

Guide to care and treatment of rats, mice, gerbils and hamsters

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POPULAR pets in the order Rodentia represent a diverse group of animals allocated to two main suborders: Hystricomorpha (chinchillas, guinea pigs and degus) and Myomorpha (rats, mice, hamsters and gerbils).

The past decade has seen an exponential increase in the number of rodents kept as pets. Information from the Pet Food Manufacturers Association (2012) estimates 200,000 rats, 500,000 hamsters and 500,000 gerbils kept at pets in the UK.

Rodent owners increasingly expect high-quality veterinary care for their much-valued pets and, because rodents have been long used as models of human diseases in biomedical research, a large amount of information is available to the practitioner, which sometimes can be applied clinically to pet rodents.

It is important to consider the normal feeding habits and dental anatomy of rodents (Yarto-Jaramillo, 2011).

Rodents are often classified in three sub-orders according to the anatomical arrangement of the masseter muscle of the jaw and the zygomatic arch of the skull (zygomasseteric system). The anteroposterior or propalinal (front-to-back) motion of the rodent jaw is enabled by an extension of the zygomatic arch and the division of the masseter into three distinct parts.

This “three muscle” morphology is adapted for different feeding strategies. In rat-like rodents or Myomorpha, both the deep and zygomatico-mandibularis portion of the masseter muscle work together to move the mandible forward and backward and are, therefore, equally adapted for both feeding modes of gnawing at the incisors and chewing at the molars (Cox et al, 2012).

Natural behaviour

Rats are considered one of the best pet rodents due to their relatively large size, calm and social nature, low tendency to bite, and relative intelligence (Lennox and Bauck, 2012).

They can be excellent and fascinating children's pets when handled from a young age and kept in social pairs or groups, and their natural inquisitiveness and dexterity mean they respond well to training and human interaction.

In rats, porphyrin staining around the eye is a non-specific sign of stress that may indicate an underlying disease or a painful state ([Figure 1](#); Miller, 2011).

Normally, the lacrimal secretions produced by the Harderian gland help in ocular lubrication and pheromone-mediated behaviours (fluoresce under UV light), but are removed during routine grooming. In stressed or debilitated rodents this observation can give the false appearance of bleeding from the eyes or nose. Clinical evaluation in these cases is warranted.

Mice (*Mus musculus*) are largely nocturnal, but their social nature (although less compared to other rodents) demands companionship of single sex groups (preferably female litter mates, as sexually mature males tend to fight), breeding pairs, or harems of one male to between three and five females. They usually make good pets for older children (over 10 years) as they move too quickly to be safely handled by younger ones ([Figure 2](#); Lennox and Bauck 2012).

Facial expressions have been studied in laboratory mice to assess pain (Langford et al, 2010). Nose and cheek bulging, orbital tightening and changes in ear and whiskers position may be useful in clinical settings to identify the need of further monitoring and analgesia.

The Syrian hamster (*Mesocricetus auratus*) is often referred to as the "golden hamster" due to its colour, and is the image of a typical pet hamster ([Figure 3](#)), although there are now many colour and hair varieties (including "teddy bear" and "long-haired"). Other common species are the dwarf hamsters (so called because they are a third the size of the Syrian hamster). These include the Russian winter white or Siberian hamster (*Phodopus sungorus*), which has a white winter coat that turns brown during the summer, with a black dorsal stripe and white ventrum. The Campbell's Russian hamster (*P campbelli*) is closely related and has a similar appearance to the Russian winter white hamster ([Figure 4](#)), but does not develop a white coat during the winter months and is not as tolerant of extremely low temperatures. It is more sociable than golden hamsters and can be kept in groups. Other species of hamsters seen in practice are the Roborovski or desert hamster (*P roborovskii*) and the Chinese hamster (*Cricetulus griseus*). Roborovski hamsters are the smallest, measuring 7.5cm (3in) when adult, and are the most recent hamster species to become established as a pet, being successfully bred in the UK only by 1990. The Chinese hamster is less commonly kept as a pet and is not as social as the dwarf hamsters.

