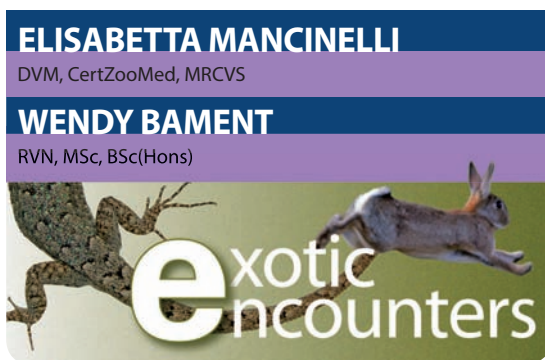


Chinchillas, guinea pigs and degus: what vets need to know

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, hamsters, gerbils).

It is important to consider the normal dental anatomy of rodents as related to their feeding habits (Yarto-Jaramillo, 2011). The zygomatic system is the anatomical arrangement of the masseter muscle of the jaw and the zygomatic arch of the skull. 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.

The common encountered types of rodents are described as sciuriformous, hystricomorphous, and myomorphous. Guinea pigs, chinchillas and degus are hystricomorphs, characterised by an enlarged zygomatico-mandibularis portion of the masseter mus-



ELISABETTA MANCINELLI

DVM, CertZooMed, MRCVS

WENDY BAMENT

RVN, MSc, BSc(Hons)

cle. The superficial portion of the masseter muscle originates on the front edge of the zygoma and moves the mandible forward and backward, while the deep portion adduces the jaw closing the mouth (Cox et al, 2012). This results in an effective grinding action at the molars.

Natural behaviour

Chinchillas are a critically endangered species on the International Union for Conservation of Nature (IUCN) Red List. They are the longest liv-

ing rodent of this size (Jenkins, 2010) and share many anatomical and physiologic characteristics with guinea pigs. Both these South American rodents are monogastric herbivores, have a large caecum and produce precocious young (fully furred, with teeth and opened eyes) after a relatively long gestation period (average 68 days for the guinea pig and 111 days for the chinchilla; Quesenberry et al, 2012).

Guinea pigs are creatures of habit and even slight changes to their environment or die-

tary routine can lead to anorexia and depression. They are very social and should be housed with other guinea pigs, although bullying may occur due to their hierarchical tendencies, especially between entire animals (Figure 1). Chinchillas are nocturnal rodents and have a large cornea, a sensitive retina, and a densely pigmented iris with a vertical slit pupil, which is an adaptation to their naturally bright, high-altitude environment (Yarto-Jaramillo, 2011). Both species are grazing herbivores and rely on microflora to break down fibres for digestion. They mainly eat at night – performing coprophagy in the morning. Above all, they must have ad lib access to good quality timothy hay and clean water.

Degus are diurnal herbivorous rodents with microbial fermentation of ingesta occurring in the caecum (Edwards, 2009) and originate from desert areas of South America. Owing to their highly social nature (Figure 2), degus should be housed in same sex pairs or groups up to four or five individuals to fulfill basic social enrichment needs and to avoid stress. Captive female degus have no regular oestrus cycle, but it has been suggested the presence of the male may induce ovulation. Pregnancy lasts 90 to 93 days and degus are precocial, being born fully furred, with eyes opened and with complete dentition (Edwards, 2009).

Degus have excellent eyesight and their retinas contain rod cells and two types of cone cells, which allow visualisation of UV light. This is thought to have a social function as studies have shown 20 per cent of UV wavelengths from the sun are reflected from the surface of the degu's pale ventrum and also from the urine. This is



Figure 2. Degus should be housed in same sex pairs or groups to fulfil basic social enrichment needs and avoid stress.

possibly used to warn other degus of predators or to identify their territory boundaries (Chavez et al, 2003).

Captive housing requirements

Guinea pigs and chinchillas should not be exposed to high temperatures (18°C to 26°C and 10°C to 20°C are recommended respectively) and humidity (less than 40 per cent). Chinchillas require regular (for example, 10 to 30 minutes a day) dust-bathing opportunities for grooming purposes, although increased access to dust baths may result in stereotypical behaviours, conjunctivitis and dermatophytosis (Johnson-Delaney, 2010).

They both require plenty of hides and secure areas, such as tunnels, boxes and blocked off draught-free areas, especially if housed outside. Water should be either provided via a dropper bottle or, if bowls are used they should be slightly raised or in an area unlikely to be soiled and walked in. Providing plenty of adjustable bedding material, such as shredded paper, hay or straw, allows for natural nesting and hiding behavioural expression and will help prevent pododermatitis (Figure 3).

