BLOOD CHEMICAL PARAMETERS IN FREE-LIVING WHITE RHINOCEROS *CERATOTHERIUM SIMUM*

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ABSTRACT: Van Heerden J.; Keffen R.H.; Dauth J.; Dreyer M.J. 1985 **Blood chemical parameters in free-living white rhinoceros *Ceratotherium simum*.** *Journal of the South African Veterinary Association* (1985) **56** No. 4, 187-189 (En). Department of Medicine, Faculty of Veterinary Science, Medical University of Southern Africa, 0204, Medunsa, Republic of South Africa.

Serum concentrations of sodium, potassium, chloride, total protein, albumin, aspartate transaminase, creatine kinase, lactate dehydrogenase, gamma-glutamyltranspeptidase, alkaline phosphatase and alanine transaminase were determined in free-living white rhinoceroses *Ceratotherium simum* (n = 20). Single serum cortisol (n = 20), oestradiol-17 Beta (n = 14) and progesterone (n = 14) concentrations are also presented. Low serum sodium (129,6±4,2 mmol/ℓ) chloride (94,2±3,05 mmol/ℓ) and albumin (26,1±3,71 mmol/ℓ) as well as high globulin (alpha 1, alpha 2, beta and gamma) concentrations were outstanding features.

Key words: Serum biochemistry, steroid hormones, *Ceratotherium simum*

INTRODUCTION

Very limited information on baseline laboratory data for the white rhinoceros *Ceratotherium simum* has been published. This paper presents data on the basic blood chemistry and serum hormone concentrations in the free-living white rhinoceros.

MATERIAL AND METHODS

Twenty free-living rhinoceroses, 8 males and 12 females of which 16 were adults and 4 subadults were immobilized with varying dosages of etorphine hydrochloride (M99, R & C Pharmaceuticals), azaperone (Stresnil, Janssen) and fentenyl (Fentenyl, Janssen). Animals were immobilized between 07h06 and 11h05 and blood specimens were collected in evacuated tubes (Vac-u-test, Radem Laboratory Equipment, Wijnberg) from an ear vein between 5 – 80 min after administration of the immobilizing agent (Table 1). The blood was centrifuged within 1,5 h of collection and the serum subsequently stored at –4°C until analyzed in the laboratory.

Serum specimens were analysed for sodium (Na), potassium (K), chloride (Cl), aspartate transaminase (AST), creatine kinase (CK), lactate dehydrogenase (LDH), gamma-glutamyltranspeptidase (GGT), alkaline phosphatase (ALP), alanine transaminase (ALT), albumin (Alb) and total proteins (TP) as described[7].

The serum levels of cortisol, progesterone and oestradiol-17 Beta were determined by radioimmunosays utilizing the following kits: Clinical Assays Gamma Coat™(^{125}I) Cortisol Radioimmunosay Kit (Division of Travenol Laboratories, Inc., Cambridge, Massachusetts); Coat-A-Coat^{R} Progesterone (Diagnostic Products Corporation 5700 West 96th Street, Los Angeles, Ca 90045) and EIR radioimmunoassay (Radio Isotopen Service, Eidg Institut für Reaktorforshung, 5304 Würenlingen/Schweiz).

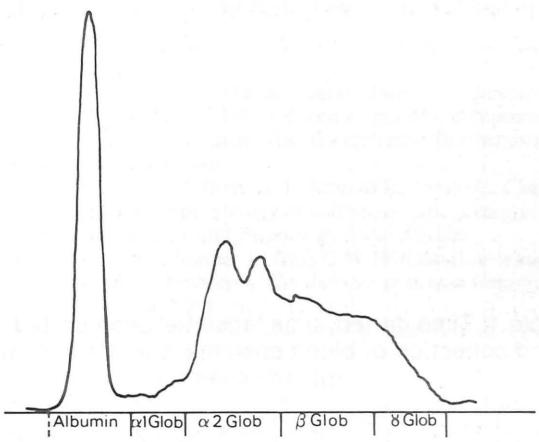

Fig. 1: Densitometric scan of serum proteins of the rhinoceros

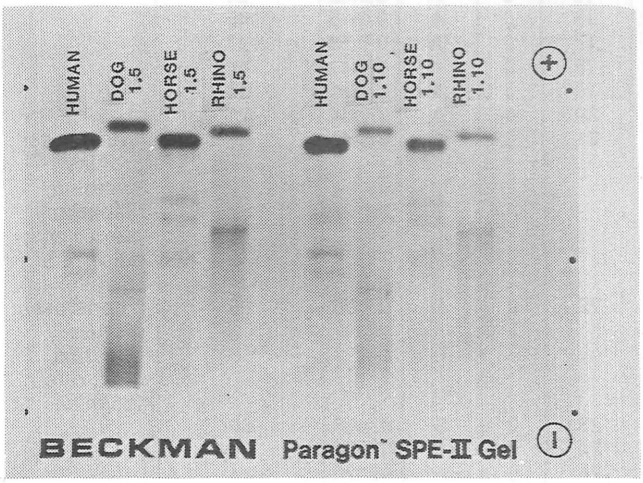

Fig. 2: Serum electrophoretic patterns of the dog, human, horse and rhinoceros

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RESULTS

The results of serum chemical analyses are presented in Table 2. Serum enzyme concentrations (AST, CK, LDH, GGT, ALP) showed different degrees of individual variation. A very high concentration of CK (1800) was measured in one animal which was darted 4 times before it was eventually immobilized. Unusually high concentrations of GGT (> 3 350 and 165 U/l) were recorded in two animals. The densitometric scan of the serum proteins is presented in Fig 1. The cellulose acetate membrane on which serum protein electrophoresis of the rhinoceros is compared to that of the dog, human and horse is presented in Fig. 2. The different globulin fractions in the rhinoceros could not be clearly identified and were empirically designated as alpha, beta 1, beta 2 and globulin fractions.