Gerbils (*Meriones unguiculatus*) are desert animals with efficient kidneys for conserving water, therefore they need very little water and produce a small volume of concentrated urine. They are

extremely active and do not make good pets for children as they tend to slough their tail skin if they are grasped too firmly (Keeble, 2009). Gerbils are social animals that can be kept in family groups, but they are very territorial and cannibalism of strangers may occur.

Captive housing requirements

To minimise stress, rodents should be housed away from the sight and smell of predators (dogs, cats, ferrets and raptors). Social hamster species should be housed with their cage mates.

Adequate environmental temperatures for these animals vary between 26°C and 28°C with a relative humidity of 30 per cent to 70 per cent, away from direct sunlight and draughts (Kling, 2011). Rodents cannot pant and do not have sweat glands, therefore cannot tolerate high temperatures. Appropriate ventilation and adequate cleaning is of utmost importance to reduce the build-up of ammonia (metaplastic and ciliary inhibiting effects) and carbon dioxide, hence the risk of respiratory infections. Levels of ammonia between 50ppm and 100ppm greatly enhance multiplication of *Mycoplasma pulmonis* in rats and mice (Saito et al, 1982).

Paper-type bedding is preferable to reduce the risk of respiratory disease and immune suppression and because of its lower levels of coliforms and endotoxins (Whiteside et al, 2010). The risk of facial lesions developing increases in gerbils housed on shaving and it is suggested they are provided with sand baths periodically, as with chinchillas (Lennox and Bauck, 2012).

Veterinary care

Integument

Mammary tumours are extremely common, especially in female rats. The mammary tissue is extensive in rodents, therefore mammary tumours can be found anywhere from the shoulder to the perianal area ([Figure 5](#)).

Digestive system

Rats, mice, gerbils and hamsters have continuously growing (elodont) incisors, but short crowned rooted molars (brachyodont andelodont) that stop growing once fully erupted. Their dental formula is I 1/1, C 0/0, P 1/1, M 3/3. They are monogastric and many species (such as hamsters) have a fore-stomach (which has a high pH and microorganisms similar to the rumen) and a glandular stomach.

This feature, along with the presence of a high pressure and strength oesophageal sphincter and the innervations of the diaphragm, accounts for their inability to vomit (Pickering and Jones, 2002).

Hamsters have large paired muscular sacs or cheek pouches, which are evaginations of the oral mucosa extending as far back as the scapula. These pouches are used to transport food, bedding

and neonates, and they can potentially prolapse and are prone to impaction, infection or neoplasia.

Reproductive and urinary systems

The testicles and scrotum in myomorphs are usually larger in relation to the body size and the inguinal canal remains opened, allowing free movement between abdomen and scrotum ([Figures 6, 7](#) and [8](#); Lennox and Bauck, 2012).

Normal urine production is approximately 5.5ml/10g bodyweight and water consumption is 8ml/100g to 12ml/100g bodyweight in healthy rats (4ml/100g to 10ml/100g bodyweight water consumption in gerbils).

It is important to consider any change in the daily husbandry routine as renal disease is common in aged rats, but it can be seen in animals as young as six months of age (Haines, 2010). A free-catch urine sample can be obtained and examined for abnormalities. Baseline values have been reported for rats, mice and hamsters. Urinary calculi have been reported in rats, often associated with haematuria, cystitis, hydronephrosis and obstruction, depending on their location along the urinary tract. Obstruction of the urine flow may also be related to prostatic enlargement due to hyperplasia, but more probably to neoplasia of the gland, which in the rat has multiple lobes ventral, dorsal and lateral to the urethra (Haines, 2010).

