



# Management of forelimb wounds in a juvenile captive capybara



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**ABSTRACT** A 3-day-old capybara presented with deep cutaneous wounds to both front feet. The wounds were treated with ozonated oil, antibiotics, pain relief and cleaning, over a period of 6 weeks. Veterinary treatment in a zoo environment presents challenges that can impede normal wound-healing processes. The juvenile could not be kept in a clean environment and could not be housed separately from its mother, and bandaging could not be used due to the risk of ingestion. Treatment required daily capture of the juvenile while mitigating the mother's defensive behaviour. Although the capybara suffered partial loss of digits, recovery was sufficient for normal activity.

**Keywords** zoo, welfare, exotic, wound

## Case presentation

The capybara (*Hydrochoerus hydrochaeris*) is a South American caviomorph and is the largest living rodent in the world. Capybaras are popular display animals at zoos and, at Shepreth Wildlife Park (SWP), visitors are often heard comparing these animals to their own pet guinea pigs. They contribute significantly to park income via visitor experiences and virtual adoptions.

At SWP on 5 January 2021, two infant capybaras were born to a first-time mother. Although the mother was attentive to the juveniles and they were seen to suckle, there was concern that the extremely cold weather could be detrimental to them if the mother did not ensure they stayed next to her and followed her into heated areas. Indeed, at the end of the day of their birth, the mother was seen inside a heated den sleeping next to a radiator, having left the juveniles outside. They were put inside with their mother (**Figure 1**) and the sliding door to the outside was closed. The intention was to keep the juveniles inside with the mother for a few days to ensure they were well bonded.

On the third day of their confinement, two small linear wounds (approximately 2 cm long on the right forefoot and 3 cm long on the left) were seen on the dorsal areas of both front feet of the smaller juvenile. Catching juvenile animals has inherent risks, so it was decided to monitor the wounds and only intervene if necessary. It was assumed they might have been caused by the juvenile pushing its feet under an object, such as the food trough. Staff planned to monitor these wounds for signs of healing or infection.

However, the next day, both feet were seen to have extensive and deep lesions. Although the cause of this was unknown, the conclusion drawn was that the juvenile was irritated by the wounds on its feet and had gnawed at the source of irritation, creating the lesions. SWP does not have an on-site veterinary surgeon (VS) and instead contracts external services. Photographs



**Figure 1.** Capybara mother and offspring in the internal enclosure; the patient is in the foreground.

of both feet were sent to the VS for assessment, accompanied by a description of the timeline and the current husbandry of the family group.

## Considerations for treatment

Although the wounds in this case were not abnormal, the management process for treatment within a zoo environment differs significantly from that of small animal practice due to the many challenges involved. Unless removed to an off-display hospital facility, which is not usually feasible for reasons of stress to the animal and disruption to social groups (Hosey et al., 2013), a zoo animal must have its wounds treated within the enclosure, which is a difficult environment to keep clean. Wild animals are unlikely to tolerate e-collars to prevent tampering with the wound – in primates, hands as well as mouths can be used to interfere with wounds, and within groups, enclosure-mates can also tamper with wounds (Samantara et al., 2013). Bandaging is also unlikely to be tolerated and if bandaging material is ingested it can lead to impaction (Hudson & Romagnano, 2010).

Many zoo animals, particularly in winter, require substrate for bedding, such as wood shavings or straw, both of which can enter a wound (Rees, 2010). Captive wild animals may stand in urine or faeces, making foot wounds difficult to manage. Unless trained to tolerate the application of topical treatments, most wild animals will require capture and restraint for each treatment



session. This can be stressful for the animal and its enclosure-mates, and potentially dangerous for the staff involved (Rees, 2010). Delivery of oral medications can be difficult if unpalatable, and if hidden in palatable food they can be difficult to deliver to the animal if it is low-ranked within a social group (Rees, 2010). Within zoos, animals are often only observed during the keepers' working hours, so any behaviours detrimental to wound healing are not able to be curtailed overnight. Also, zoos are open to the public and zoo visitors may be distressed by seeing unbandaged wounds and by witnessing the capture, restraint and treatment process.

## Treatment

The VS prescribed injectable amoxicillin every 72 hours, oral meloxicam (Metacam®, Boehringer Ingelheim) daily and ozonated oil (O2 Zap®, Global Healing Center) topical application daily, following flushing with chlorhexidine gluconate (Hibiscrub®, Regent Medical Ltd). This treatment required the capture and restraint of the juvenile. Capybaras are known to be protective parents and have very large incisor teeth, which are used as their primary defence (Lord, 1994). This meant two people were needed to capture the juvenile – the first to hold back the mother capybara with a large protective board, shielding the second person who caught the juvenile in a net. The juvenile was then removed from the enclosure to a service area, where it was weighed and treated. This was repeated daily.

The enclosure was kitted out with a 5 cm layer of pine-wood shavings and straw bedding. The capybaras urinated and defecated in one area, so this was relatively easy to keep clean, but straw had to be removed from the wounds using tweezers at every treatment session. It was hoped that the aversive taste of the chlorhexidine gluconate and ozonated oil would prevent further self-harm.

