Koedoe 15: *61–65* (1972).

TRANSFERRIN AND HAEMOGLOBIN TYPES IN THE AFRICAN ELEPHANT (*LOXODONTA AFRICANA*)

by

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Abstract – In a random sample of 84 elephants from the Kruger National Park and five elephants from the Addo Elephant National Park, biochemical polymorphism in the serum transferrins could be established. It seems that elephants in the Kruger and Addo Parks are genetically similar but further studies are indicated to confirm these preliminary findings. For the haemoglobin investigations 109 blood samples were available, all originating from the Kruger National Park and all revealing only one type of haemoglobin.

Introduction

In a study of the African buffalo (Osterhoff, Young and Ward-Cox, 1970 a), it was concluded that these animals were genetically homogeneous with regard to the serum types as analysed by current techniques. The homogeneity within two herds of buffalo was coupled to a very high degree of inbreeding resulting in certain morphological abnormalities. Another study was carried out by Osterhoff and Keep (1970) on the black and white rhinoceros of Zululand. Here, a related problem was investigated because the black rhino, which is actually threatened with extinction, displays a remarkable degree of genetic uniformity regarding serum types as compared with the white rhino.

A similar study in the African elephant was undertaken to estimate the degree of homogeneity and to study possible migration routes of different herds.

Material and Methods

Blood samples for transferrin analysis were obtained from animals in the following areas in the Kruger National Park (progressing from north to south): Mahlangene (7), Letaba (8), Satara (6), Nwanedzi (10),

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Tshokwane (20), Skukuza (16) and Crocodile Bridge (17). Five serum samples were also obtained from the Addo Elephant National Park for comparative purposes.

The specimens included in the haemoglobin analysis were obtained from animals in the following areas in the Kruger National Park: Shangoni (17), Shingwidzi (30), Mahlangene (9), Satara (27) and Nwanedzi (26).

The samples were obtained from animals immobilized during an identification and marking programme, or from culled animals (Pienaar, van Niekerk, Young, van Wyk and Fairall, 1966). The samples were subjected to protein typing using the classical technique of starch gel electrophoresis, this being performed in the Veterinary Investigation Centre at Skukuza.

Results

Although no iron-binding experiments could be performed, it is assumed that the beta-globulin bands depicted in Figure 1 are in fact the transferrin bands. The designation of the different types is tentative.

In Table 1 the different transferrin types are shown grouped according to the regions of origin.

Table 1

Transferrin phenotype distribution in African elephant from the Kruger National Park.

Region	Transferrin phenotypes			Total
	FF	FS	SS	
Mahlangene	—	—	7	7
Letaba	—	2	6	8
Satara	—	5	1	6
Nwanedzi	—	2	8	10
Tshokwane	2	3	15	20
Skukuza	2	8	6	16
Crocodile Bridge	—	5	12	17
Total	4	25	55	84

Haemoglobin typing could be performed on 109 samples. All samples exhibited only one migration line and no variation was found. Figure 2 depicts eight samples analysed; the feint band in front of the haemoglobin band (in six of the eight samples) originating from serum proteins. This was often seen because many samples were haemolysed, thus containing the proteins from the serum and the haemoglobins.

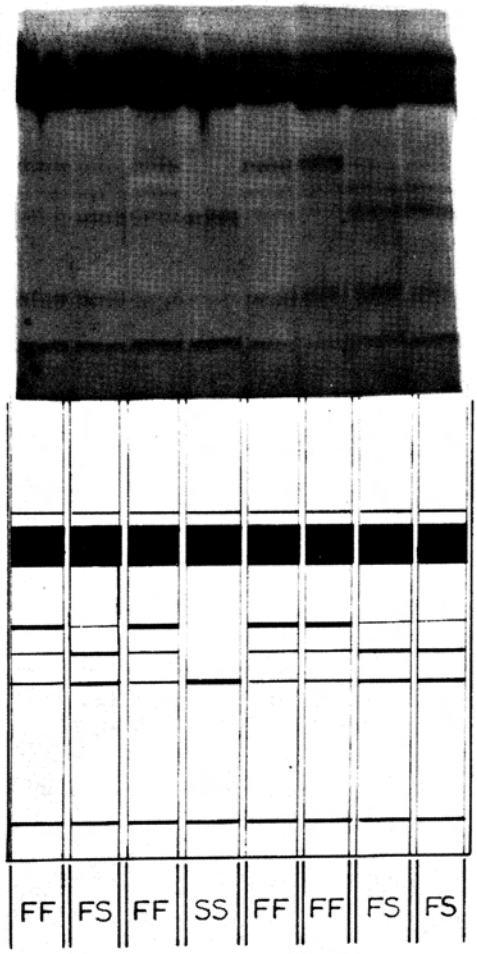

Fig. 1 Serum types in African elephant.

Discussion and Conclusions

The part of the Kruger National Park included in the present study represents an area of ± 300 km from north to south and ± 80 km from east to west, with the greatest concentration of elephants to be found in the north. From the results portrayed in Table 1, it appears that elephants in the Kruger National Park are genetically very homogeneous and certainly belong to the same gene pool. The overall observed figures are in complete agreement with the expected figures according to the Hardy-Weinberg-equilibrium.