In the female, the urinary and reproductive tracts terminate in a separate urethral and vaginal orifice. This makes it easier to identify the origin of haemorrhagic discharge. Female golden hamsters produce a copious vaginal discharge at day two of the oestrous cycle, normally just after ovulation, which can sometimes be mistaken for a sign of infection. Vaginal cytology may help diagnosis (Capello, 2001).

Cystic ovaries are reported to occur frequently in female gerbils, and ovarian granulosa cell tumours are considered the most common neoplasia in this species.

Respiratory system

The main concern with the respiratory tract in rats is bacterial infections, mainly caused by *Mycoplasma pulmonis*. Mycoplasmosis should be differentiated from other bacterial pneumonias caused by cilia-associated respiratory bacillus, *Corynebacterium kutscheri*, *Streptococcus* species, and from mycotic and environmental causes. Many respiratory infections are multifactorial and need thorough investigations to achieve a definitive diagnosis and for an early and more efficacious treatment.

It must be stressed to owners that treatment is not always curative, but, in particular cases, can only alleviate symptoms. The use of particular antibiotics (?-lactams, macrolides, lincosamides, aminoglycosides) via the oral, parenteral route or via nebulisation can cause dysbiosis and fatal

enterotoxaemia, especially in hamsters and gerbils, but infrequently in mice and rats (Kling, 2011). Nebulisation can be useful in delivering antimicrobials, bronchodilators, mucolytics when able to produce particles small enough (3µm) to reach the alveoli (Mayer, 2008). In many rodents, the cardiac muscle fibres surround major branches of the pulmonary veins extending into the lung tissue. This allows infectious agents to spread from the heart, through the pulmonary veins, into the lungs (Kling, 2011).

Endocrine system

Pituitary adenomas are commonly encountered in aged male and female rats ([Figure 9](#)). It has been suggested prolactin-producing pituitary tumours may be associated with a higher incidence of mammary fibroadenomas.

Common techniques

Venipuncture

Traditional venipuncture sites used in laboratory settings (such as the orbital sinus or the heart) are not considered acceptable methods of blood collections in pet animals.

The lateral caudal tail vein, the dorsal tail vein and the ventral tail artery are sites commonly used for safe blood collection in rats.

However, the cranial vena cava is the largest and most easily accessible vessel in all rodent species, although anaesthesia is required ([Figure 10](#)). The intramuscular route should be used with caution or preferably avoided because of the small muscle mass and potential damage in rodents (Miller, 2011).

Fluid therapy

Recommended dosage volume for fluids is 25ml/kg/day maximum subcutaneously (Haines, 2010). Hyaluronidase can be added to subcutaneous fluids to enhance the permeation through the tissues for more rapid availability to the patient.

Analgesia

The use of a multiple analgesic that acts in different ways to enhance effective pain relief (multimodal analgesia) and reduce side effects is beneficial in rodents (Miller, 2011). A practical example of this includes administration of preoperative buprenorphine, use of lidocaine (often combined with bupivacaine) to infiltrate the surgical field, and meloxicam postoperatively. Furthermore, buprenorphine administered 30 minutes preoperatively has an “isoflurane sparing” effect (0.25 per cent to 0.5 per cent) in rats (Criado et al, 2000).

Zoonotic risks

Significant attention has focused on rodents as sources of zoonotic agents, including lymphocytic choriomeningitis virus and *Hantavirus*. A natural reservoir of these viruses is wild rodents; however, cases are reported of transmission from pet rodents. As a rule, applying standard hygienic rules and precautions should prevent development and infection of diseases.

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Figure 1. Red tears or chromodacryorrhea in a rat.

