

HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF CAPTIVE SPOTTED DEER (*Axis axis*) AS A REFERENCE VALUE

Seemanthini R. and R.G. Jani

Department of Veterinary Medicine
College of Veterinary Science & Animal husbandry
Anand Agricultural University, Anand

Received 28-5-2015 Accepted 10-6-2015

Corresponding Author : vetjani@gmail.com

ABSTRACT

Haematological and blood biochemical status were measured in 20 sedated chital deer (*Axis axis*) (2-8 years of age) reared in different captive environment to compare as reference values vis-à-vis domestic small ruminants for assessing their health status. Haemoglobin, haematocrit (PCV), total erythrocyte count and total leucocyte count were measured to show 10.8 ± 0.87 g/dl, $38.0 \pm 0.7\%$, $12.6 \pm 0.8 \times 10^6$ and $5.20 \pm 0.2 \times 10^3$ respectively. The mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration were found to be $28.6 \pm 1.4 \mu\text{m}^3$, $8.2 \pm 0.6 \mu\text{g}$, and $26.4 \pm 1.5\%$ respectively. The erythrocyte size was of microcytic type in spotted deer. Amongst the different leukocyte neutrophil predominated ($58.0 \pm 1.50\%$) over lymphocyte ($40.0 \pm 1.24\%$) compared to other small ruminant species. Plasma glucose, serum total protein, cholesterol and urea concentration were 68.00 ± 8.01 mg/dl, 9.80 ± 0.60 g/dl, 134.00 ± 09.20 mg/dl and 24.20 ± 0.36 g/dl respectively. Serum calcium and phosphorus showed in normal range stress of handling due to chemical immobilization and restraint may have induced some alteration in these haemato-biochemical parameters which is difficult to be eliminated and similar observation may be compiled for reference in captive deer species.

KEY WORDS : *Axis axis*, Haematology, Biochemical parameters, Spotted deer

INTRODUCTION

In India many zoological parks and deer parks have different variety of deer and antelope species for exhibition. The Indian spotted deer (*Axis axis*), popularity known as chital, is one of the most beautiful species in entire corvine race and is the commonest jungle deer in entire India. Baseline characteristics of haematological and serum biochemical parameters have not been properly documented for the captive Indian deer species and comparison are usually made with data obtained from domestic small ruminants species (sheep & goat). Reference values would be useful for evaluation of physiological and pathological alterations in wild and captive deer species. In this study an attempt was made to assess various haematological and blood biochemical values in spotted deer reared in captivity and compared with the reference values in domestic small ruminant species.

MATERIALS AND METHODS

Twenty spotted deer female aged between 2-8 years of age were selected from a larger population reared in different zoos of Gujarat state and were handled with drugs and immobilization techniques similar to those in most field studies.

Anesthesia and capture

A dart filled with drug (estimated dose. 1- 2-3-5 ml Hellabrunn's mixture) for tranquil zing/immobilization was blown through a long range tranquilizing gun and spotted deer (Chital) were captured as per standard techniques (Arora 1998) . Animals were examined clinically for clinical

signs of disease and temperature, pulse and respiration were monitored during the period of immobilization and blood collection.

Blood collection and sampling

Blood samples were collected from the jugular vein using disposable syringes and 18 gauge needles. About 5 ml blood was placed into tubes containing anticoagulant (sodium EDTA and sodium fluoride mixture) with the remainder (about 5 ml) being placed into a serum separated tube. Blood in the serum separated tube was left to clot at room temperature for 1hr. Tubes with anticoagulated and serum separated tube were centrifuged at 2500 rpm for 10 min. The plasma/ serum was removed and stored under deep freezing (-20°C) condition until analysis.

Analysis

The haematological characters like, red blood cell (RBC) count, packed-cell volume (PCV), hemoglobin concentration (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), white blood cell (WBC) count and differential leucocytic count (DLC) were measured as per standard procedure- outlined by Jain (1986). PCV was measured by centrifuging blood in a microhaematocrit tube using a haematocrit centrifuge. The blood metabolites were analyzed by following the standard protocol outlined for the specific metabolites kits (Crest Biosystem) with autoanalyser.

