

## KETAMINE HYDROCHLORIDE – A USEFUL DRUG FOR THE FIELD IMMOBILIZATION OF THE SPOTTED HYAENA *CROCUTA CROCUTA*

by

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*Abstract* – The use of Ketamine hydrochloride (Vetalar, Parke-Davis) for the capture and restraint of five spotted hyaenas (*Crocuta crocuta*) is discussed. The wide margin of safety and relatively short recovery period associated with Ketamine make it a useful substitute for drugs such as Phencyclidine hydrochloride (Sernylan) and Succinylcholine Chloride, routinely used for the capture of carnivores.

### *Introduction*

During recent years a new drug called Ketamine (Vetalar, Parke-Davis) has proved that it could be a useful substitute for drugs such as Sernylan and Succinylcholine Chloride, conventionally used for the capture of carnivores. In addition to being used successfully for the immobilization of free roaming lions (*Panthera leo*), leopards (*Panthera pardus*), cheetah (*Acinonyx jubatus*) and baboons (*Papio ursinus*) (Smuts, Bryden, De Vos and Young, 1973) it has been used extensively for the capture and restraint of animals as distantly related to carnivores and primates as reptiles, birds and even certain ungulates (see Beck, 1971; 1972). Ketamine is also routinely used on the human patient to provide anaesthesia for a variety of surgical procedures (Parke-Davis and Co., undated).

As a prelude to the eventual capture and marking of a number of brown hyaenas (*Hyaena brunnea*) in the Kalahari Gemsbok National Park with Ketamine, it was decided to first immobilize a series of spotted hyaenas (*Crocuta crocuta*) in the Kruger National Park to determine dosage rates. With this in mind, five spotted hyaenas were captured near Skukuza, marked with eartags and immediately released.

### *Material and Methods*

Drug mixtures were delivered using dart-syringes propelled by standard capture equipment. In four of the cases the tranquillizer Azaperone (R1929) (Janssen) was used in combination with Ketamine (Table 1).

Ketamine hydrochloride (Vetalar or Ketalar, Parke-Davis), also designated CI-581, is a rapid-acting non-barbiturate drug which produces

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Table 1  
*Dosage rates and reaction times for faw hyaenas (Crocuta crocuta) immobilized with Ketamine hydrochloride*

Age and Number	mass kg.	Anaesthetic (Ketamine) mg.	Total amount of neuroleptic used mg.	Additional Ketamine administered (mg) (time after first dart)	Total amount of anesthetic used mg.	First signs of ataxia (min. after darting)	Animal recumbent (min. after darting)	Animal tractable (min. after darting)	First signs of recovery (after darting)	Time before ambulant (after first dart)	Time before fully recovered (after first dart)	Rectal Temp. °C	Dosage Rate mg/kg.
Adult 1	68,6	500	55	200-13 min. 250-32 min.	950	3½	4½	6	1 hr. 24 min.	2 hr. 56 min.	± 3½ hrs.	39,1°C (60 min.)	13,85
Immature 2	28,4	300	25	—	300	1	3	5	24 min.	1 hr. 20 min.	± 2 hrs.	39,4°C (30 min.)	10,56
Adult 3	71,3	600	60	400-42 min.	1 000	15	20	48	1 hr. 12 min.	2 hrs.	± 3 hrs.	39,4°C (1 hr. 10 min.)	14,01
Imm. 4	29,8	200	25	—	200	1	3	6	26 min.	55 min.	1½ hrs.	40,7°C (25 min.)	6,71
Imm. 5	33,4	800	0	—	800	1½	2	3	50 min.	1 hr. 16 min.	± 2 hrs.	—	23,95

chemical restraint or cataleptoid anaesthesia, depending on dosage. It is actually a short acting analogue of Sernylan, possessing approximately one-fifth the activity of the parent compound. Ketamine was used at a concentration of 200 mg/ml.

### Results

A brief summary of the results obtained are given in Table 1.

Since two hyaenas received booster doses of Ketamine (No. 1 and 3) the dosage rates given in the table were calculated using the total amount of anaesthetic used and not always just the amount contained in the first dart.