Guinea pigs cannot jump or climb and owing to their long fragile backs they require slight ramps where gaps between furniture exist. Chinchillas are acrobatic and require plenty of vertical space (more than two cubic meters) in the form of closely positioned shelves at different levels and a wooden nest box for jumping and climbing. Tibial fractures are common when chinchillas catch their legs between cage bars or ladders.

Degu enclosures need to be large (minimum 75cm × 85cm × 80cm for two degus) with shelves at different heights, a solid running wheel, nest box, wooden toys, deep bedding (for burrowing and avoiding pododermatitis), and fruit tree branches to gnaw.

Newspaper, shredded paper, pelleted recycled paper or hay are more suitable than treated substrate to avoid reaction to possible respiratory irritants (Yarto-Jaramillo, 2011). A solid glass vivarium type enclosure will predispose to respiratory problems due to the poor ventilation. Providing a regular (for example, 10 to 30 minutes a day) dust bath helps maintain a shiny coat. Environmental temperature and humidity should be maintained at 24°C and 50 per cent respectively (Edwards, 2009).

Handling

The biggest concern when handling chinchillas is to prevent fur-slip or injury to their slender bones. Chinchillas should never be scruffed, but always secured around their pectoral girdle in one hand, with their hindlimbs sitting on and supported by the other hand.

Guinea pigs do not tend to bite or respond aggressively to handling, but are easily stressed and can damage themselves in an effort to avoid being picked up. Using small boxes they can hide in can be a useful



Figure 1. Guinea pigs are very social and should be housed with other guinea pigs.

NEW
exclusive veterinary formulation

WALKIEE EEEEEASE

YUMOVE ADVANCE
Advanced joint care for advanced joint conditions.

- ✓ Higher levels of proven EFAs*
- ✓ Fast moving synovial support
- ✓ Greater structural support

Find out how YUMOVE ADVANCE could help your clients.
Call 01462 790886 or email vet@lintbells.com

Lintbells VETERINARY

* Bierer & Bul. J.Nutr. 2002 June 132:1634S-1636S.



Figure 3. Providing plenty of soft and non-abrasive bedding material, such as shredded paper, hay or straw, allows for natural behavioural expression and will help prevent pododermatitis.



Figure 4. Suitable restraint technique for guinea pigs: place the body lengthways along the handler's arm with the head tucked behind the elbow and the other hand holding the animal's back.



Figure 5. It is recommended to use a towel or thick leather gloves when first retrieving a degu from an enclosure.

⇒ continued from page 4

way to initially remove guinea pigs from larger enclosures. However, many do not like being touched or stroked over the dorsal head area and will perform a thrusting motion to stop it. Keep their back and rump supported, by holding the pectoral girdle/forelimbs in one hand and sitting the hindlimbs on the other hand. As with many rodents, guinea pigs will feel more at ease being held the right way up and with all feet on a horizontal surface, and so placing the body lengthways along the handler's arm with the head tucked behind the elbow and the other hand holding its back is a suitable restraint technique (Figure 4).

Degus can inflict a powerful bite if they are not used to being handled, are scared or in pain. It is recommended to use a towel or thick leather gloves when first retrieving the degu from an enclosure. Never pick up a degu by its tail due to the risk of de-gloving (Figures 5 and 6). If the degu is known to be tame, the same technique used in guinea pigs and chinchillas can be employed.

Common problems and veterinary care

Inappropriate diet and husbandry are often responsible for many of the common disorders seen in chinchillas and guinea pigs (Jenkins, 2010).



Figure 6. De-gloving injury in a degu's tail after incorrect handling.

Bacterial infections with *Bordetella bronchiseptica* and *Streptococcus pneumoniae* can be triggered by a lack of ventilation, damp and drafty housing conditions. Rabbits should not be housed with guinea pigs as they are carriers of *Bordetella bronchiseptica*, which is pathogenic for guinea pigs. Furthermore, both organisms are zoonotic and can be passed between human and pet (Yarto-Jaramillo, 2011).

Guinea pigs lack the hepatic enzyme 1-gulonolactone-oxidase, responsible for the conversion of glucose to ascorbic acid. Their inability to synthesise vitamin C is responsible for their absolute dietary requirement. If vitamin C is not supplemented in the

diet, clinical signs of scurvy may arise, including anorexia, weakness, decreased mobility, stiffness, diarrhoea, skin lesions, petechiae, subcutaneous haemorrhage, teeth problems and increased susceptibility to secondary bacterial infections (Hollamby, 2009).

Guinea pigs require 10mg/kg to 30mg/kg of vitamin C daily, depending on their physiologic state, as tissue levels are only maintained for approximately four days. Cabbage, kale, dandelions, parsley, spinach, chicory and green and red peppers contain high level of vitamin C, although it may not be sufficient to meet daily requirements. Many of these vegetables also have a high level of calcium and oxalate so they should be fed in small amounts (Jenkins, 2010; Quesenberry, 2012). Clover and alfalfa hay should not be given to adult animals because their high calcium content predisposes to renal calcification (Yarto-Jaramillo, 2011).

