

A RESTRAINT CHUTE FOR SEMEN COLLECTION IN WHITE RHINOCEROS (*CERATOTHERIUM SIMUM SIMUM*) – PRELIMINARY RESULTS

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Summary

The main goal of this study was to develop a restraint chute, which enables easy access to the genital region of white rhinoceros bulls (*Ceratotherium simum*). This chute allowed safe, efficient and routine semen collection by manual penile stimulation. A protocol using a combination of Detomidine (12-15 mg/adult bull) and Buthorphanol (8 mg/adult bull) improved the protrusion of the penis and pharmacologically facilitated ejaculation. Additionally the general manipulation of the rhinoceros in the initial phase was simplified due to the sedative effect of this combination.

Zusammenfassung

Ein Zwangstand der die Samengewinnung bei Breitmaulnashornbullen (*Ceratotherium simum*) ermöglicht - vorläufige Ergebnisse.

Ziel dieser Arbeit war einen Zwangstand zu entwickeln, mit welchem es möglich ist die Genitalregion von Breitmaulnashornbullen (*Ceratotherium simum*) zu stimulieren. Dieser Zwangstand erlaubte es unter sicherem Bedingungen routinemäßig Samen durch manuelle Penis Massage zu gewinnen. Dieses Vorgehen wurde durch die Applikation einer Kombination aus Detomidin (12-15 mg/ Tier) und Buthorphanol (8mg/Tier) erleichtert. Diese Kombination bewirkte einen Penisvorfall und unterstützte pharmakologisch die Ejakulation. In der Initialphase wurde die Manipulation der Tiere zusätzlich durch den sedativen Effekt dieser Kombination vereinfacht.

Résumé

Développement d'une barrière de contention pour la récolte de sperme chez le rhinocéros blanc (*Ceratotherium simum*) - résultats préliminaires.

Le but de cette étude est de mettre au point une barrière de contention qui permet un accès aisé aux parties génitales du rhinocéros blanc (*Ceratotherium simum*) mâle. Cette barrière permet de récolter le sperme par stimulation manuelle du pénis en toute sécurité et de manière efficace. Une sédation avec Detomidine (12-15mg/rhino mâle adulte) et Buthorphanol (8mg/rhino mâle adulte) facilite la protrusion du pénis et l'éjaculation par voie pharmacologique. De plus, la manipulation de l'animal lors de la phase initiale de l'opération est plus aisée grâce à l'effet sédatif de cette combinaison.

Keywords

White rhinoceros male, restraint chute, semen collection, manual penis massage, *Ceratotherium simum*

Introduction

The White Rhinoceros (*Ceratotherium simum*) is an endangered species due to habitat loss and poaching. Poor reproductive success in captivity aggravates this situation (4, 5, 9, 10). Therefore captive propagation programs are in need of a better understanding of the reproductive physiology. New reproductive technologies (2, 3), like artificial insemination, which is currently being developed for rhinoceroses (10), requires sound andrological studies and a routine method for semen collection. Several different semen-collecting procedures are described for rhinoceros (3, 6, 7). The most common method is electroejaculation, which requires anaesthesia. However for routine and repeated semen collection penile stimulation without the necessity of anaesthesia is an effective possibility which can be used in trained animals (6, 7). Furthermore, routine collection of semen samples would not only give a supply for use in AI but would also allow the possible establishment of cryopreservation protocols.

Schaffer et al. (8) have summarised experiences with different restraint chutes and cages. However, none of these seem to be optimal for the purpose of manual penile massage. Therefore the main goal of this study was to develop a different restraint chute which enables easy access to the genital region of white rhinoceros bulls. This chute should allow efficient and routine semen collection by penile stimulation with the lowest possible stress for the animal and the highest standard of safety for the operating person.

Material and methods

Salzburg currently has 2.2 white rhinoceroses (*Ceratotherium simum simum*). In addition 0.1 rhinoceros is temporarily housed at Usti nad Labem zoo (Czech Republic) in an attempt to stimulate natural breeding. The bulls, "Denny" (29 years) and "Benno" (19 years), weigh approximately 2800 kg and both are currently being trained for semen collections in order to have a constant semen supply on hand to be used for the current AI program in the EEP (10).

