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THE IMMOBILIZATION AND TRANSLOCATION OF BLACK RHINOCEROSES *DICEROS BICORNIS* USING ETORPHINE HYDROCHLORIDE (M99)

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SUMMARY

The immobilization and translocation of 14 black rhinoceroses in Zululand between 5th June, 1964 and 6th October, 1967 is described. Etorphine hydrochloride with hyoscine hydrobromide and various tranquillizers, was employed.

The narcotic effect of Etorphine was successfully antagonised by Nalorphine hydrobromide. Ten animals were translocated from 20 to 40 miles, and did not require additional tranquillization during the journey. Four animals that travelled 130 to 200 miles received additional tranquillizer.

INTRODUCTION

It was necessary to remove black rhinoceroses living either outside the boundaries of the Umfolozi or Hluhluwe Game Reserves, or those within the reserves that became an exceptional danger to tourists or Board Officers. They were moved to more suitable areas within Umfolozi Game Reserve, or to Ndumu Game Reserve where they have formed a new breeding nucleus in an area formerly inhabited by the species.

A review of the available literature revealed no information on the immobilization of the black rhinoceros using Etorphine until King,[1] in 1965, described the immobilization of five animals in Kenya.

The experience gained by Natal Parks Board Officers during the immobilization and translocation of the Square-lipped rhinoceros (*Ceratotherium simum*) was of great value in establishing the most suitable drug combinations and the dosages used upon black rhinoceroses.

MATERIALS

The following drugs were used:

Etorphine hydrochloride (Reckitt).
This highly potent drug has been fully described by Harthoorn,[2] and other authors recently. It is now used extensively, either alone or in combination with other drugs, for the immobilization of a large variety of animals.

Hyoscine hydrobromide.
This alkaloid has an atropine-like action and depresses the central nervous system. When used in drug mixtures for the immobilization of Square-lipped rhinoceroses it reduced the latent period between darting and capture, and caused temporary partial blindness, due to pupillary dilation.

Acetylpromazine (Boots Pure Drug Company).
This tranquillizer was used primarily as a vehicle for dissolving

Etorphine. The solution proved very stable and was coloured yellow. It is a phenothiazine derivative, and is a rapidly absorbed central nervous depressant.

Trilafon (Scherag).
This is also a phenothiazine derivative tranquillizer similar to the last named drug. It was used in three of the drug mixtures to potentiate the narcotic effect of Etorphine, and to sedate the animals after immobilization.

Sernyl (Parke Davis).
This neuroleptic drug causes rapid induction and has a distinct potentiating effect upon narcotics such as Etorphine. Harthoorn[2] states that it has an advantage over other potentiators in that, in small doses it does not destroy the righting reflexes. It was used by Harthoorn in his early work on immobilization of the Square-lipped rhinoceros.[3]

R0-0403 (Roche).
This is an experimental tranquillizer for veterinary use, and has proved useful in maintaining tranquillity in black rhinoceroses during transportation. The aqueous solution, containing 50 mgm/cc, was used.

Nalorphine hydrobromide (Burroughs Wellcome & Co.).
This morphine antagonist was used to reverse the narcotic effect of Etorphine. It acts rapidly when injected intravenously, but can also be administered parenterally when a slower, more prolonged action is required. The water soluble powder was prepared as a solution containing 25 mgm/cc.

Darting Equipment.
The darts containing the immobilizing drugs were projected either by means of the Cap-Chur gas-gun or the Palmer Powder-charge gun, both of which were manufactured by Palmer Chemical & Equipment Co., Atlanta, Ga. Standard 2 cc or 3 cc capacity projectiles were used with 1½ in. barbed needles. The gas-gun proved the weapon of choice for use at ranges up to 30 yards, and the powder-charge gun over this distance. Ranges of over 35 yards were accurately measured with a range-finder (Wild Heerbrugg Ltd., Switzerland).

METHODS

In thick bush country the rhinoceroses were approached on foot and darted using either the powder-charge weapon or gas-gun depending upon the range.

