

A VN's guide to guinea pigs: behaviour, housing and anatomy

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Wendy Bament RVN, MSc, BSc(Hons) discusses the origins, taxonomy, social activity, anatomy and physiology of the popular mammal in the first of a two-part article

GUINEA pigs (*Cavia aperea f porcellus*) are one of the most common small exotic mammals seen in UK practice, and are a popular pet choice owing to their relatively easy husbandry requirements, cheeky character and appealing vocalisations and appearance.

Despite its considerable history of “domestication”, it should be acknowledged this species will still respond in a prey-like manner, and high levels of stress can be a constant threat to animals’ well-being and health. Therefore, careful consideration and thorough advice will be required from veterinary staff for owners to optimise peaceful living environments for guinea pigs.

Origins and taxonomy

The domestic guinea pig (*Cavia aperea f porcellus*) is a descendant of wild guinea pig species, such as *Cavia aperea*, *C fulgida* and *C tschudii*, originating from the lowlands of the Andes in South America. Domestication occurred for religious ceremonies and as a food source, according to archaeological records thought to date back to at least 500 to 1000AD, although possibly as early as 1000BC. In some areas, they remain a staple food item (Johnson-Delaney, 2010; Weir 1974). Much speculation surrounding the origins of the scientific and common names exists, and they vary relative to regions and countries.

- **SUBORDER: Hystricomorpha.** This term is used to characterise the medial masseter muscles entering through an enlarged infraorbital canal (Allaby, 1991).
- **FAMILY: Caviidae.** This refers specifically to guinea pig species characterised by cheek teeth that are hypsodont (“high-crowned”), have a vestigial tail and four digits on the forelimbs and three digits on the hindlimbs
- **GENUS and SPECIES: *Cavia porcellus*.** In Latin, “*porcellus*” means “little pig”, while “*cavia*” could have originated from a South American language meaning rat.
- **COMMON NAME: Guinea pig.** Guinea could originate from “Guiana”, being an area in South America, or the fact they cost one guinea to buy when first imported to Britain. The “pig’ possibly referred to the pig-like vocalisations and their reported resemblance in taste to pork.
- **DOMESTICATION:** the definition is “selective breeding of species by humans in order to accommodate human needs”. It may also involve ecosystem alterations to optimise species survival (Allaby, 1991).

Guinea pigs were first recorded as being introduced as an exotic pet to Europe in the 16th century by Spanish, Dutch and English traders, and they were soon selectively bred and domesticated into a variety of coat characteristics, ranging from block colours and smooth fur ([Figure 1](#)) to colour mixing and long, curly fur. Breeds originated from three main coat varieties: the English (smooth, short); Abyssinian (rosettes); and Peruvian (long). The UK’s breed standards can be consulted at the National Cavy Club (www.nationalcavyclub.co.uk), and posters depicting breeds can be purchased from *Fur and Feather* magazine (www.furandfeather.co.uk).

Natural behaviour and social activity

In the wild...

Wild species of guinea pigs choose to live in small social groups (herds) of usually a single male (boar), a hierarchical harem of between five and 10 females (sows), and any young (pups). Females are documented to demonstrate altruistic behaviour, where non-related individuals will help nurse and rear young other than their own (King, 1956). Bachelor satellite groups, which are also hierarchical, occur where males remain within a sociably acceptable distance to a breeding male’s harem, in the hope a female may venture out of its boundaries and start a new group with a bachelor boar. Both groups will be using the principle of safety in numbers, and studies have clearly indicated their need for “support” from other individuals (Bradley Bays et al, 2010). Guinea pig herds also move about to feed on vegetation during dawn and dusk (crepuscular) to reduce threat from predation, and they do not store food, so rely on good availability of their dietary needs. They take shelter in rock crevices, and in grassy plains they will establish tunnel networks in the long grass or take advantage of other animals’ burrows.

When threats or predators are detected, guinea pigs will “freeze” or become stationary, usually followed by explosive scurrying for shelter. All behaviours are usually accompanied by vocalisations from a wide repertoire (11 have been identified), including purrs (social interactions), whistles (anticipation of food), chattering, squeals and shrieks (when in pain or fearful), along with some that are inaudible to humans (Hrapkiewicz and Medina, 2007). Therefore, guinea pig behaviour and vocalisations can be useful indicators of welfare that aids in your emotional assessment of them.

In captivity

Captive or domesticated guinea pigs should have their wild origins considered to optimise welfare standards. This is because their prey instincts have not been eradicated, despite their external appearance being altered by domestication. They are creatures of habit, and even slight changes to their environment or routines can lead to anorexia and depression. Guinea pigs should be housed in the presence of other guinea pigs, but bullying may occur due to their hierarchical tendencies. For instance, neutered males are less likely to fight, and mixed-sex groups should be restricted to a single male with one or more females. Mixing guinea pigs with other species, such as rabbits and chinchillas, is not recommended, due to lifestyle, dietary and behavioural differences and the potential for disease transmission. Rabbits can carry diseases asymptotically, including *Bordetella bronchiseptica*, which can be devastating to guinea pigs.

