XENARTHRANS: ‘ALIENS’ ON EARTH

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JONATHAN CRACKNELL finds that hanging around with sloths and their fellow Xenarthrans offers up exciting challenges

XENARTHRANS: the name sounds like a race from a low-budget science fiction film.

This is actually a super-order of mammals that get their name from their “alien” joint, which is exhibited in the vertebral joints.

The Xenarthrans include 31 living species: six species of sloth, four anteaters and 21 species of armadillos – all of which originated in South America.

Historically, these animals were classified within the order Edentata (meaning “without teeth”), which included pangolins and aardvarks. It was realised that this was a polyphyletic group, containing unrelated families. Therefore, the Xenarthra order was created.

The Xenarthrans are a well-represented order in captivity, with banded armadillos (*Dasypus novemcinctus*) becoming one of the new “exotic” exotics to be presented to clinicians. In zoological collections, giant anteaters (*Myrmecophaga tridactyla*), southern tamanduas (*Tamandua tetradactyla*), and sloths (typically the southern two-toed sloth – *Choloepus didactylus* – although others are present) are among the more common species housed in captivity.

Every species has its own needs and oddities. With this brief review of each species, the author will look at basic anatomy and physiology, along with a quick review of some of the more commonly reported complaints for this group of animals.

Giant anteater

The giant anteater's most obvious feature is its long tongue and bushy tail. They are approximately 1.5 to two metres long and weigh in the region of 18kg to 45kg. They have no teeth, but the hard palate is ridged. The stomach has grinding plates that effectively replace the dentition.

The tongue attaches to the sternum and can protrude 60cm from the small mouth. Saliva coats the tongue and ants stick to it – 35,000 can be consumed in a single day. A further adaptation to their unusual diet is the large claws on the forelimbs that are used for opening ant or termite nests.

These claws, which are also found in tamanduas, must be considered significant defensive tools; care must be taken when handling these animals. There is a case of a spectacled bear (Andean bear) being eviscerated by a giant anteater in a mixed exhibit in South America. Remote chemical restraint or push boards should be used for invasive procedures, despite the usually docile nature of tamanduas.

The larynx is placed at the thoracic inlet, which makes intubation impossible without modified endotracheal tubes combined with long endoscopes. However, in the author's experience, face masks have been used to maintain anaesthesia.

Some literature suggests the use of a tracheostomy in emergency cases. However, the author advises against this, as a true tracheostomy requires a thoracotomy, and pharyngostomy must be undertaken with care so that the clinician does not damage the salivary and masticatory apparatuses, which are essential for the animal to survive postoperatively.

The giant anteaters have a reduced metabolic rate (approximately 34 per cent compared to similarly sized Eutherian mammals) due to their low-energy diet. As such, the body temperature is also lower by 3°C (the average temperature is 33°C when active).

Research looking at tympanic membrane temperatures found that giant anteaters exhibit shallow torpor when asleep and can reduce their body temperature between 4°C and 6.5°C. Therefore, when assessing temperatures, it is important to ensure that the time of day and activity level are assessed and recorded. Radiography is fairly straightforward, but the oval body shape makes rotational artefacts possible; the careful use of wedges can avoid these difficulties.

Medical problems reported in giant anteaters are most often related to inappropriate husbandry or nutrition. These problems include:

• bacterial pneumonia;

• dermatitis;

• anteater pox;

• dilated cardiomyopathy, possibly secondary to taurine deficiency (related to feeding commercial dog foods);

• vertebral hyperostosis, thought to be secondary to feeding cat-based diets (related to excessive vitamin A or D);

• hypovitaminosis K, manifesting as nosebleeds (some cases due to trauma) or haematuria or melaena or anaemia;

• vaginal polyps;

• gastric ulceration;

• seizures;

• hydrocephaly;

• strangulation of the tongue secondary to substrate or tendons being left in the food;

• gastrointestinal foreign bodies;

• swollen salivary glands with eventual rupture; and

• chronic diarrhoea secondary to excessive liquid feeds.

Claw injuries are often reported and anteaters should be kept on soft substrates. Ecto and endoparasites are also reported. To this author's knowledge, there are no contraindicated pharmaceutical agents in the giant anteater, but readers are advised to confirm this themselves.

Tamanduas

There are two species of tamanduas: the northern (*Tamandua tetradactyla*) and the southern (*T mexicana*). Both resemble small, arboreal giant anteaters and, as such, exhibit similar physiological and anatomical traits – with the exception that their tail is prehensile and is used to support the body when climbing through trees.

