

CONCLUSIONS

CT1341 was used for the first time in cheetahs during the present study. The effective means of restraining cheetahs in crushes designed during the study made the use of intravenous CT1341 possible. No deaths were recorded after > 750 immobilizations. CT1341 is a safe and effective drug for the immobilization of cheetahs. The intramuscular administration of CT1341 for the immobilization of large felids is, however, not feasible because of the large volume of drug required. A mixture of approximately 8 mg/kg of ketamine hydrochloride with 0,5 mg/kg of xylazine hydrochloride was effective when cheetahs were darted. Anaesthesia with this drug combination was however characterized by muscular hypertonicity and occasional epileptiform convulsions. The possibility of eye damage as a result of the suppression of palpebral reflexes and mydriasis was ever present.

When the present study was embarked upon the fertility of the male cheetahs at the Centre was questioned. Standard methods of evaluating semen quality in domestic species were adopted in assessing the fertility of cheetah males. Males with what appeared to be good quality semen were used for breeding. This approach was successful. Over 240 cheetah cubs were born from 71 litters at a conception rate of 52% during the period 1975 - 1984.

Initially it was postulated that poor semen quality, as assessed on the basis of spermatozoal morphology, seen in the majority of the captive cheetah males examined was the most important factor affecting the fertility of this population. Spermograms from

successful sires at the Centre, however, indicate that spermatozoal morphology alone does not accurately reflect the fertility of cheetah males.

The percentage of normal spermatozoa counted in successful sires ranged from 18-80 % with half the recorded births resulting from matings when males with normal sperm counts below the population mean of 47,6 % were used. Other semen characteristics including sperm motility, percentage motile spermatozoa and concentration of spermatozoa per ml appear to be more important as measures of fertility in cheetahs as has been reported in other species (Austin et al. 1961; Clarke et al. 1973; Carroll et al. 1973). The subjective assessment of these factors made immediately after semen was collected, by a person experienced in the evaluation of semen quality, was used in the choice of males for breeding purposes during the last few years of the study and with good results.

O'brien et al. (1983) reported that the cheetah has a distinct monomorphic genome. The physiological relevance of this finding is open to question. Quantification of the proteins identified is not possible and the fact that a specific enzyme protein is present need not be a measure of its functional activity. Wildt et al. (1983 & 1986) reported on the high percentage of morphologically abnormal spermatozoa seen in both captive and free-ranging cheetahs examined by them. The conclusions of O'brien et al. (1983) and Wildt et al. (1983 & 1986) in which the

(Chandley et al. 1975; Afzelius, 1981 in Wildt et al. 1983).
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species' lack of genetic variation is linked to the belief that the cheetah is endangered because of poor fertility and fecundity are however contradicted by the evidence available.

Captive cheetahs at the De Wildt Centre have reproduced in such numbers that at times the breeding program has been halted because the dramatic increase in the population has exceeded the demand for animals from world zoos. The release of eight cheetahs, five males and three females, into the Suikerbosrand Nature Reserve in 1975 was followed by a rapid increase of that population. Within five years and after 16 cheetahs from the reserve were relocated to other areas 30 cheetah were still in the reserve and the prey populations of blesbok (Damalisca dorcas phillipsi) and springbok (Antidorcas marsupialis) were in decline (Pettifer, 1981). Cheetahs are regarded as problem animals in the farming areas of the Northern Transvaal and relatively large numbers are shot or captured, yearly, by farmers in South West Africa - Namibia (Morsbach, pers. comm.). The cheetah was reported to be out of danger from extinction by Smithers (1986).

The spermogram results obtained during the present study are not directly comparable with those of Wildt et al. (1983 & 1986) because of the different morphological classifications used. Nevertheless both studies have shown that cheetah semen is characterized by a high percentage of pleomorphic spermatozoa. Similar spermatozoal pleomorphism has been reported in man (Chandley et al. 1975; Afzelius, 1981 in Wildt et al. 1983). Bornman, Van Vuuren, Meltzer, Van Der Merwe & Van Rensburg

(1987) reported a 50 % mean normal spermatozoa count in 680 spermograms from chacma baboons (Papio ursinus). A result of the same order as the 47,6 % mean normal count in cheetahs during the present study.

The marked drop in semen quality seen in the grouped cheetah males after the breeding season may be an indication of the effects of stress or the presence of females on the quality of the semen of cheetah males. Cheetahs are not seasonal breeders (Wrogemann, 1975; Wildt et al. 1986). It appears that the conditions under which these animals were kept and the fact that they had been removed from the area around the female enclosures a month prior to the evaluation of their semen may have affected semen quality. Until these possible influences on semen quality have been investigated in a controlled manner it is not possible to reach a conclusion regarding the relevance of the poor spermatozoal morphology reported on both by Wildt et al. (1983 & 1986) and the present study.

Plasma testosterone studies were undertaken to obtain an understanding of the hormonal status of cheetah males considered to be either fertile or sub-fertile after the evaluation of their semen quality. The marked diurnal variation in plasma testosterone concentrations in the group of five cheetah males sampled over a 24 h period indicated that a single blood sample collected from an animal would be valueless. A controlled stimulus for testosterone production, the administration of 50 µg GnRH, resulted in a

libido. *Miss van Dyk's thorough understanding of individual be-*

maximal plasma testosterone response. However no significant difference in this response was found in mature cheetah males despite differences in semen quality.

The intravenous administration of GnRH appeared to be advantageous. Maximum testosterone concentrations were reached sooner. Prolonged anaesthesia with thiopentone sodium resulted in a significant decline in plasma testosterone concentrations in untreated control animals. A comparison of the variation in plasma testosterone concentrations measured in cheetahs over a 24 h period with those of cheetah males anaesthetized with CT1341 for up to 6 h appears to indicate that CT1341 does depress plasma testosterone concentrations, albeit to a lesser degree. The plasma testosterone response after GnRH administration did not differ when either of these two anaesthetics was used.

The hormone studies performed during this study indicate that the assessment of these animals' hormonal status was of little or no value in the pursuance of the objective of promoting optimal reproduction.

As suggested at the beginning of the present study effective management of the cheetah population made an important contribution to the breeding success achieved at the De Wildt Centre. The fact that males were kept separated from the females for most of the year prevented habituation of the sexes to one another. The presence of males appeared to stimulate females to come into oestrus and the interaction between males in a group stimulated libido. Miss van Dyk's thorough understanding of individual be-

havioural characteristics of the animals made it possible to introduce males into female enclosures when oestrus was not apparent.

The use of selected males with the best semen quality and the meticulous attention to the management of the animals at the Centre were the most important factors that resulted in the successful breeding of cheetahs in large numbers.

Comparative data for conception rates in non-domestic species are not available, nevertheless the mean conception rate of 52% achieved during a 10 year period appears to indicate that the captive cheetah, like their wild counterparts, do not have a fertility problem.

The appropriate management of the captive population was essential for the stimulation of sexual activity. The fertility of the male cheetahs was examined and males were selected on the basis of their semen quality for inclusion in the breeding program. Semen was collected by electroejaculation from cheetah males immobilised with a combination of ketamine and xylazine or with GT1361. Semen quality was evaluated using standard methods. Fresh semen samples were examined for motility, percentage live and density. Spermatozoal morphology was examined using stained semen smears.

Plasma testosterone was determined in cheetah males bled at 2 hourly intervals for 24 h. Thereafter an intramuscular injection of 50 µg GnRH was used as a standard stimulus. Plasma testosterone concentrations, after GnRH, were measured in cheetah males from different age groups, at different times of the year, in electroejaculated animals and animals with differences in