications/animals-laboratories/comfortable-quarters-laboratory-anima)
* [Royal Society for the Prevention of Cruelty to Animals (RSPCA VIC)](http://www.rspcavic.org/)
* [Universities Federation for Animal Welfare (UFAW)](https://www.ufaw.org.uk/)
* Care for your Pet: an Official RSPCA Publication, Snowball D. (1989), Malvern, Victoria, Snowball Educational Publications
* Handle with Care, McGreevy P. (2002), Sydney, Halstead Press ►Rabbits