They weigh between 2kg and 7kg, and are approximately 0.8m long. The two species should not be considered the same, as both have very different requirements for enclosure size and design. However, both require an abundance of branches for climbing. Despite being smaller, they are extremely strong animals and their claws can cause considerable crushing injuries and damage.

They are becoming popular exhibit animals, but little has been reported regarding medical problems. This author is aware of a case of pneumonia and a uterine infection, both of which responded well to conservative therapies. It is likely that their medical problems are similar to giant anteaters, with inappropriate husbandry techniques an important factor.

Sloths

Six sloth species are currently recognised. One of these, *Bradypus pygmaeus,* was only "discovered" as recently as 2001.

The most common representative in captivity is the southern two-toed sloth, but others include the Hoffmann's two-toed sloth (*Choloepus hoffmani*) and the other three-toed varieties (*Bradypus* species).

Sloths also have a lower body temperature, which varies with the surrounding temperature; this is in the region of between 32.7°C and 35.5°C (the temperature is slightly higher in two-toed sloths). As such, they are unable to cope with cold temperatures well.

They have a coarse coat and, in the *Bradypus* species, this parts over the ventral abdomen, fanning dorsally to allow water to run off when they hang upside down. In the wild, most sloth species have seasonal symbiotic algae, which grow in the hair shafts and provide camouflage for the sloth. This does not occur in animals less than two months of age, possibly because the hair has not developed suitably, or due to the seasonality of the algae.

The *Choloepus* species have larger brains than the other species, with a well-developed olfactory bulb. Interestingly, after a cerebellectomy was performed in the 1970s, it was found that it had a minimal effect on the movement of these animals – it was assumed that, due to their slow movement, minimal fine control was needed. This finding should be considered in trauma cases or intracranial lesions.

Sloths are extremely shortsighted and lack ciliary muscles, meaning they cannot accommodate for near vision. They also have very convex corneas and thick lenses. Sloths have been reported to blink with one eye at a time, and this should be discriminated from blepharospasm. All sloths are folivorous. Compared to other Xenarthrans, sloths also have a low metabolic rate, thought to be in the region of 40 to 45 per cent of other Eutherian mammals of comparable size. However, most species perform 10 per cent of the work of an equivalent mammal.

They are a foregut fermenter, with a strange sacculated stomach that is unique to these species and makes up to a third of their bodyweight.

Cardiovascularly, they have relatively small hearts with large atria. There is a wealth of information on the cardiac physiology of *Bradypus* species, and telemetry studies have shown biphasic

changes in the heart rate related to motor activity. Heart rates are in the region of 71bpm and 80bpm.

Other oddities of note are the location of the adrenals, which are high up in the abdominal cavity and unassociated with the kidneys. The gall bladder is present in *Choloepus* species but not in the *Bradypus* species.

The spleen is triangular and intimately attached to the pancreas in *Choloepus* species, but not *Bradypus* species. Many other strange anatomical features are found when you start delving inside sloths.

Out of the Xenarthrans, sloths have the largest amount of data regarding anatomy and physiology. Medically, sloths in the wild may be carriers of arboviruses with associated viraemia, with no clinical signs in the animals screened; these include yellow fever, Venezuelan encephalitis viruses and the St Louis encephalitis virus. The *Bradypus* species is thought to amplify hosts, and this should be considered if animals are being imported from range countries. Haemoflagellates are also common in caught wild individuals, but this is true of most Xenarthran species.

Sloths provide a habitat for a number of invertebrate species, including ticks, sloth beetles, sloth moths and sloth mites.

The captive medical problems documented include emaciation or malnutrition in animals from private collections following improper nutrition (the two-toed sloths have a more diverse diet than the three-toed variety).

Pneumonia was also relatively common and was seen in the winter and spring and, as such, was likely to be related to husbandry concerns.

Constipation has been reported, but it should be noted that sloths will only regularly defecate every four to five days in the wild and this can be true in captivity. Diarrhoea has been associated with endoparasitism.

Claw injuries are also common, and this author has seen several cases of onychia secondary to twisted claws; it is unclear whether the nail pathology was a primary cause or related to historically inappropriate nutrition. Other pathologies have been reported, but are less frequent.

Armadillos

Armadillos are the final Xenarthran group. They are a familiar species due to their protective armour. The typical species seen is the nine-banded armadillo, but there are a further 20 species, varying from the pink fairy armadillo (*Chlamyphorus truncatus*), which is 10cm in length, to the giant armadillo (*Priodontes maximus*), which can weigh up to 50kg.

