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Operant-conditioning programme for White rhinoceros, Black rhinoceros and Indian or Greater one-horned Asian rhinoceros

Ceratotherium simum, Diceros bicornis and *Rhinoceros unicornis*
at Whipsnade Wild Animal Park, Dunstable, UK

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This paper describes the development of an operant conditioning programme for rhinoceros at Whipsnade Wild Animal Park, Dunstable, UK. The programme was designed to facilitate the treatment of a range of health conditions and to allow husbandry procedures to be carried out without the need of anaesthesia. A successful conditioning programme requires good planning, consistency and precise record keeping. Routine management practices can be now carried out within a safe and largely stress-free environment for both rhinoceros and animal-management staff.
Key-words: health, husbandry procedures, management, operant-conditioning programme, rhinoceros

Thirty years ago, the five extant species of rhinoceros numbered over 70 000 (see http://www.rhinos-irf.org). Today, fewer than 18 000 rhinoceros persist as a direct result of human activities (IUCN, 2004; http://www.rhinos-irf.org). Poaching, to supply the trade in rhinoceros horn, and loss of habitat, through logging and agricultural use of land, have accelerated population decline and four species are listed as Critically Endangered (IUCN, 2004; Amin, Thomas *et al.,* this volume). Zoological collections can support the long-term survival of rhinoceros by maintaining well-managed captive populations, enhancing public awareness and education, and promoting *in situ* and *ex situ* conservation initiatives (Foose & Wiese, this volume).

Managers of living collections must consider the physical, behavioural and psychological needs of the animals in their care (see also Hutchins & Kreger, this volume). Encouraging animals to participate in routine husbandry procedures can be as important as providing optimal nutrition (Clauss & Hatt, this volume), a complex habitat and an appropriate social structure. At time of writing Whipsnade Wild Animal Park (WWAP), Dunstable, UK, maintains three species of rhinoceros: 1.6 White rhinoceros *Ceratotherium simum,* 1.0 Black rhinoceros *Diceros bicornis* and 1.3 Indian or Greater one-horned Asian rhinoceros *Rhinoceros unicornis.* The operant conditioning of rhinoceros at WWAP has an integral role in the management of these species.

TRAINING

A well-prepared planning stage to identify the aims of the training will greatly improve the success of the programme (MacPhee & Mellen, 2002: http://www.animaltraining.org). Staff from different disciplines should be involved because, although keepers carry out the daily hands-on contact with the animals, input from veterinary staff, line managers and curators is also essential. As well as defining the behaviours required of the animals, it is important to discuss when, where and how training will take place in order to secure a safe environment for both animals and staff.

Prior to designing the training programme at WWAP, information was gathered from collections in North America where operant-conditioning programmes were already established, including Fort Worth Zoological Park, Fort Worth, TX, and Fossil Rim Wildlife Center, Glen Rose, TX. The experiences of staff using similar procedures for Asian elephants *Elephas maximus* and Californian sealions *Zalophus californianus* at WWAP, and Black rhinoceros at London Zoo, UK, were also documented to inform the planning process.

This paper does not document training and its terminology comprehensively but briefly explains some basic definitions, adapted from Pryor (1999) and MacPhee & Mellen (2002: http://www.animaltraining.org). Operant conditioning allows the animal to 'operate' in its environment to receive a reward by exhibiting a particular behaviour. Behaviours are 'shaped' by teaching each required behaviour in small steps or 'approximations'. At WWAP the completion of each step was signalled to the animal by a secondary reinforcer (dog whistle), also known as a 'bridge', followed by a primary reinforcer (food, tactile stimulation or verbal praise). The secondary reinforcer had been conditioned earlier in the programme by pairing a positive stimulus (food: a primary reinforcer) with the sound of the whistle. Because the sound of the whistle indicated that the behaviour displayed by the animal would result in a positive experience (receiving food), it would, therefore, be likely that the behaviour would occur again and was thus 'reinforced' or 'conditioned'.