### Discussion

Since a suitable drug which can be antagonised by injection is not yet known for carnivores, the field biologist has had to rely on drugs such as Sernylan and Succinylcholine Chloride. Both these drugs, however, have distinct disadvantages when used routinely in the field:

- (i) Sernylan-immobilized hyaenas take long to recover. Kroll (1962) who used Sernylan at a dosage rate of 1,0 mg/kg on the spotted hyaena obtained a recovery period of five hours 28 minutes. Pienaar, le Riche and le Roux (1969), on the other hand, obtained recovery periods of up to 10 hours on a series of spotted and brown hyaenas captured at a dosage rate of 0,7 to 1,0 mg/kg. Recovery periods of over 26 hours have been witnessed in the case of brown hyaenas on which 2-3 mg/kg of Sernylan was used (Mills, *pers. comm.*).
- (ii) Using Succinylcholine Chloride the problem is just the opposite i.e. the immobilized hyaena recovers within a few minutes. Heuschele (1961), for example, obtained a recovery time of 15 minutes, while immobilization took eight minutes. In addition to this an overdose of Succinylcholine Chloride is usually fatal to the animal, while an underdose has no effect on it. Overdosages of Sernylan could similarly prove fatal to hyaenas.

When comparing Ketamine to the above mentioned drugs it appears to fit the field biologist's requirements i.e. a drug with a rapid reaction time, relatively short recovery period and a wide margin of safety.

Comparing the dosages used on the various hyaenas (Table 1), it is clear that the Ketamine has a very wide margin of safety. Hyaena No. 5, for example, received almost four times the anaesthetic threshold dose. Reaction times were rapid and four of the five were tractable within three to six minutes.

In all cases ataxia was initiated in the hind-quarters, this also being the last part of the body to recover completely (Fig. 1). Depending on dosage, the hyaenas were ambulant within one to three hours.



Fig. 1. An adult spotted hyaena disturbed while recovering from Ketamine anaesthesia. Although paresis of the forequarters is noticeable, the hind-quarters remained parietic for a greater length of time. The tail has been cropped for identification purposes.

As was the case with lions (Smuts *et al.*, 1973) the depth of anaesthesia and analgesia could be regulated at any stage by administering intravenous or intramuscular booster doses of Ketamine.

Even though the animals kept their eyes open and could in certain instances move their heads, no signs of nervousness were witnessed (Fig. 2) during any stage of anaesthesia. Once recovery has commenced it is, however, advisable to leave the animal as undisturbed as possible (see also Commons, 1970 and Smuts *et al.*, 1973).

During the entire time of immobilization temperature reactions were minimal, convulsive seizures entirely absent, salivation minimal, and protective reflexes (laryngeal-pharyngeal) normal.

### Conclusion

It is concluded that Ketamine is a safe and effective drug to use for the capture and restraint of hyaenas. Depending on the degree of anaesthesia required and the time interval for which the animal must remain immobilized, Ketamine should be administered at a dosage rate of 7 to 15 mg/kg and in combination with a suitable tranquillizer such as Azaperone.

