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BLACK AND WHITE RHINO CAPTURE IN THE WILD

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Black rhino (*Diceros bicornis*) and white rhino (*Ceratotherium simum*) are frequently immobilized and translocated by the Veterinary Wildlife Services Unit (VWS) of South African National Parks (SANParks). The two species occupy overlapping habitats but differ considerably in their social behavior, diet, and response to the drugs used. Knowledge of these differences is essential for any successful capture and translocation of these species.

WHITE RHINO

These gregarious grazers were almost extinct at the beginning of the century in Southern Africa. It was the concerted effort of the then Natal Parks Board in one of the provinces in South Africa that was directly responsible for the revival of the species and there are more than 14,000 southern white rhino in South Africa, up from 20 to 50 individuals at the beginning of the century. The white rhino is also the first species of large African mammal that was translocated using chemical immobilization on a large scale and many of the drugs used today in wildlife capture were tested and developed on white rhino, the most notable drug being M99 (etorphine). White rhino translocations took place in significant numbers from the 1960s and they were taken to other conservation areas including the Kruger National Park (KNP), where they went extinct in the previous century. Today there are over 5000 white rhino in the KNP and the capture unit of SANParks move over 100 white rhino a year.

There is another northern subspecies of white rhino that until recently survived only in Garamba National Park in the Congo but from recent reports provided by the International Rhino Foundation it appears that this northern subspecies may be at the brink of extinction from poaching.

White rhino are relatively easy to introduce into new areas when other rhino are present due to their gregarious nature. They adapt to most habitats where suitable grass cover and water is available and breed well even in relatively small areas. This fact has made the success story of white rhino conservation much more dramatic than black rhino, which are much more difficult to capture and reintroduce.

BLACK RHINO

Unlike the white rhino, black rhino survived in large numbers throughout sub-Saharan Africa until the 1970s when large scale poaching reduced their numbers to a few thousand. Successful conservation of this species is now only happening in Kenya, South Africa, and Namibia. In other countries their numbers are critically

low or they have gone extinct, which makes this species of rhino the most endangered in Africa. Currently only about 3500 black rhino survive in the wild.

Black rhino are complex social animals. They are browsers and live in thick bush, making immobilization difficult. They are habitually more aggressive than white rhino and respond better to the drugs used. **The key to successful black rhino translocation is to protect the animal from itself and its highly aggressive nature.** Introduction of black rhino into established populations is far more difficult than white rhino due to the increased incidence of aggression between individuals after release.

The capture procedures for black rhino described below is used by SANParks VWS for all the subspecies of black rhino that SANParks have worked with (*Diceros bicornis minor*, *D.b.bicornis* and *D.b.micheali*).

DARTING SYSTEMS FOR RHINO

Both species are darted with robust dart systems (aluminum) as the skin of rhino is extremely thick and tough. Sturdy needles of at least 45-mm length are used by SANParks VWS to ensure effective penetration of the skin into the underlying muscle. It is accepted practice by the SANParks VWS that all rhino immobilizations are done from a helicopter so that the operation can be controlled to ensure safety to staff and also facilitate quicker recovery once the animal has become immobilized. The large rump muscles are ideal for dart placement from a helicopter.

Darting in confined conditions can be done with lighter darts (like Dan-inject) but considerably higher pressures of the CO₂ driven dart guns are required than soft-skinned animals, even at close range to ensure effective intramuscular penetration with long needles (at least 50 mm). The neck is the most suitable area for dart placement from the ground.

DRUG DOSES

OPIOIDS

White rhino in particular are very sensitive to the physiological effects of opioids and hypertension, forced respiration, and muscle rigidity are very apparent side effects in this species. Very quick partial antagonism is required to improve the anesthesia. Partial antagonism to the opioids in black rhino is only indicated if the respiratory depression associated with opioids is severe. Black rhino are far more sensitive to the partial antagonistic effects used and may get up suddenly so the utmost precaution is necessary when administering these antagonists. Unlike white rhino, black rhino generally handle the opioid narcosis very well.

M99 (Etorphine, sold in South Africa by Norvartis AH)

M99 is the most commonly used drug by most veterinarians who work with white and black rhino. Doses are generally higher per weight in black rhino and they tolerate the negative physiological aspects of the drug better than white rhino .