To manipulate the rhinoceros into position, each animal was trained to touch a 'target', either a keeper's hand or the end of a stick. Once this was achieved, 'cues' were added and the animal learned the desired behaviour associated with each cue; for example, the verbal cue 'come up' paired with the presentation of the target, to allow the rhinoceros to walk up and touch the target in the position designated by the keeper. Other, more complex, behaviours were then built into the programme.

At WWAP two members of staff are usually involved in each training session. All staff should understand the principles and techniques of training, be fully instructed in the health and safety issues related to the procedure, and be conversant with the behavioural profile of each animal, amassed from daily recordings in the section diary and working consistently with each individual animal. One member of staff acts as the primary trainer, giving cues to the animal and offering reinforcement through tactile stimulation and verbal praise. The support trainer offers only food as a reinforcement, usually comprising a small piece of apple, carrot or banana. Primary trainers are usually limited to two per section so that the training is uniform and continuous, following the 'Ten Laws of Shaping' described in Pryor (1999).

To chronicle progress in training a record is made of the staff present, behaviour and procedure carried out, as well as the time and location of each session. These data can be used to review and assess the effectiveness of the training procedures, so that changes can be made if necessary. Each animal is treated individually: methods that produce good results with one animal may not be successful with another. Good record keeping can provide a framework that can be applied to different species within the collection, or to help other collections establish similar programmes.

DEVELOPMENT OF THE OPERANT-CONDITIONING PROGRAMME

Rhinoceroses generally respond well to tactile stimulation and can become quite tractable in captivity. Therefore, it is often possible to carry out many husbandry procedures without a structured conditioning programme.

At WWAP it was impractical to initiate a conditioning programme for White rhinoceros owing to the large herd size [1.6 (♂.♀)] and restrictions on staff time, especially as this herd had few medical problems. However, the species has a docile temperament which allows many routine procedures, such as visual and manual inspections, topical applications of creams and sprays, washing and blood sampling, to be carried out while scratching the animal or hand-feeding. In 2004 a 28 year old ♀ underwent a lateral buccotomy under anaesthetic, where an incision was made in the left cheek to remove an infected molar tooth. The follow-up treatment included daily cleaning of the incision, flushing with pevidine antiseptic solution and the application of an antibiotic cream (Orbenin LA) until the wound healed *c.* 8 months later.

The operant-conditioning programme was developed in 1996 in order to treat a recurring problem with pododermatitis (inflammation of the dermal tissue underlying the horny layers of the hoof) in Greater one-horned Asian rhinoceros at WWAP. Pododermatitis is one of the most common medical conditions observed in this species in captivity (von Houwald, 2001, 2002). It particularly affects the hind feet of ♂♂ and is characterized by an overgrowth of the middle toenail causing further growths and infections between the toes. The most effective treatment involves trimming the toenail, removing the hyperplastic tissue and cleaning the infected area, which may require an animal to be anaesthetized several times a year, with all the associated risks of this procedure. In order to reduce the need for anaesthesia and to implement preventative treatment, staff developed a structured conditioning programme to familiarize the animals to the contact necessary to carry out the essential veterinary care.

Greater one-horned Asian rhinoceros were conditioned to having their nails filed, originally while lying down but later, following training, after placing the foot on a wooden block (*c.* 30 cm × 25 cm × 4 cm high), so they could remain standing while the procedure was carried out. Rhinoceros could even be anaesthetized by positioning the animal so that a veterinarian had good access to the area of the neck to facilitate hand injection, while the keepers would keep the animal calm. After *c.* 8 months the pododermatitis had been effectively controlled and could be treated without the use of anaesthesia.