Guinea pig commercial pelleted diets are often supplemented with vitamin C, but storage can significantly reduce the vitamin content. Chinchillas require high fibre diets (15 per cent to 30 per cent) in the form of ad lib high quality hay and pellets (five grams to 10 grams per day). Pellets for chinchillas and degus should be longer than those manufactured for guinea pigs and rabbits because they preferentially use their forepaws when eating (Yarto-Jaramillo, 2011).

Digestive system

Chinchillas and guinea pigs have long, crowned (hypodont), open-rooted (aradicular) incisors and cheek teeth that continuously grow (elodont) several inches annually, leading to malocclusion if they are not worn down sufficiently (Legendre, 2002).

Nutrition (including vitamin C deficiency in guinea pigs), genetics and trauma may all play a role in the development of dental disease in these species. Degus also have elodont dentition, and premolars and molars have deeply infolded margins resembling a figure of eight, hence the family and genus name *Octodon* (Edwards, 2009). Tooth wear is ensured by chewing on fibrous food.

Total gastrointestinal time is approximately five hours and degus are coprophagic with 87 per cent of this activity occurring at night. This activity is common in hindgut-fermenting herbivores and represents a strategy evolved to recover nutrients not initially absorbed from the faeces (Sakaguchi and Ohmura, 1992). Unlike guinea pigs, degus and chinchillas are not known to have a dietary requirement for vitamin C (Jenness et al, 1980).

Similarly to other hystrico-

morphs, insulin is only one per cent to 10 per cent as biologically active as the insulin of other mammals; however, degus may exhibit higher insulin concentration or increased numbers of insulin receptor as compensatory mechanisms (Opazo et al, 2004). Consumption of food items high in sugar and starch may contribute to the increased incidence of diabetes mellitus seen in captive degus. Diabetes mellitus has been described in guinea pigs and chinchillas and linked by some researchers to type C retrovirus (Lee et al, 1978) and obesity (Jenkins, 2010) respectively. Serial blood glucose concentrations are required for a definitive diagnosis in rodents because of stress, pain, hyperthermia and shock can all cause hyperglycaemia (Jenkins, 2010).

Reproductive system

Ovarian cysts are frequently seen in middle aged to older female guinea pigs, independent of the reproductive history, and increasing in size with age. Uterine disorders are frequently associated. Guinea pigs are also predisposed to dystocia, especially if bred after seven to eight months of age. Many authors believe this is due to fusion of the fibrocartilaginous pubic symphysis, which typically occurs at this age. Others blame dystocia of mature sows on obesity and vitamin C deficiency (Quesenberry and Donnelly, 2012).

The inguinal canal remains open in all hystricomorphs, which is a feature that has to be considered during orchietomy to prevent herniation.

Common techniques

Venipuncture

As a general rule, the amount of blood that can be safely collected from a healthy animal corresponds to one per cent of total bodyweight in kilos. In small animals, haematoma formation and bleeding after sampling can be serious as this blood is unavailable to the circulatory system. Blood should be collected into tubes with the appropriate anticoagulant, preferably lithium heparin (Wiedmeyer et al, 2007; Pilny, 2008). The jugular vein, cranial vena cava and the lateral saphenous vein are all reliable sites for venipuncture in guinea pigs, chinchillas and degus.

Anaesthesia is required in the majority of cases. Guinea pigs have larger erythrocytes compared to other rodents and unique specialised mononuclear leukocytes called Kurloff cells, which occur in higher numbers in pregnant females (Pilny, 2008). The intramuscular route should be used with caution or is best avoided because of the small muscle mass and risk of potential damage in rodents (Miller, 2011).

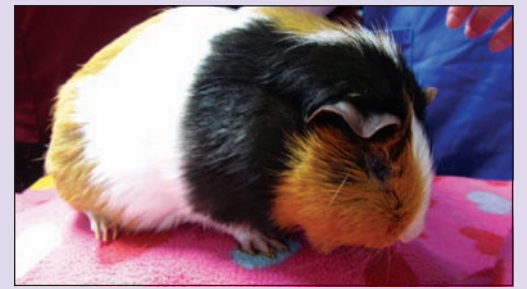


Figure 7. Guinea pig with typical hunched posture due to abdominal pain.

General consideration

Rodents are hindgut fermenters and have a predominantly Gram-positive gastrointestinal flora. They are very susceptible to changes in enteric microbial flora, therefore practitioners should choose antibiotics (especially those with Gram-positive spectrum of activity) carefully, particularly if administered orally, to avoid risks of dysbiosis and enterotoxaemia. Exotic formularies are available for dosages of common and uncommon drugs used (Carpenter, 2013).