The white rhinoceros facility of the Salzburg zoo consists of two indoor enclosures and a 20.000-m² natural outdoor area. The older house has been in operation since 1992. The new building is currently under construction and will be finished by May 2000. Both houses have four separate indoor boxes each. The new house will include 2 indoor restraint chutes, which have been adapted according to experiences with this described out-door chute. As planing and construction of the original rhino building did not anticipate the necessity of direct rhino manipulation for research purposes, a restraint facility was not provided for. Due to a floor heating system subsequent placement of an indoor-chute was not possible. Therefore a low budget outdoor chute was built to train bulls for manual semen collection, and to obtain experience for the chutes to be built in the new house.

Technical Report of the Restraint Chute

The restraint chute was constructed and built into the existing white rhinoceros facility under the precondition of being cheap, simple to construct and operate. A walk through chute was built and placed at the passage of the indoor to the outside yards and is part of the existing forecourt of the outdoor area. Consequently the rhinoceroses have to pass through this chute during the daily routine. The basic idea was to create a chute which allows easy and safe access to any part of the animal's body but which especially enables a wide and free manipulation for semen collection by penile stimulation.

Strong, about 30 cm in diameter, vertical oak wood posts were used as side walls. The vertical bars were cemented 100 cm deep in 6 m³ of concrete at distances of 33 cm. These vertical posts reduce visibility of the rhinoceros to the operator's area and allow easy access to the animal. The operator can easily enter and leave the chute through these side walls. The entrance of the chute can be closed with a 120-cm wide manually operated steel door. The operation area for the manipulator can be closed with 2 horizontal steel bars of 1,45 meters in length and 5 cm in diameter affixed at a height of 60 and 100 cm. Sliding two 10 cm strong horizontal steel bars at a height of 60 and 110 cm can close the rear side. The total internal length of the chute is 470 cm, which is approximately one and a half times the body length of the rhinoceros. The inner diameter of the chute is funnel shaped between 140 at the head and 115 cm at the rear (see fig.1).