Table 1. SANParks Recommended M99 Doses

Age Class	White Rhino Dose	Black Rhino Dose
Adult	4 mg (up to 4.5 mg for large bulls)	3.5–4.5 mg (up to 5 mg for large bulls)
Sub-adult (size related)	3–3.5 mg	3–4 mg
Juvenile (size related)	2–2.5 mg	2–2.5 mg
Calf (>6 months)	0.5–1.5 mg	1–1.5 mg

Much lower doses of opioids are used to load rhino out of the bomas for transport. In both species, it is not advisable to dart calves younger than 6 months of age due to their complete dependence on their mothers.

Other Opioids

A30-80 (thiofentanyl, sold by Wildlife Pharmaceuticals in South Africa), **Fentanyl** (sold by Kyron Laboratories in South Africa), and **Butorphanol** (Wildlife Pharmaceuticals are trying to produce a concentrated format for use in darting) are all drugs used in white and black rhino in South Africa. Butorphanol is used extensively in captivity in the United States with very good results (personal communication, Dr Scott Citino). This will most likely become a drug of choice for black and white rhino immobilizations under certain conditions.

Addition of Hyalase to the Dart Cocktail

SANParks use M99 mixed with at least 1500 IU of hyalase (produced by Kyron Laboratories) with very good effect and get knockdown times of between 3 and 5 minutes in both species. Without hyalase the knockdown time can increase by an additional 2 minutes. The most noticeable effect of hyalase is when the dart goes subcutaneously and knockdown times of less than 6 minutes are still achieved.

TRANQUILIZERS AND SEDATIVES

Azaperone (sold as Stresnil by Bayer AH in South Africa)

Azaperone is the tranquilizer drug of choice and used by most veterinarians for both species. It has a very good synergistic relationship with the opioids and may help reduce some of the negative physiological effects of the opioids. It is routinely used as part of the dart cocktail. The azaperone doses recommended by SANParks are shown in Table 2.

Other Tranquilizers

Alpha-2 antagonists like **xylazine** (sold as Rompun by Bayer AH) and **detomidine** (sold as Domosedan by Novartis AH). These drugs are used extensively in Zimbabwe. Diazepam derivatives like **midazolam** and **valium** are also very effective in both species. Midazolam (Dormicum injectable, sold by Roche in South Africa) is especially effective to keep rhino asleep by administering 5 mg IV during longer anesthetic procedures.

Table 2. SANParks Recommended Azaperone Doses

Age Class	White Rhino Dose	Black Rhino Dose
Adult	40 mg in the dart and 80–100 mg for tranquilization	80–100 mg in the dart and 100–150 mg for tranquilization
Sub-adult (size related)	40 mg in the dart and 60–80mg for tranquilization	60 mg in the dart and 60–100 mg for tranquilization
Juvenile (size related)	20 mg in the dart and 40 mg for tranquilization	40–60 mg in the dart and 60 mg for tranquilization
Calf (>6 months)	20 mg in the dart, use valium for tranquilization	20 mg in the dart and 40 mg for tranquilization

Longer-acting Tranquilizers

Cloxipol acuphase (medium-acting tranquilizer) has been used with good results. Acuphase is the drug of choice by SANParks for longer tranquilization in both species and doses of 150 mg in adults (100 mg in white rhino), 80–100 mg (50 mg in white rhino) in sub-adults, and a maximum of 50 mg (25 mg in white rhino) in younger animals are used.

Trilafon (long-acting tranquilizer sold by Kyron laboratories in South Africa) at doses of 150 mg for adults and 100 mg for sub-adults has been very successfully in black rhino by SANParks VWS. Trilafon is not recommended for white rhino.

PARTIAL ANTAGONISM FOR WALKING, LOADING, AND TRANSPORT AND ANTAGONISM AT RELEASE

It is important to note that black rhino are much more responsive to the available antidotes than white rhino and good care must be taken to use the right reversal techniques for the different stages of loading, transport,

and release. Always err on the cautionary side by giving a weaker antagonist as full reversal of a black rhino at the wrong time will be detrimental for the rhino, the equipment, and staff involved.