In 1998 the conditioning programme was introduced to 1.1 Black rhinoceros in order to facilitate the collection of blood samples and ultrasound procedures (Thorne & Whalen, 1996; McCaskill, 1997; Schaffer *et al.,* 1998; Mylniczenko, 1999; Pill, 2000; Shaffstall, 2000). In captivity Black rhinoceros are more susceptible to a range of diseases, such as leptospirosis and haemolytic anaemia (Bobko, 1996; Miller, 2003). In 1999 a 7 year old ♂ developed interdigital hyperplasia and was observed resting his front right foot on the toe nails. A hole in the sole of the foot tracked into the space between the middle and inner toe, resulting in a crack *c.* 3 cm × 1 cm. Hyperplastic growth occurred, causing further discomfort. The rhinoceros was conditioned to present the infected foot on a wooden block (*c.* 30 cm × 20 cm × 10 cm high) (Plate 1), both flat on the sole and on the toe nails, to allow the affected area to be treated daily, which involved cleaning the foot, flushing with pevidine antiseptic solution, trimming the necrotic tissue and applying gentamycin antibiotic cream. It was also possible to cauterize the foot with silver nitrate and potassium permanganate. Although this controlled the hyperplasia it did not eradicate it, so the ♂ was eventually anaesthetised in order to cauterize the infected area. Following this procedure a bandage and boot (made from Vetcast Plus casting tape) were placed on the foot. After a few days the base of the boot was worn through

but the cast remained around the lower leg. The ♂ allowed staff to remove the cast and the foot seemed to have healed; however, after *c.* 6 weeks the hyperplastic growth recurred. Treatment continued as before with daily sessions of cleaning and the applications of antiseptics and antibiotics, and eventually the growth regressed. The conditioning programme facilitated treatment, leading to the full recovery of the rhinoceros, without administering a series of anaesthetics.

The conditioning programme has also made it possible to carry out the routine management necessary when maintaining rhinoceros. Visual and tactile inspections can be carried out frequently without distressing the animals, which is particularly useful for those species that are more readily excitable (e.g. Black rhinoceros). Foreign bodies, such as stones, can be removed from the body or the feet before they cause problems. Regular blood samples can be taken from the ears and legs, and if the rhinoceros places its front foot on a block, the medial radial vein running down the front of the leg is more readily accessible. Swabs can be taken from any part of the body. Eye and oral examinations can be carried out and ultrasound investigations can proceed without the use of anaesthetic. Animals can be weighed regularly by encouraging them to stand on a platform placed on removable weighing scales, *c.* 30 cm above the ground (Plate 2). A 7 year old ♀ Black rhinoceros allowed fluid to be drawn from her abdomen with only a topical (local) anaesthetic.

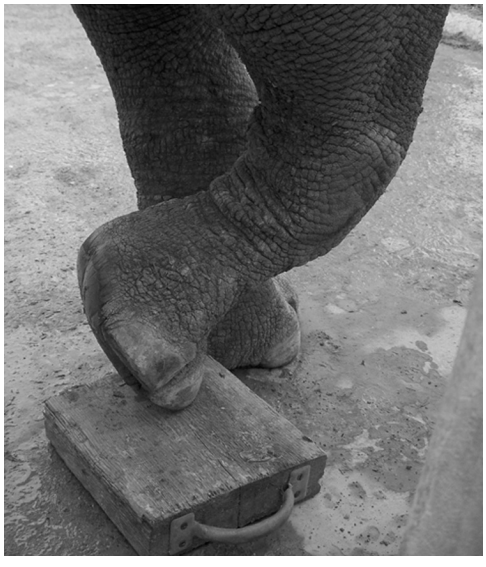

Plate 1. A Black rhinoceros *Diceros bicornis* **presenting the sole of the foot on a wooden block to enable cleaning and application of creams for the treatment of interdigital hyperplasia.** *M. D. Holden, Whipsnade Wild Animal Park, ZSL, UK.*

FACTORS AFFECTING TRAINING

It is possible to implement training with even the most basic set-up. Many zoological collections incorporate an area for training, such as a restraint device or chute, when designing new facilities, which can be useful for carrying out procedures like ultrasound examinations. Although a transport crate was adapted at WWAP to facilitate ultrasound investigation on a ♀ Black rhinoceros, all other procedures on Black and Greater one-horned Asian rhinoceros were carried out through vertical bars in an outdoor enclosure. The animals were never restrained and could become distracted and simply walk away at any time. The outdoor enclosures are mainly on view to the public and, although this could serve as an excellent education opportunity, this could be a major source of distraction for the animals and keepers. In addition, free-ranging species within the Park, especially Peafowl *Pavo cristatus* which have a loud call, could appear at any time and startle the rhinoceros, which would then move suddenly or kick with the hind feet. The health and safety of staff during a training or treatment session is paramount, especially when working around the feet, so reviews of health and safety procedures should be carried out regularly.