The group had to be kept inside to support ease of capture, to allow both juveniles to nurse, to protect against the cold weather and to prevent the injured juvenile from exposing its wounds to the pools of faeces and urine outside. Daily photographs of the wounds were taken and submitted to the VS for monitoring (Figures 2–5).

## Outcome

After 6 weeks, the VS examined the wounds and considered them sufficiently healed to allow access to the enclosure. The wounds had completely granulated and closed, but the majority of the two middle toes on the left foot had been lost. Gait observations indicated that the juvenile had no issues with walking and no signs of pain when doing so. After release, keepers made daily observations of the health of all four capybaras. The family group was seen to have positive interactions, with both parents affectionate



**Figure 2.** Day 3 – Following the loss of necrotic skin, the full extent of the wounds can be seen.



**Figure 3.** Day 7 – Proliferation phase and reduction in wound size.



**Figure 4.** Day 13 – Maturation/remodelling phase and loss of the distal phalanx of the third digit.



**Figure 5.** Day 32 – Healing almost complete. The distal phalanges of digits 2 and 3 are missing.

to, and protective of, the juveniles. The injured juvenile showed no signs of pain or infection, and no issues with locomotion.

## Discussion

There were three key causes for concern during the treatment process. First, that systemic infection could cause death. Second, that maternal stress or handling of the juvenile could cause the animal to be rejected. Third, that healing may not be sufficient to allow normal locomotion when the animal reached adult weight.

Infection control is challenging in the zoo setting, particularly in cases like this where the family group needs to be kept together to avoid maternal rejection. In this case, the animals could be isolated in the inside section of their enclosure. This approach is similar to that described by Samantara et al. (2013), where a chimpanzee (*Pan troglodytes*) had to be treated for a cheek abscess but could not be separated from the group without affecting the stress levels and appetite of conspecifics.

Ozonated oil is created by bubbling ozone gas through unsaturated vegetable oil (such as olive oil) to create a gel with ozone in suspension (Anzolin et al., 2020). Ozonated oil has beneficial effects on wound healing due to its antimicrobial properties, moderation of inflammation, debridement effect, stimulation to angiogenesis and promotion of wound cicatrisation (Anzolin et al., 2020). Topical application of ozonated oil on acute cutaneous wounds in guinea pigs was shown to accelerate wound healing relative to the application of ordinary oil or no treatment (Kin et al., 2009).

Care was taken when purchasing the ozonated oil for use in this case. Many products described as 'ozonated

oil' are readily available for purchase on the internet, but often these oils are insufficiently ozonated to have therapeutic effect. Sufficiently ozonated oils become colourless and thicken to the consistency of petroleum jelly (Uysal, 2014). Ozone is unable to be stored, and must be generated from oxygen, then immediately bubbled through the oil for several hours for sufficient ozonation (Uysal, 2014), so genuine ozonated oil is expensive to manufacture and costly to purchase. The product degrades in UV light and must be sold in opaque or darkened packaging.

Maternal rejection of the offspring was a serious concern. Stress (such as that caused by keepers regularly catching offspring) is a primary cause of maternal rejection in zoo animals (Thomson et al., 2010). Capybaras are known to practise infanticide when encountering young from another group (da Cunha Nogueira et al., 1999), so there was a possibility that the juvenile might be injured or killed by its mother if she did not recognise it as her own. If the mother had rejected the juvenile, a decision between hand-rearing and euthanasia would have been made. Factors in this decision would have included the conservation value of the species, time and resources required to hand-rear the juvenile, and the likelihood of its successful integration into a capybara group.

Defensive behaviour by the mother towards keepers – including lunging – meant that the offspring had to be removed from the enclosure, treated quickly and returned promptly. Precocial caviomorph rodents use olfactory clues to recognise their offspring (Tang-Martínez & Congdon, 2016). The concern was that the smell of humans, chlorhexidine gluconate and ozonated oil (although it did not have a strong scent) would cause the mother to reject the juvenile. However, capybaras also rely on auditory cues to recognise their offspring (Lord, 1994; Barros et al., 2011).

When the juvenile was returned to the enclosure, the mother at once sniffed it, responding with vigilance behaviours (flaring nostrils, wide eyes, erect posture) previously seen by keepers as precursors to lunging or fleeing. However, once the juvenile had vocalised, the mother relaxed and touched her nose to its nose – a behaviour indicating intimate recognition in capybaras (Lord, 1994).

Although the juvenile showed normal gait on release, it is difficult to ascertain future potential effects on the animal once it reaches adult weight. There is the possibility of long-term issues resulting from unequal weight distribution. However, many mammals have thrived after full-limb amputation (Forster et al., 2010). Of more concern is the loss of webbing around the toes, which could affect locomotion in water when access to a lake is given in summer. Both potential issues will be monitored across the animal's lifespan.



## Summary

Managing even simple wounds in captive wild animals presents unique challenges. Animals can rarely be fully hospitalised or kept in an antiseptic environment. If they do not fully heal from injuries, they may not be able to function as part of a captive group.

If treatment causes rejection from a social group, it becomes necessary to have a management plan for a single animal that takes into account its welfare needs. For these reasons, careful planning is required before beginning treatment.

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