Armadillos are used as the experimental model for leprosy in humans and, as such, a wealth of material is available for them – although this is limited to a very narrow field. Leprosy is the least infective mycobacterial disease. Armadillos are especially sensitive to infection, either due to their low body temperature or to some failure of the immune responses.

Incubation varies from 10 months to four years. They often appear grossly normal, with no lesions present, progressing to nodulous lesions within the skin and viscera. Treatment is possible, but is often not undertaken.

The hard external carapace makes examination difficult and, like hedgehogs, examination is facilitated by the use of anaesthesia. The saphenous veins are the easiest to obtain blood from. The jugular is also useful, as in the other Xenarthrans. The armadillo’s temperature is between 32°C and 35°C.

Superficial wounds can be treated using diluted iodine solutions. However, carapace wounds can become infected rapidly, and require aggressive systemic antibiosis.

Pododermatitis, gastrointestinal impaction and a multitude of endoparasites have been recorded. It should be noted that captivity-bred specimens are available, but caught wild animals still predominate.

Summary

The Xenarthrans are an interesting group and applying the basic clinical treatments to these patients can be a rewarding experience, especially as you scratch the surface and begin to marvel at the unusual aspects of their comparative anatomy and physiology.

Tamanduas are smaller than giant anteaters and, being arboreal, have a prehensile tail to support the body.

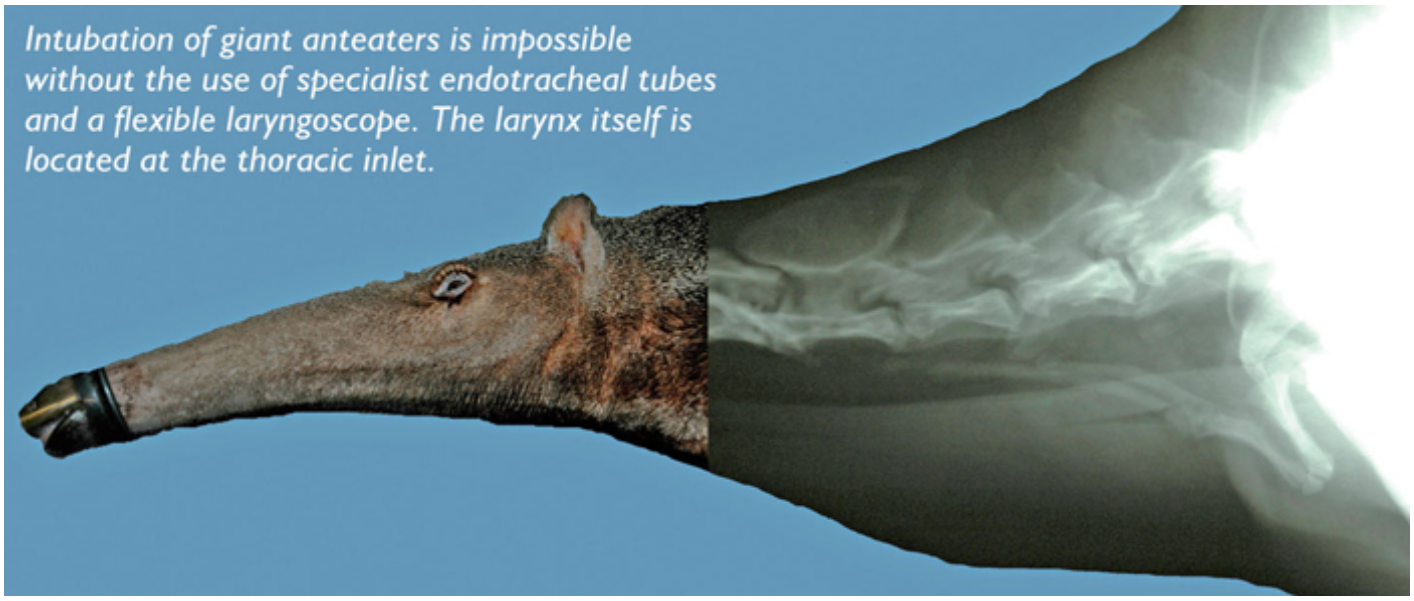
With their long noses and bushy tails, giant anteaters are easily identified.

Armadillos are becoming one of the more common “exotic” pets to be presented to clinicians.

The Xenarthrans get their name from the unusual extra joint found on the vertebral bodies.

Sloths can be challenging animals to work with due to their unique physiology and

anatomy.



Intubation of giant anteaters is impossible without the use of specialist endotracheal tubes and a flexible laryngoscope. The larynx itself is located at the thoracic inlet.