The weather had an effect on training and Black and Greater one-horned Asian rhinoceros were distracted when the con-

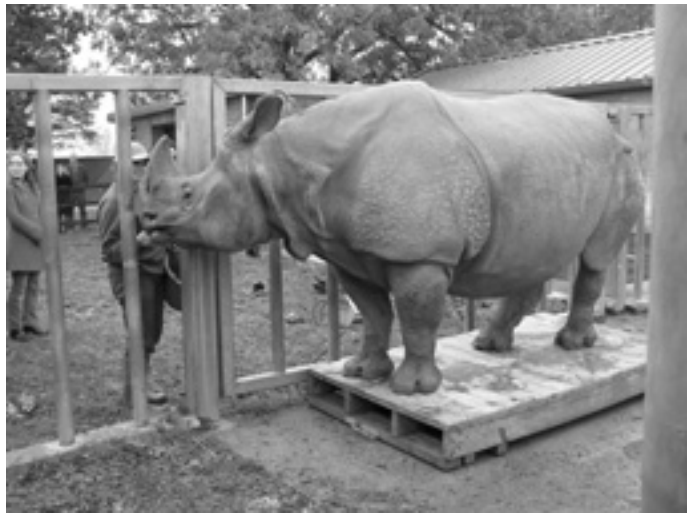

Plate 2. An Indian or Greater one-horned Asian rhinoceros *Rhinoceros unicornis* **standing on a platform to be weighed while the keeper keeps the animal calm by providing tactile stimulation through the enclosure bars.** *R. M. Catchpole, Whipsnade Wild Animal Park, ZSL, UK.*

ditions were windy. On cold days collecting blood samples from the ears proved difficult and even though the vein could be located easily, little (if any) blood could be drawn. Therefore on cold days blood samples were taken from the medial radial vein running down the front of the foreleg.

Prior to a training/treatment session the behaviour of the individual rhinoceros must be assessed before any contact is made. It is important that the rhinoceros is not agitated or being affected by other factors, such as being in oestrus. On some occasions it may be necessary to postpone a session to allow the rhinoceros to calm down.

CONCLUSIONS

Operant conditioning can be an important aspect of the daily husbandry routine of animal species in captivity. Many collections view it as integral to providing a complex and stimulating environment, and dedicate time and specialized personnel to the programme. Staffing levels and time restrictions can present difficulties for some institutions but the benefits of a long-term conditioning programme outweigh these factors. At WWAP routine management and monitoring of rhinoceros can be carried out more effectively and with minimal stress and risk to animals and keepers using operant-conditioning techniques. Numerous procedures are carried out without the need for immobilization, and the trust between the animals and the keeper and veterinary staff has strengthened. The programme can also be viewed as a form of stimulation for rhinoceros in captivity, improving physical and psychological well-being, and complementing other aspects of husbandry, such as environmental enrichment and habitat complexity.

PRODUCTS MENTIONED IN THE TEXT

Gentamycin: antibiotic cream, manufactured by Roche Products Limited, Welwyn Garden City AL7 3AY, UK.

Orbenin LA: antibiotic cream, manufactured by Pfizer Limited, Ramsgate Road, Sandwich, Kent CT13 9NJ, UK.

Pevidine: antiseptic solution, manufactured by Novartis Animal Health UK Limited, Litlington, near Royston, Herts. SG8 0SS, UK.

Vetcast Plus: veterinary casting tape, manufactured by 3M Animal Care Products, St Paul, MN 55144-1000, USA.

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