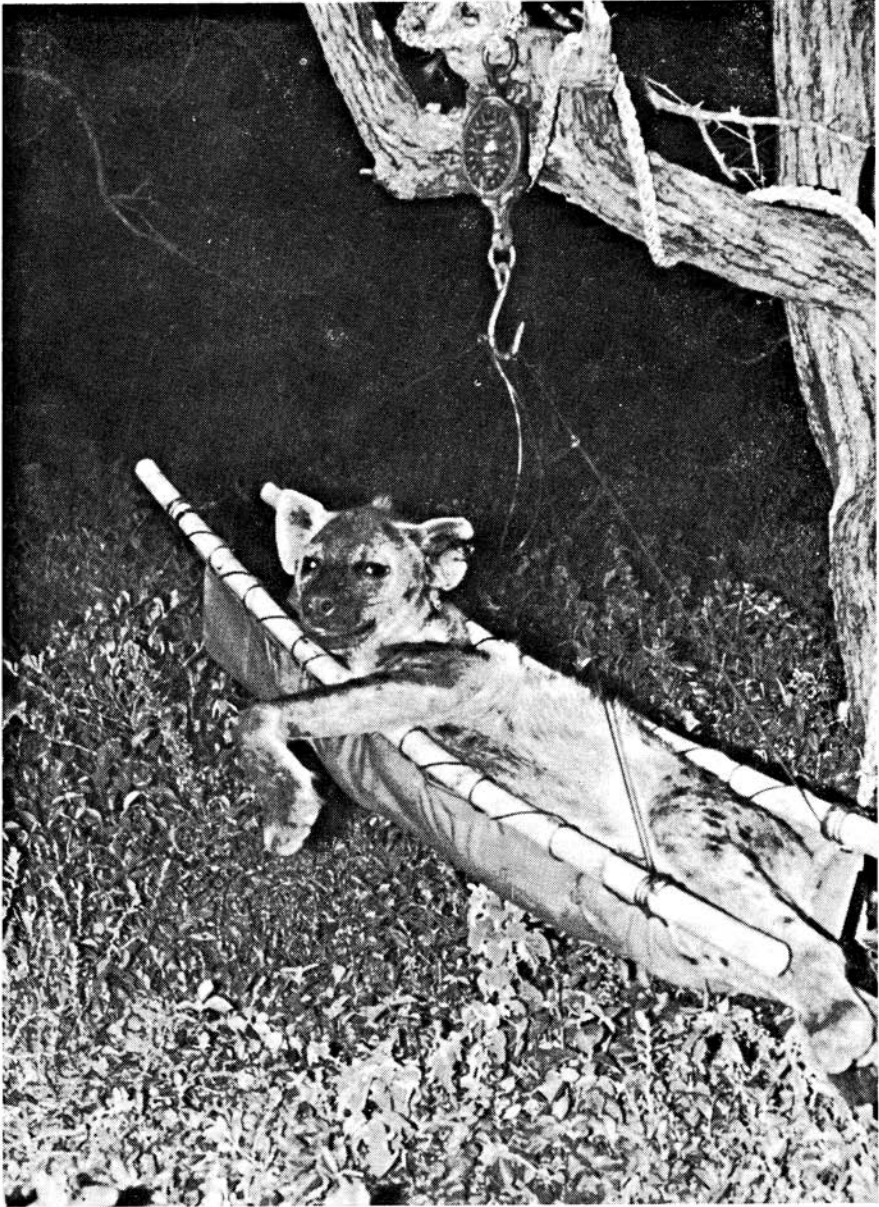


Fig. 2. A spotted hyaena being weighed. Although showing the first signs of recovery at this stage (lifting its head) the animal was still fully tractable. During recovery from Ketamine anaesthesia all hyaenas were sensitive to visual and auditory stimuli.

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### REFERENCES

- BECK, C. C. 1971. Chemical restraint of exotic species. *American Association of Zoo Veterinarians*. Annual Convention in Honolulu, Hawaii: 1-81.
- BECK, C. C. 1972. Vetalar. Its role in veterinary anesthesia. *41st Ann. Conf. for Veterinarians*: 1-8 Sponsored by the Louisiana State University and Cooperative Extension Service, Baton Rouge, Louisiana.
- COMMONS, M. 1970. Clinical experiences with Ketamine Hydrochloride as an intramuscular general anesthetic in the cat. *Vet. Med. small Anim. Clin.* 65, 12: 1151-1152.
- HEUSCHELE, W. P. 1961. Immobilization of captive wild animals. *Vet. Med.* 56, 8: 348-351.
- KROLL, W. R. 1962. Experience with Sernylan in Zoo Animals. *Int. Zoo Yb.* 4: 131-141.
- PIENAAR, U. DE V., E. LE RICHE and C. S. LE ROUX. 1969. The use of drugs in the management and control of large carnivorous mammals. *Koedoe* 12: 177-183.
- PARKE-DAVIS & CO. (Undated). Ketalar (Ketamine hydrochloride, Parke-Davis). New Anesthesia catalogue. Detroit, Michigan 48232 U.S.A.
- SMUTS, G. L., B. R. BRYDEN, V. DE VOS and E. YOUNG. 1973. Some Practical Advantages of CI-581 (Ketamine) for the field immobilization of Larger Wild Felines, with comparative notes on baboons and impala. *Lammergeyer* 18: 1-14.