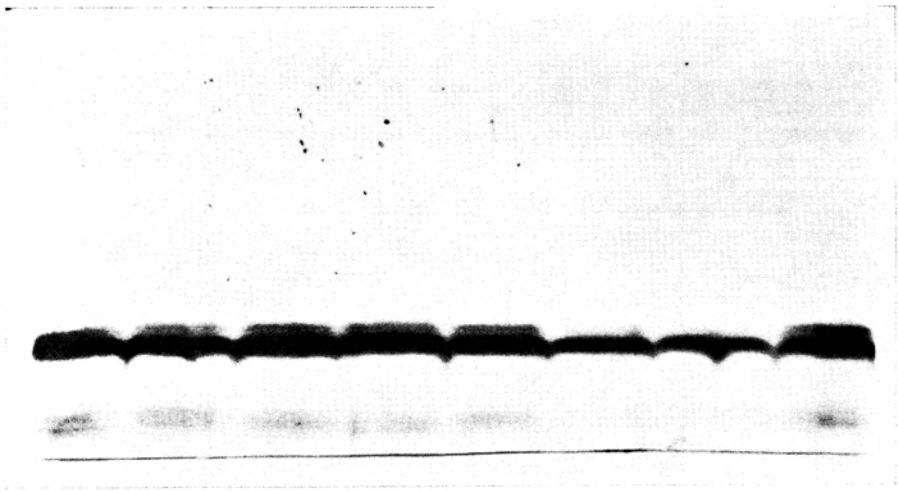

Fig. 2 Elephant haemoglobin.

It could be stated that the degree of inbreeding seems to be comparatively lower than in African buffalo, although not as low as that of the zebra (Osterhoff, 1966).

The five serum samples obtained from elephants in the Addo Elephant National Park showed no difference from those obtained in the Kruger National Park. One animal exhibited the SS-type, the other four the FS-type. Since the elephants in the Addo Park are isolated, a higher degree of inbreeding is expected, but from the information obtained hitherto from these specimens it is impossible to make any categorical statements. It seems, however, that these animals are genetically similar to those in the Kruger National Park. A further study including other genetic markers would confirm this indication.

The haemoglobin typing of wild animals performed during January 1972 could possibly solve a puzzle on elephant blood proteins experienced before (Osterhoff, Young and Ward-Cox, 1970 b). Thirty blood samples of wild animals were investigated and 11 "slow" types were found. It could now clearly be shown that these 11 animals were actually impala (Osterhoff, Young and Petrie, 1972). One has to be very careful in marking samples, especially under conditions where the work is performed 500 km distant from the home laboratory. On the other hand, the techniques used are now so well advanced, that samples can be identified by using only one genetic marker.

The use to which these biochemical polymorphisms may be put, is of a taxonomical nature. The question whether wild animals within a species should be further subdivided into different subspecies and eventually breeds can be put, as is the case in domestic animals. Furthermore, is there any possibility that specific breed characteristics could be mani-

fested through natural selection? Could a certain subgroup of a species be improved along the lines of domestic animal breeding by the introduction of "new blood" from another subgroup of the same species? All these aspects could ultimately be of inestimable value to the nature conservationist, who always investigates new means and methods of not only controlling game populations but also endeavours to avoid eventual extinction of rarer species.

Acknowledgements

The authors are indebted to Mr. A. M. Brynard, Dr. U. de V. Pienaar and Dr. G. de Graaff of the National Parks Board for their interest and co-operation. They also wish to thank the staff of the Veterinary Investigation Centre at Skukuza, Mr. I. A. Petrie, students at the Veterinary Faculty at Onderstepoort, and other personnel of the National Parks Board who contributed to this project, for their assistance.

REFERENCES

OSTERHOFF, D. R. 1966. Haemoglobin, transferrin and albumin types in Equidae (horses, donkey, mules and zebras). *Proc. 10th Eur. Blood Group Conf.*, Paris, 262.

OSTERHOFF, D. R. and M. E. KEEP. 1970. Natural variation in the blood proteins of white and black rhino. *Lammergeyer* 10: 50.

OSTERHOFF, D. R., E. YOUNG and I. S. WARD-COX. 1970a. A study of genetical blood variants in African buffalo. *Jl. S. Afr. vet. med. Ass.* 41:33.

OSTERHOFF, D. R., E. YOUNG and I. S. WARD-COX. 1970b. Natural variation of the blood proteins types of the African elephant (*Loxodonta africana*). *Proc. 12th Eur. Blood Group Conf.*, Budapest, 683.

OSTERHOFF, D. R., E. YOUNG and I. A. PETRIE. 1972. Haemoglobin differences in wild animals. *Jl. S. Afr. vet. med. Ass. In Press.*

PIENAAR, U. DE V., J. W. VAN NIEKERK, E. YOUNG, P. VAN WYK and N. FAIRALL. 1966. The use of oripavine hydrochloride (M-99) in the drug-immobilization and marking of wild African elephant (*Loxodonta africana* Blumenbach) in the Kruger National Park. *Koedoe* 9: 108–124.