RESULTS AND DISCUSSION

All the deers were physical active, alert before immobilisation and no clinical signs of disease were observed in animals examined after immobilization and capture. There was also no mortality of animals during or after immobilization and blood sampling.

Haematology

Table 1 presents the average and range of values for various haematological characters in spotted deer. Attempts were made to compare the values in deer with the reference values of domestic sheep and goat. Haematological profile comprised Hb, RBC, MCV, MCH and MCHC showed a great variation within the animals. The RBC count was higher in deer (12.6×10^6) but Hb concentration (10.8 g/dl) was lower compared to domesticated sheep and goat. The PCV, MCV and MCH values were well within the range that reported in sheep and goat except that of MCHC was lower. Naiket al. (1964) reported a higher RBC count ($17.3-200 \times 10^6$) and Hb concentration (16.0-17.0 g/dl) in Indian spotted deer with a microcytic type of red cell. Naiket al. (1964) also observed a low MCH similar to that in sheep and a low MCHC. Arora et al. (1985) studied blood samples in swamp deer (*Cervus duvauceli*), which revealed Hb concentration at 8-11 g/dl.

A lower Hb concentration in spotted deer might have resulted in low PCV and it further influenced the MCH and MCHC value and the reduction in Hb is relatively greater than the average decrease in erythrocyte volume the little change in erythrocyte number also conferred for the microcytic type of red cell.

The white blood cell parameter, WBC count and different leukocyte concentration, also showed variability within the animals and the values were quite different from that in domestic small ruminant species.

The WBC count was quite low (5.20×10^3) as compared to sheep and goat. DLC reveals high per cent of neutrophil in deer as compared to sheep and goat whereas other components lymphocyte, eosinophil and monocyte were at lower as compared to sheep and goat.

Blood biochemistry

Observations on serum/plasma chemistry of spotted deer are presented in Table 2. Plasma glucose concentration in deer was within the reference range (50-80 mg/dl), but serum concentration of

Table 1. Haematological parameters of spotted deer under captivity.

Parameters	Spotted deer	Sheep*	Goat*
Haemoglobin (g/dl)	10.8±0.87 (8.2-13.4)	11.2 (8-16)	10.6 (8-14)
Packed cell volume (mm)	38.0±0.70 (33-42)	34 (22-50)	32 (20-48)
RBC count(10 ⁶)	12.6±0.80 (10-15)	12.2 (6-16)	14.5 (9-20)
MCV(μ ³)	28.6±1.40 (24.0-32.0)	30 (23-48)	22 (18-30)
MCH (μg)	8.2±0.60 (6.86-8.38)	10.2 (9.0-13.0)	7.0 (5.0-8.0)
MCHC%	26.4±1.50 (24.2-36.2)	32 (28-34)	32 (28-34)
WBC count (×10 ³)	5.20±0.20 (3.2-5.6)	8.6 (4-17)	9.8 (6-16)
Differential count (%)			
Neutrophil	58.0±1.50 (42-58)	33 (20-50)	40 (30-48)
Lymphocyte	40.00±1.24 (41-47)	58 (40-75)	53 (40-70)
Eosinophil	1.00±0.32 (1-3)	4.8 (0-15)	3.2 (0-15)
Monocyte	1.25±0.34 (1-4)	3.7 (0-13)	3.3 (1-5)
Basophil	0.0±0.0 (0)	0.5 (0-2)	0.5 (0-3)

*Benzamin (1964). Value in parenthesis () represent the range of value observed.

protein, albumin and globulin was higher than that observed in small ruminant species Arora et al. (1985) observed serum protein concentration in the range of 6.20-8.00 g/dl in swamp deer. Chapple et al. (1991) observed Serum protein concentration of 5.63g/dl in juvenile hind to 7.02 g/dl in adult hinds. English and Lopherd (1981) observed altered serum proteins and gamma globulins in fallow deer (*Dama dama*) after stressful handling. This also affected albumin: globulin ratio as well. In the present study albumin globulin ratio was varied between 1.240 to 1.980 suggesting various factors (stress, nutritional status and seasonal reproductive cycle) might have affected within the animals. Plasma urea, serum total cholesterol, calcium and phosphorous levels were following the trend that was observed in domesticated sheep and goats.