In more open country the animal was chased for a short distance and darted at close range from a Land Rover using the gas-gun. When darted on foot any convenient area well covered with muscle was chosen, such as the neck or upper hind-limb. From a vehicle the dart was fired at the buttock or upper hind-limb.

After the dart had injected the drug mixture the animal was followed either on foot or on horse-back depending upon the terrain through which it ran, until immobilized. Eye ointment was

applied to the corneas to prevent drying and an intramuscular injection of Penicillin and Streptomycin given.

After being unloaded from a truck which is equipped with a special winch and rollers, a crate was placed in front of the rhinoceros with the door open.

A rope noose was placed under the animal's chin and behind the posterior horn, but in front of the ears. The other end of this was passed through a hole in the front of the crate and held by assistants.

The antidote was injected intravenously and when the animal stood up it was guided, not pulled, into the crate with the rope. A few firm blows with the hand on the animal's buttocks were usually sufficient to make it move forwards.

The door was closed and securely bolted. Then the crate and rhinoceros were loaded onto the truck which proceeded to its destination. There the crate was unloaded and the animal released. The rhinoceros always travelled with its posterior towards the truck cab. This prevented neck damage if the driver braked suddenly during transit.

RESULTS

The drug combinations and dosages used are given in Table 1.

TABLE 1

No.	*Sex*	*Approx. Wt. lbs.*	*Etorphine mgm.*	*Hyoscine mgm.*	*Acetylpromazine mgm.*	*Trilafon mgm.*	*Sernyl mgm.*
1	M	2,000	2.5	100	—	25	—
2	M	1,800	2.5	100	—	25	—
3	F	1,500	2.5	100	—	25	—
4	M	1,000	3	100	18	—	—
5	F	2,000	2.5	100	5	—	—
6	F	2,200	2.5	100	5	—	—
7	F	550	2	50	—	—	—
8	M	2,200	2.5	100	5	—	—
9	M	?	3	100	10	—	—
10	F	1,800	2.5	100	5	—	—
11	M	1,800	2	50	8	—	—
12	M	2,019 exactly	1	50	2	—	200
13	M	2,000	3	100	6	—	—
14	M	2,000	3	100	6	—	—

Upon being darted the animals trotted or ran with the tail raised over the back. In 6 to 8 minutes the first sign of drug action was seen. They slowed down and often swayed sideways or tripped, regaining their balance quickly. They finally came to a stop and then fell onto their sides. When lying quietly they were pushed into sternal recumbency where possible.

The observations following darting and the administration of the antidote are given in Table 2.

TABLE 2

No.	*Ataxic in mins. after darting*	*Immobilization time, mins.*	*Distance approx. run*	*Recumbency times in in mins.*	*Nalorphine mgm/i/v*	*Recovery time in in mins.*
1	20	45	1 mile	157	150	8
2	12	20	—	108	90	2
3	5	9	—	79	60	3
4	—	7	—	86	60	—
5	—	±12	1 mile	No record	240	—
6	—	—	—	80	60	4
7	—	7	15 yds.	No record	240	—
8	—	±11	—	61	30	5
9	—	10	1 mile	No record	60	—
10	—	11	¾ mile	124	150	4
11	9	17	1 mile	138	NONE	—
12	—	11	¾ mile	53	150	4
13	—	12	¾ mile	58	300	5
14	—	12	1 mile	89	300	2

IMMOBILIZATION TIME

This is the time elapsed between the injection of the drug mixture and recumbency. Where the animal became ataxic some time before recumbency it is indicated in Table 2.

Number 2 fell into a donga, number 9 into a river bed and number 10 over a 20 ft. bank after becoming partly ataxic which probably shortened the immobilization time in each case. Number 9 injured its back as a result of the fall, but numbers 2 and 10 were apparently not injured at all. Number 11 was roped to a tree by means of a hind leg after becoming ataxic, but lay down 4 minutes later.

Provided the drugs were injected intramuscularly, the actual site of dart impact did not affect the immobilization times.

RECUMBENCY TIME

This is the time elapsed between recumbency and standing up prior to walking into the crate.