For walking, white rhino are given 10 mg nalorphine (sold by Kyron Laboratories in South Africa) and 1 mg M50-50 (diprenorphine, which comes as the standard reversal with M99) IV as soon as possible after immobilization to improve the respiration. This dose is usually enough to facilitate walking of a white rhino into the cart after stimulation with an electric prod.

In black rhino smaller incremental doses of 5 mg nalorphine IV are given. Some rhino take longer to respond than others, and then incremental doses of 10 mg can be given after the second 5 mg dose.

Please note that some black rhino can take 40 mg of nalorphine (the minority) and be very unsteady on their feet, while others can be almost fully awake with only mg of nalorphine.

For transport, white rhino are reversed with the full recommended dose of M50-50 (2.5x the mg dose of M99). Diprenorphine is a partial agonist/antagonist and the agonistic effects are very pronounced in white rhino, which results in up to 8 hours of tranquilization during crate transportation.

Black rhino are far more responsive to antagonists so only the very weak antagonist nalorphine (which also has agonistic properties) with a very small dose of diprenorphine is given to black rhino during transport. The equivalent of 15 mg nalorphine for every mg M99 used and an additional total dose of 1–1.5 mg M50-50 is given once the rhino is in the crate. By using the effects of the agonistic qualities of nalorphine and the small dose of M50-50, a very tranquil state is achieved for up to 8 hours in black rhino.

Please note that some rhino push excessively in this partial reversed state. By using this combination and a vial of naloxone (5 mg IM) with additional azaperone will wake the animal up enough to get it standing but usually wears off within half an hour and the animals are then calm and standing.

For release, white rhino must be reversed prior to release with naltrexone (supplied by Kyron Laboratories in South Africa) as renarcotization commonly takes place if M99 is used. Naltrexone is a pure antagonist for opioids and has a longer half life than most opioids, preventing renarcotization. Tranquilization in the form of azaperone is required before release to help avoid post-release aggression and running.

The release of black rhino is more complex than that of white rhinos, and is the most critical stage of the translocation process. The black rhino can become extremely aggressive once released from the crate and it is important to protect the rhino against itself by the careful use of drugs at release. SANParks VWS use a very low dose of etorphine (0.1–0.25 mg) with 60–80 mg azaperone to tranquilize the rhino before release (even if the animal appears calm in the crate and especially animals that were tame before transport).

If the animal is to be released into a boma then it can be monitored and if it starts pushing then IM M50-50 can be used to reverse the effect without causing the animal to wake up suddenly and attack the boma complex. If the rhino is being free released give IM Naltrexone as the crate door is opened; it takes a few minutes to take effect and usually by this time the rhino has moved off some distance and will not attack the crate if there is no disturbance in the area.

If the animal is released after being transported under anesthesia (the preferred method used by SANParks if the distances are not too great) naltrexone IM (NOT IV) is given at release (no disturbance; all people and vehicles removed from the immediate release area) and usually they get up slowly and start feeding immediately. If the rhino is released into a holding facility give M50-50 IM (not IV) and monitor the rhino for a few hours to ensure that the rhino does not renarc. In this way the animal remains confused for some time and does not attack the boma. This is also the recommended technique of putting cow and calf together again to avoid aggression between them. Do not use naltrexone in boma releases as this wakes them up too much and can result in trauma-related injuries. Naltrexone can be used IM if they have settled in the bomas and wake up in their familiar environment.

IMPORTANT POINTS TO REMEMBER WITH WHITE AND BLACK RHINO CAPTURES AND RELEASES

- **Always** use a helicopter (even if it is as back-up only) when darting free-range rhino, even in small camps, as they can cover large distances in short periods of time.
- The most important capture-related injuries that are seen in rhino (especially black rhino) are self-trauma during transit and release, trauma from fighting with other rhino in the new area and **most importantly leg injuries** straight after capture when the animal goes down in a poor position. It is therefore important to get to the rhino quickly after it has gone down and position them so that their legs get adequate perfusion.
- At all times use the right drugs, tranquilization, and reversal techniques to protect the rhino against itself during transport and during release into the boma and free range.
- SANParks are recommending veld-to-velde translocations if the veld conditions are good as placing black and white rhino in holding facilities is very stressful to the animals.
- Boma holding prior to transport and release is essential for times when the veld condition is not good, if young orphaned animals are transported to new areas on their own, or where the transport distance is very far (ie, international translocations).

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