Captive housing requirements

The captive housing requirements of guinea pigs should, in their very basic form, include plenty of hides and secure areas, such as tunnels, boxes and blocked off draught-free areas, especially in outdoor housing ([Figure 2](#)). The floor space should be a minimum of 0.9m² per adult (Johnson-Delaney, 2010). Water should be provided either via a dropper bottle or a bowl. If bowls are used, they should be slightly raised or in an area unlikely to be soiled and walked in (for example, not the cage perimeter). Providing plenty of adjustable bedding material – such as shredded paper, hay or straw – allows for natural nesting and for hiding behavioural expression, and will also help prevent pododermatitis.

Guinea pigs can't dig, so they can be enclosed on grass without fear of any of the great escapestyle tunnel attempts that are typically seen with rabbits. Additionally, good ventilation and humidity control (40 per cent to 70 per cent) is important, and temperatures should be maintained – ideally between 12°C and 22°C – to avoid heat stress. Plenty of bedding material should be provided for the lower temperatures encountered in outdoor accommodation (Keeble, 2009). Guinea pigs cannot jump or climb, and owing to their long, fragile backs they require slight ramps where gaps between furniture exist, for example between the hutch and run. Like other rodents and rabbits, guinea pigs are masters of chewing, so this should be considered when enclosure materials are chosen, or when they are allowed to exercise indoors around electrical cables and so on.

Anatomy and physiology

Musculoskeletal

- **SKULL.** Guinea pigs have a typical rodent-shaped head, with relatively small eyes on the sides of the skull, rounded hairless pinnae and large tympanic bullae. These assets provide a well-developed sense of hearing, almost 360 degree colour vision and olfaction.
- **DENTITION and BUCCAL CAVITY.** The dental formula is: I 0/0, C 0/0, PM 1/1, M 3/3. Guinea pigs have diphyodont dentition (two sets of teeth during lifetime) and the permanent set occurs early postnatally at the latest. The teeth are open rooted and continually growing (Jekl, 2009). The space where the canines would be is called the diastema, and is seen in other rodents and lagomorphs. The characteristic rodent incisors are chisel-shaped, although the enamel on the labial (surface against the lip) surface is white, rather than pigmented as with other rodents, and the lower incisors are longer than the upper ([Figure 3](#)).

The pre-molar and molars (referred to as “cheek teeth”) are used for grinding vegetation and are angled obliquely from lateral to medial. Chewing movements are both unilateral and bilateral. Guinea pig dentition is well designed for dealing with regular mastication of high-fibre coarse vegetation, which is matched by continually growing teeth. Therefore, diets lacking in high fibre will lead to malocclusions and incisor overgrowth, which if not dealt with early on will distort the tooth’s growing position. The soft palate is connected to the base of the muscular tongue, and the oropharynx and pharynx communicate via a hole in the soft palate called the palatal ostium, which can make intubating challenging (Timm et al, 1987). Guinea pigs do not possess any laryngeal ventricles and just have small vocal folds, despite being so vocal.

- **VERTEBRAE and PELVIS.** The vertebral formula for guinea pigs is: C7, T13(14), L6, S2(3), Cd4(6). The characteristic squat appearance of guinea pigs is mainly owing to their thickened neck from increased soft tissue, reducing mobility of the cervical vertebrae, and a flattened back with no external tail.

Although they have some coccygeal vertebrae (four to six), this is considerably fewer than found in other rodents (27 to 30 in rats and mice). The female pelvis has a fibrocartilaginous suture line at the pubic symphysis, which relaxes and stretches during parturition to facilitate the pup’s passage through the pelvis. This suture line fuses usually within the first year and it is suggested sows are mated before they reach seven months to ensure successful parturition.

- **LIMBS and DIGITS.** As with most rodents, guinea pigs have small cylindrical clavicles (collar bones), but despite their stunted appearance guinea pig limbs are relatively longer than those seen in other rodents. Guinea pigs have four digits on the forelimb and three on the hindlimb.

Respiratory system

Guinea pigs have a similar lung anatomy to other rodents, with four lung lobes in the right lung and three lobes in the left lung. The trachea is surrounded by the thymus instead of being located in the thorax, as for other rodents, and the bilobed adrenal glands and broad spleen also vary from other rodents, as they are disproportionately large (O'Malley, 2005).

Digestive system

The stomach of a guinea pig is undivided (monogastric) and entirely lined with glandular epithelium with acid and pepsinogen secretin cells. The stomach always contains food and the cardiac sphincter is strong, minimising the ability to vomit. The caecum lies on the left side, takes up most (up to 70 per cent) of the remaining abdominal space, and has sacculations (haustrae) caused by three smooth muscle bands, called taeniae coli. The guinea pig's gastrointestinal flora is mainly gram-positive, and is thus very sensitive to antibiotics with a gram-positive spectrum. Use of such antibiotics (for example, penicillins) allows excessive growth of pathogenic *Clostridium difficile*, which releases clostridial toxins. The colon does not possess any haustrae, unlike the chinchilla colon.