RECOVERY TIME

This is the time elapsed between the administration of Nalorphine intravenously and standing.

Number 4 received a high dose of Etorphine and was therefore given Nalorphine only 21 minutes after darting, that is, 72 minutes before loading. It did not receive any further Nalorphine. Numbers 5 and 7 received Nalorphine only upon release, and none at the time of loading. The former rose on its own and walked into the crate, and the latter, weighing only about 550 lbs., was lifted in. Numbers 8, 12, 13, and 14 received 300 mgm Nalorphine intramuscularly at release, in addition to the doses given intravenously before loading shown in Table 2.

CLINICAL EXAMINATION

The physiological parameters which were recorded are given in Table 3 below. The time elapsed between darting and the recordings being taken is given. The normal respiration rate of the adult black rhinoceroses is 15 to 30 per minute. The normal pulse rate is not known by us, but King[1] gives that of a young adult Square-lipped rhinoceros as 40 to 60 per minute. The normal temperature of Square-lipped rhinoceroses varies greatly, but is usually between 98.5°F and 100°F.

TABLE 3

No.	*Respiration / min.*	*Pulse rate / min.*	*Temperature °F*	*Time after darting*	
				hrs.	*mins.*
1	11	82	—	0	54
	12½	88	—	1	47
	12	—	—	2	37
2	15	—	—	0	55
3	16	—	—	0	17
	12	—	—	0	21
	—	68	—	0	40
	8	—	—	0	45
4	3	—	—	0	20
5	10	—	—	1	45
6	8	—	—	No record	
7	5	—	—	No record	
9	12	—	—	0	10
10	12	—	—	0	11
11	8	72	—	0	45
12	10	—	98.6	0	20
	40	—	—	1	5 after Nalorphine
	24	—	—	2	22
	—	—	104.7	3	45
13	6	—	99.6	0	40
	14	—	—	2	10
	13	—	—	3	10
	14	—	102	3	24
14	7	—	99.7	0	13
	6½	—	99.7	1	24

THE USE OF THE TRANQUILLIZER R0-0403

This tranquillizer was injected intramuscularly into 7 of the 14 rhinoceroses in order to maintain tranquility during prolonged transportation, thus preventing the animals from damaging either themselves or the crate.

In 4 cases the R0-0403 was given before the Nalorphine was injected, and in 3 cases immediately afterwards. The dosage of R0-0403 injected intramuscularly are given in Table 4.

TABLE 4

No.	1	2	3	4	11	13	14
R0-0403 mgm.	100	150	100	100	150	200	200

If necessary more R0-0403 was given during the journey. For example, number 1 was given three injections of 100 mgm at 4 hour intervals during transportation. The animal stood throughout the journey and was quiet till released 19 hrs. 22 minutes after darting.

MORTALITY

Number 6 was in very poor condition when darted and died the day following release. If it had not been necessary to move her from thick bush outside the reserves no effort would have been made to immobolize her. Number 9 injured its back when it fell into a river bed and, as a result, died the day after release. Number 11 died during transportation. This was probably due to an error of judgement in this particular case in not giving Nalorphine. The animal stood up and walked into the crate just before the Nalorphine would normally have been injected. It was thought that he might become violent and damage himself and the crate if the antidote was given after entering the crate. Number 12 died 4½ hours after darting as a result of over-tranquillization with Sernyl in the immobilization mixture.

CONCLUSIONS

The drug mixture of Etorphine 2.5 to 3 mgm, acetylpromazine 5 to 6 mgm and hyoscine hydrobromide 100 mgm is, in our opinion, ideal for immobilizing adult black rhinoceroses in bush country. In more open country the Etorphine could probably be reduced to 2 mgm, and the hyoscine hydrobromide to 50 or 75 mgm.

To prevent the violent reaction which often follows the injection of Nalorphine, it is advisable to give a tranquillizer some 20 to 40 minutes before injecting the antidote.

It is essential that additional doses of tranquillizer be given before the animal becomes violent during transportation. If this is not done it becomes very difficult to retranquillize sufficiently without giving dangerously large doses.

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