The serum concentration of AST and ALT in spotted deer revealed more similarity with goat than sheep. Chapple et al. 1991). According to Duncan and Prasse (1986) muscle enzymes have been shown to increase in animals during the excitement and stress of restraint, due to increased cell permeability and cell damage. Alteration in enzymatic activity is also noted during liver damage and regeneration (Kaneko 1989) The findings in this study did not show marked elevation in any individual animals, however, the stress factor due to handling cannot be ruled out.

Table 2. Serum/plasma biochemical parameters of spotted deer under captivity.

Parameters	Spotted deer	Sheep*	Goat*
Serum/plasma chemistry glucose (mg/dl)	68.00±8.01 (41.46-78.30)	68 (50-80)	63 (50-75)
Total protein (g/dl)	9.80±0.60 (7.24-9.34)	5.38 (4.0-7.0)	6.67 (5.0-8.0)
Albumin (g/dl)	4.36±0.28 (4.22-5.86)	3.07	3.96
Globulin (g/dl)	3.684±0.24 (2.46-4.21)	2.31	2.71
Albumin: globulin ratio	1.242±0.147 (1.240-1.980)	1.33	1.46
Urea (mg/dl)	24.20±0.36 (12.64-32.12)	--	--
Cholesterol (mg/dl)	134.00±09.20 (68.24-162.22)	--	--
Calcium (mg/dl)	9.20±0.33 (7.12-12.28)	11.4	10.7
Phosphorus (mg/dl)	3.56±0.12 (3.0-12.0)	--	--
Serum enzyme AST IU/l	58.46±3.68 (52.24-86.28)	61 (38-67)	107 (74-155)
ALT (IU/l)	41.34±2.12 (30.56-52.42)	34 (18-67)	46 (24-83)

*Kaneko (1989). Values in parenthesis () represent the range of values observed.

ACKNOWLEDGEMENTS

The authors thank the Zoo Officers and Veterinarians of the Vadodara, Surat and Junagadh Zoos and the Dean and Principal of Veterinary College, Anand for providing necessary facilities to carry out the above work. The authors appreciate the technical guidance by senior scientist Dr. Arora for such wildlife related work.

REFERENCES :

- Arora B.M. (1998) . *Tiger paper* **15 (1)**:8-14.
- Arora, B.M., Tandon, H.K.L. and Bhat, P.N. (1985) . *Indian Journal of Veterinary Medicine* **5:58**.
- Benjamin, M.M. (1964) . *Outline of Veterinary Clinical Pathology*. 2ndedn. Iowa State Univ. Press, Ames, Iowa, USA.
- Chapple, R.S. English, A.W. Mulley, R.C. and Leoperd, E.E. (1991). *Journal of Wildlife Diseases* **27**: 396-406.
- Duncan, J.R. and Prasse, K.W.(1986). *Veterinary Laboratory Medicine-Clinical Pathology*, pp.285. Iowa State University, Ames, Iowa.

English, A.W. and Lopherd, E.E. (1981) ..*Journal of midlife Diseases* **17**: 289-95.

Heidi, G.A., Rucker, R.A., Kennedy, M.L. and Boeyens, M.E. (1988) . *Journal of Wildlife Diseases* **24**: 180-83.

Jain, N.C. (1986) *Schalm's Veterinary Haematology*. 2ndedn Lea and Febiger, Philadelphia, USA.

Kaneko, J.J. (1989) . *Clinical Biochemistry of Domestic Animals*. 4thedn Academic Press, Inc. New York. Kent J E.

Kent, J.E., Chapman, D.I. and Chapman, N.G. (1980). *Research in Veterinary Science* **28**: 55-57.

McEwan, E.H. and Whitehead, P.B. (1969) . *Canadian Journal of Zoology* **47**:557-62.

Naik, S.N., Bhatia, H.M., Baxt, A.J. and Naik, P.V. (1964) . *Journal of Experimental Zoology* **155**:231-36.

Rehbinder, C. and Edquist, L.E. (1981). *Acta Veterinaria Scandinavia* **22**: 480-92.

Reitman, S. and Frankel, S. (1957). *American Journal of Clinical Pathology* **28**: 56-67.

□