Pain recognition

Rodents have been used as animal models in many research facilities. Many studies have underlined how important and difficult pain recognition is in these prey species (Figure 7). To effectively alleviate pain, we must first be able to recognise its different forms and intensity. However, in many species, signs of pain are subtle. It is extremely important to consider accurately any change in food and water consumption, bodyweight or coat condition and the social behaviour of pet rodents.

Conclusion

Hystricomorphs have fascinating anatomical and behavioural characteristics that should be acknowledged when creating treatment and management plans in the veterinary setting. Their sensitive prey-like nature and small size can pose a challenge to the veterinary team, but these species can be surprisingly cooperative and enduring when handled with care.

References

- Carpenter J W and Marion C J (2013). *Exotic Animal Formulary* (4th edn), Elsevier Saunders, St Louis, Missouri.
- Chavez A, Bozinovic F, Peichl L and Palacios A (2003). Retinal spectral sensitivity, fur coloration, and urine reflectance in the genus *Octodon* (Rodentia): implications for visual ecology. *Investigative Ophthalmology and Visual Science* 44(5): 2,290-2,296.
- Cox P G, Rayfield E J, Fagan M J, Herrel A, Pataky T C and Jeffery N (2012). Functional evolution of the feeding system in rodents. *PLoS ONE* 7(4): e336299. doi:10.1371/journal.pone.0036299.
- Johnson-Delaney C (2010). Guinea pigs, chinchillas, degus and duprasi. In Meredith A and Johnson-Delaney (eds), *BSAVA Manual of Exotic Pets* (5th edn), BSAVA, Gloucester, UK: 2: 28-62.
- Edwards M S (2009). Nutrition and behavior of degus (*Octodon degus*). *Vet Clin North Am Exot Anim Pract* 12(2): 237-253.
- Hollamby S (2009). Rodents:

neurological and musculoskeletal disorders. In Keeble E and Meredith A (eds), *BSAVA Manual of Rodents and Ferrets*, BSAVA, Gloucester, UK: 14: 161-168.

Jenkins J R (2010). Diseases of geriatric guinea pigs and chinchillas. *Vet Clin North Am Exot Anim Pract* 13(1): 85-93.

Jenness R, Birney E C and Ayaz K L (1978). Isolation of virus-like particles from urine of guinea pigs (*Cavia porcellus*) with spontaneous diabetes mellitus. *Vet Pathol* 15(5): 663-666.

Legendre L F J (2002). Malocclusions in guinea pigs, chinchillas and rabbits. *Can Vet J* 43(5): 385-390.

Miller A M (2011). Rodent analgesia. *Vet Clin North Am Exot Anim Pract* 14(1): 81-92.

Opazo J C, Soto-Gamboa M and Bozinovic F (2004). Blood glucose concentration in caviomorph rodents. *Comp Biochem Physiol* 137A: 57-64.

Pilny A A (2008). Clinical hematology of rodent species. *Vet Clin North Am Exot Anim Pract* 11(3): 523-533.

Quesenberry K E, Donnelly T M and Mans C (2012). Biology, husbandry and clinical techniques of guinea pigs and chinchillas. In Quesenberry K E and Carpenter J W (eds), *Ferrets, Rabbits and Rodents Clinical Medicine and Surgery* (3rd edn), Elsevier Saunders, St Louis, Missouri: 22: 279-294.

Sakaguchi E, Ohmura S (1992). Fibre digestion and digesta retention time in guinea pigs (*Cavia porcellus*), degus (*Octodon degus*) and leaf-eared mice (*Phyllotis darwini*). *Comp Biochem Physiol* 103A(4): 787-791.

Yarto-Jaramillo E (2011). Respiratory system anatomy, physiology and disease: guinea pigs and chinchillas. *Vet Clin North Am Exot Anim Pract* 14(2): 339-355.

Wiedmeyer C E, Ruben D and Franklin C (2007). Complete blood count, clinical chemistry, and serology profile by using a single tube of whole blood from mice. *J Am Assoc Lab Anim Sci* 46(2): 59-64.

ELISABETTA MANCINELLI

graduated from the University Federico II, Naples in 2002.

After graduating she undertook an internship in small animal medicine and surgery in Padua. She moved to the UK in 2007 and worked in private practice and wildlife charities. She started the first European College of Zoological Medicine residency in small mammals in June 2009. She gained her Certificate in Zoological Medicine in 2010.

WENDY BAMENT

qualified as a veterinary nurse in 2000, and later undertook an honours degree in zoology and a masters in applied animal behaviour and welfare. She started work at the University of Edinburgh Royal (Dick) School of Veterinary Studies in 2007 and works in the exotic animal and wildlife service. She also lectures and has contributed to two BSAVA manuals.