The results of assays for cortisol, oestradiol-17 Beta and progesterone are presented in Table 3. The highest concentration of cortisol was recorded in animal # 22 which was darted twice before eventually immobilized. Low but detectable concentrations of oestradiol-17 Beta and progesterone were found in the serum of males.

Table 1: Time darted, time lapse between darted and blood collection of blood specimens and age of white rhinoceroses

Animal No	Sex	Age class	Time	Time lapse between darted and blood collection (min)	Remarks
4	0	A	11h05	5	
5	0	S	09h57	21	
6	0	A	07h47	23	
7	0	S	08h12	13	
9	♂	A	08h12	16	
10	0	A	07h55	22	
12	0	A	08h56	16	
13	0	S	07h15	25	
14	0	A	09h07	33	
15	0	A	09h32	28	
16	0	A	07h15	45	
17	0	A	09h58	17	
18	0	A	07h41	14	
19	0	A	07h31	19	
20	0	A	07h54	21	
21	0	A	07h41	80	4 darts used; profuse sweating, respiratory rate 20/min; pulse rate 150/min
22	0	A	07h36	69	2 darts used; profuse sweating, heart rate 156/min
23	0	S	07h06	39	
24	0	A	07h50	18	
26	0	A	08h20	14	

A = Adult
S = Subadult

Table 2: Concentrations of serum chemical constituents in white rhinoceroses

	n	$\bar{x}$	SD	range
Na (mmol/ℓ)	20	129,6	4,2	122 – 138
K (mmol/ℓ)	20	5,4	2,6	4,8 – 8,7
Cℓ (mmol/ℓ)	20	94,2	3,05	90 – 101
AST (U/ℓ)	20	40	14,6	23 – 93
CK* (U/ℓ)	17	48	14,1	24 – 72
LDH (U/ℓ)	20	526	126,1	335 – 925
GGT** (U/ℓ)	18	7,6	2,8	2 – 13
ALP (U/ℓ)	20	127	33,2	66 – 189
ALT (U/ℓ)	20	8,6	3,7	2 – 20
TP g/ℓ	20	92,7	9,0	75 – 107
Alb g/ℓ	20	26,1	3,7	17,8 – 31,3
alpha 1 g/ℓ	20	2,3	1,1	0,4 – 4,0
alpha 2g/ℓ	20	32,0	10,5	3,9 – 43,1
beta g/ℓ	20	23,6	6,7	13,5 – 30,7
gamma g/ℓ	20	16,0	7,1	7,3 – 41,1

*three animals with CK concentrations of respectively 200,559 and 1800 U/ℓ were excluded
**two animals with GGT concentrations of respectively >3350 and 165 U/ℓ were excluded

Table 3: Serum cortisol, oestradiol-17 Beta and progesterone concentration in white rhinoceroses

Animal No	Cortisol (nmol/ℓ)	Oestradiol-17 (pmol/ℓ)	Progesterone (nmol/ℓ)
4	5,7	13,7	7,4
5	17,5	10,9	0,4
6	20,9	–	–
7	10,3	6,8	0,8
9	16,7	–	–
10	9,1	8,6	0,5
12	10,2	–	–
13	5,9	8,0	8,0
14	50,1	85,7	81,7
15	4,7	17,9	2,9
16	19,8	17,2	86,8
17	6,7	50,4	62,7
18	32,3	–	–
19	22,0	15,2	5,9
20	13,9	22,1	106,2
21	14,6	–	–
22	122,5	23,8	<0,3
23	109,6	–	–
24	17,0	1,5	7,7
26	15,4	17,2	9,8

DISCUSSION

The presented serum chemistry results as well as serum cortisol concentrations may be regarded as baseline values for free-living white rhinoceroses immobilized as described.

The relatively low serum sodium (129,6 ± 4,2 mmol/ℓ), serum chloride (94,2 ± 3,1 mmol/ℓ) as well as relatively high total protein (92,7 ± 9,0 g/ℓ) concentrations are interesting findings. In the horse and mountain zebra *Equus zebra zebra*, related Perissodactyls, average concentrations for sodium, chloride and total proteins are in the order of respectively 140 mmol/ℓ, 100 mmol,ℓ and 70 g/ℓ [6]. Seal et al.[4], however, reported an average serum sodium concentration of 139 mmol/ℓ, an average serum chloride concentration of 95 mmol/ℓ and an average serum total protein concentration of 76 g/ℓ