Urinary system

The urine produced by guinea pigs is cloudy, yellow, naturally alkaline and may contain lots of crystals, which is typical of herbivores. In females the urethra exits close and caudal to the vagina with a reduced papilla, which can be misperceived as a shared urogenital opening.

Reproductive system

- **MALE.** Male guinea pigs are referred to as boars. The genital (prepuce) orifice is round in males and the penis can be protruded by gentle pressure above the prepuce. Boars do not have an obvious scrotum. Adult boars possess relatively large testes, which are easily seen when relaxed, and their os penis can be palpated midline. The penis has two prongs at its end, and there are two spurs that lie just within the pouch separating the anus from the genitalia. These spurs are thought to match grooves in the female's reproductive anatomy (Girling, 2003).

Guinea pig boars possess a pair of vestigial nipples in the same location as sows' mammary glands, but the space between genitalia and anus is longer in boars to accommodate the testes. Boars become sexually mature at 12 to 16 weeks, and are usually bred at three to four months of age (Johnson-Delaney, 2010). [Figure 4](#) shows the male genitalia.

- **FEMALE.** Female guinea pigs are referred to as sows. As with other rodents, guinea pig sows have separate urethral and vaginal orifices. The classic Y-shaped genitalia is demonstrated where the top branches of the "Y" point cranially and surround the urethra opening. The vulva is located at the middle of the "Y" and the anus is tucked behind a small mucosal envelope at the base of the "Y". When taking a rectal temperature, great care must be taken in both boars and sows, as it is

easy to falsely insert the thermometer into the vulva, or push up against the pouch between anogenital openings. The female genitalia are shown in [Figure 5](#).

- **BREEDING.** Sows need to be bred before seven months of age to prevent dystocia from a fused pelvis (see aforementioned musculoskeletal text), and are usually bred at around two to three months. They are continuously polyoestrous (every 15 to 17 days), nonseasonal and have spontaneous ovulation, and oestrus usually lasts six to 12 hours (Girling, 2003). Signs of oestrus are an arched back when stroked (lordosis) and a swollen vulva, and any present males will “purr” and fuss over the sow, mounting and licking the anogenital area.

A couple of hours after mating, a copulatory plug can be found in the cage. The plug is formed in the vagina and made up of the boar’s semen, and is thought to prevent semen leaking out and prevent fertilisation by other boars (Quesenberry and Carpenter, 2004). Pregnancy can be identified two to three weeks post-mating by palpitation or ultrasonography. When nearing the end of the gestation period, sows can achieve double their pre-gestation weight. When the hormone relaxin initiates parturition, the pubic ligaments start to spread, widening the pelvis in preparation for passing the relatively large pups. Immediately following parturition, the sow will usually eat the placenta. Nest building behaviour is not seen in guinea pigs, and pups are precocial (fully furred, with open eyes and ears) and capable of consuming small amounts of solid immediately. Altruistic behaviour is observed in guinea pig sows, where groups of multiple females will suckle unrelated pups to optimise their survival (Johnson-Delaney, 2009). Pups, particularly females, will reach sexual maturity at four to six weeks of age, and will need to be weaned prior to this (Keeble, 2009).

- **GLANDULAR and FAT PADS.** Guinea pigs have scent glands that are more prominent in boars, owing to androgenic influences. The animals use them for marking, they are found on their rump and dorsum, and they can clearly be seen pressing the gland against objects in their environment.

Boars particularly can get excessive oily secretions from the glands, resulting in localised matted, greasy fur. The pouch between the anogenital region in the boar houses glands that empty into anal sacs and produce a white discharge with a strong odour. The scruff region of the guinea pig has a substantial subcutaneous fat pad and it should be noted that injecting large volumes of fluid in this region will be very painful (Girling, 2003).

Blood sample sites

The most useful blood sampling sites in guinea pigs are the jugular, cranial vena cava or the femoral, cephalic or saphenous veins, with a maximum total sample volume of one per cent of the bodyweight to be taken (Johnson-Delaney, 2010). Heavy sedation or general anaesthesia is likely to be required to obtain blood samples to avoid excessive stress. [Figure 6](#) depicts blood sampling of the femoral vein.

Haematology

The main areas to highlight in guinea pig haematology are that in a white blood cell count, more lymphocytes than neutrophils are present, and inclusions, called Kurloff bodies, are visible in intracellular space surrounding Kurloff cells (monocytes). They play a role in physical immunity and are more commonly seen in females, particularly during gestation, as they concentrate in the placenta.

Part two of this CPD article will cover handling, nutrition, nursing and common health problems.

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