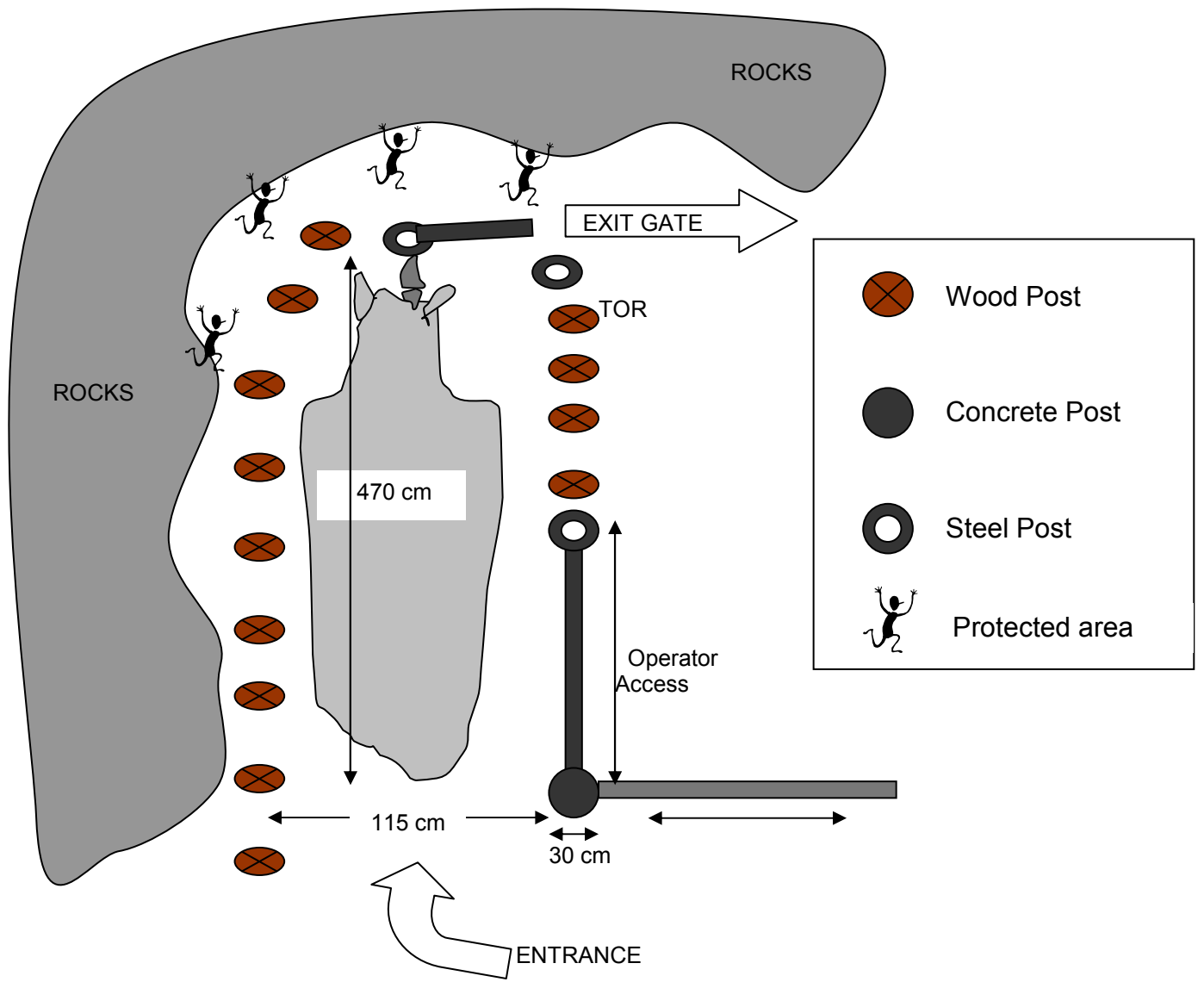


Fig. 1 Restraint chute seen from above (not to scale)

Semen collection procedure

Before actual semen collection was attempted the two rhinoceros bulls were slowly habituated to this new installation. Bulls initially had free access to the open chute and the manipulators area and could freely decide whether they wanted to pass through.

For the penile stimulation the operator starts with massaging the medial aspects of the rear legs and the abdomen through the horizontal steel bars of the operation area. This procedure induces a protrusion of the glans penis. Additional massage of the rudimentary papilla mammae at the cranio-lateral basis of the preputium intensifies this stimulation, which consequently leads to a strong erection with a cranioventral orientation of the glans penis. Thereafter warm fat-based cream (gels have a strong cooling effect) was applied on the distal 20 cm of the penis, beginning from the bilateral longitudinal wings towards distal with exception of the penis tip, which should not be touched. Gentle rubbing mainly between the basis of the wings and the dorsal protrusion of the glans penis and additional careful compressions of the entire distal penis should lead to an ejaculation.

Following reports in the equine literature on successful pharmacologically induced ejaculation in stallions with alpha-2 agonists (1, 11). We attempted a similar protocol using a combination of Detomidine (Domosedan[®]) and Butorphanol (Turbogesic[®]) applied IM. Not only was it intended to improve the protrusion of the penis but also to facilitate the general manipulation of the rhinoceros in the initial phase due to the sedative effect of this combination.

Results and Discussion

The chute was accepted by the two males without fear, nervous or aggressive behaviour after three days. The presence of food kept the rhinoceroses standing inside the chute calmly for a period of about 15 to 20 minutes.

The alpha-2 mimetic detomidine in combination with butorphanol had muscle-relaxing effects, which lead to a complete protrusion of the penis without additional manual stimulation. Several different combination dosages were tested. A dose of 12-15 mg/adult bull Detomidine and 8 mg/adult bull Butorphanol proved adequate as this dose still had a very low general sedative effect and no observable ataxia. With the combination of Detomidine - Butorphanol and manual stimulation semen was successfully been collected several times.

These first experiences demonstrate the possibilities of the new restraint chute. It is of utmost importance that the side-to-side mobility is reduced as far as possible. A maximum width of 120 cm for an adult male white rhinoceros is recommended. Former attempts without restraint in the indoor enclosure demonstrated that right at the onset of the pulsatile contraction of the penis muscles immediately prior to ejaculation, the bulls always made a side-step which consequently lead to contact of the glans penis with the medial aspect of the rear legs. This resulted in an abrupt end of the erection and every further attempt at an erection was extremely difficult, possibly due to a reduced sensitivity of the glans.

The chute length of approximately one and halftime of the body length provides enough space and time for a secure closing of the rear end of the chute. Within the chute the bulls were extremely calm; the authors feel this was due to the fact that the animals are not tightly restrained and may move back- and forwards. Despite movements, the manipulation at the operation area was not negatively affected. Similar experiences using an open chute for rectal ultrasonographic investigations of a white rhinoceros female were reported recently (5).

Additional to the semen collection procedures, various other manipulations, like blood sampling, minor medical procedures, and ultrasonographic reproductive evaluations could be possible in this restraint chute with adequate prior training

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