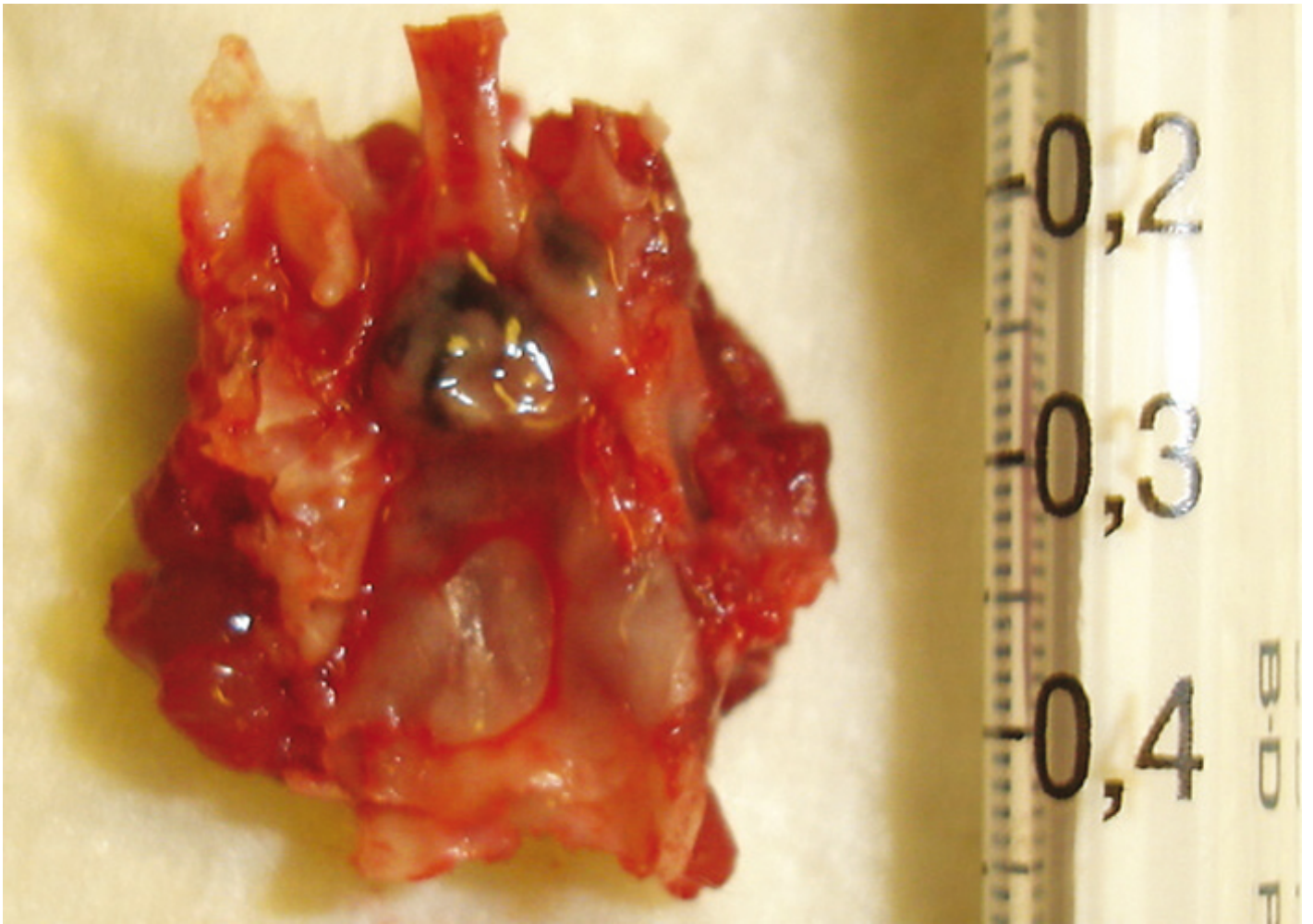


Figure 10 (above). A blood sample being taken from the cranial vena cava in a gerbil.





Figure 2. The correct way to handle rodents.



Figure 3. A Syrian or golden hamster.



Figure 4. A Campbell hamster argente.



Figure 5. A mammary tumour in a rat.



Figure 6. A male gerbil.



Figure 7. A male hamster.



Figure 8. A male rat.



Figure 9 (left). Pituitary tumour in a rat.