

HAEMATOLOGICAL OBSERVATIONS FOLLOWING XYLAZINE-KETAMINE ANAESTHESIA IN TEN CAPTIVE SPOTTED DEER (*Axis axis*) STAGS

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ABSTRACT

The study was conducted in ten adult male Spotted Deer maintained at Zoological Gardens, Thiruvananthapuram, which underwent vasectomy under xylazine and ketamine anaesthesia. Xylazine and ketamine were administered at the rate of 3 mg/kg body weight and 2 mg/kg body weight respectively by darting. Venous blood samples were collected just prior to reversal of anaesthesia using yohimbine at the rate of 0.3 mg/kg body weight, half intravenously and the other half intramuscularly and were subjected to haematological analysis. The mean haemoglobin concentration, volume of packed red cells and total erythrocyte count were 12.38 ± 0.68 g/dL, 36.30 ± 1.96 % and $9.75 \pm 0.60 \times 10^6/\mu\text{L}$ respectively. The mean total leucocyte count was $5.00 \pm 0.53 \times 10^3/\mu\text{L}$ and the counts of neutrophil, lymphocyte, monocyte, basophil and eosinophil were 55.80 ± 4.02 %, 35.90 ± 3.93 %, 6.00 ± 0.82 %, 0.30 ± 0.15 % and 1.00 ± 0.15 % respectively.

Key words: Hematological observations, Spotted Deer, Xylazine-Ketamine anaesthesia

INTRODUCTION

Spotted Deer is a very commonly reared deer species in Indian zoos. It is also highly prolific, making it one of the most numerous of captive deer populations. As per International Union for Conservation of Nature and Natural Resources (IUCN) Red List, the status of Spotted Deer is listed as "Least Concern" because it inhabits a wide geographical range in large populations. Available data on the haematology and serum biochemistry of captive wild animals are limited. Hence, they are usually compared with the normal values of the domestic counter parts. In case of deer, they are compared with the normal values of small ruminants like sheep and goat (Gupta *et al.*, 2007). It was reported that stressful handling procedure could result in alterations of haematological parameters like haemoglobin level, red blood cell count and haematocrit value in Red Deer (Carragher *et al.*, 1997). The increasing deer population in zoos, greater concern on the health status of captive wild animals and emergence of new

diseases has led to the need for investigation of normal haematological reference values.

MATERIALS AND METHODS

The study was conducted in ten adult male Spotted Deer maintained at the Zoological Gardens, Thiruvananthapuram, Kerala, which underwent vasectomy procedure as a part of the zoo's deer population control programme, from November 2013 to January 2014.

All the animals were anaesthetised using a combination of xylazine hydrochloride and ketamine hydrochloride at the rate of 3 mg/kg body weight and 2 mg/kg body weight respectively. Two millilitres of venous blood were collected in K₂ EDTA vials (BD Vacutainer[®], K₂ EDTA, BD Franklin Lakes, NJ, USA) by venipuncture using 22G blood collection needles (Eclipse[™], BD Vacutainer[®], Blood collection needles, BD Franklin Lakes, NJ, USA) from the jugular vein just prior to reversal of anaesthesia using yohimbine at the rate of 0.3 mg/kg body weight, half intravenously and the other half intramuscularly.

Estimation of Haematological Parameters

All the blood samples were analysed within 12 hours from collection. The haematological parameters like haemoglobin concentration (Hb), volume of packed red cells (VPRC), total erythrocyte count (TEC) and total leucocyte count (TLC) were estimated using veterinary haematological analyser (Exigo, Boule Medical AB, Stockholm, Sweden) with the pre-set reference ranges for caprine blood cells. Blood smears were prepared from the venous blood sample and were stained using Geimsa stain to estimate differential leucocyte count (%). The mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were calculated using Hb, VPRC and TEC values.

Statistical Analysis

Basic statistics *viz.* arithmetic mean, standard deviation and standard error were calculated for all the replicative variables and are given as Mean \pm Standard Error. Statistical analysis was performed using Windows based statistical package *viz.* Microsoft Excel and SPSS (Statistical Package for Social Science, Nie *et al.*, 1975). Non-parametric test (Kolmogorov-Smirnov) was used to test differences among different individuals. For hypothesis testing, $P < 0.05$ was considered and the level of significance was noted. Statistical inferences were made in accordance with the guidelines recommended by Zar (2003).

RESULTS AND DISCUSSION

The mean \pm standard error (M \pm SE) values and the ranges of haemoglobin, volume of packed red cells, total erythrocyte count, MCV, MCHC and MCH are presented in Table 1. The mean \pm SE values and ranges of total leucocyte count, neutrophils, lymphocytes, monocytes, basophils and eosinophils are presented in Table 2.

The mean values of haemoglobin, volume of packed red cells, total erythrocyte count, MCV, MCHC and MCH were within the reference ranges provided by International Species Information System (ISIS, 2002). The haemoglobin concentration and volume of packed red cells were in agreement with the observation of Sahoo and Arora (2002) in which the Spotted Deer were anaesthetised using Hellabrunn mixture (Xylazine:Ketamine 1.25:1). Chapple *et al.* (1991) observed increased levels of haemoglobin concentration and volume of packed cells values in Spotted Deer stags which were manually restrained. Gupta *et al.* (2007) reported a markedly elevated total erythrocyte count in Spotted Deer which were also anaesthetised using **Hellabrunn mixture**. The differential leucocyte count observed in the present study was in agreement with the observation of Gupta *et al.* (2007).

Table 1. Red blood cell counts of ten male Spotted Deer		
Parameter	Mean±SE	Range
Haemoglobin Conc. (g/dL)	12.38±0.68 ^a	9.80 - 16.40
VPRC (%)	36.30±1.96 ^a	29.00 - 48.00
TEC (×10⁶/μL)	9.75±0.60 ^a	6.60 - 13.20
MCH (pg/cell)	13.15±1.10 ^a	8.87 - 19.82
MCV (fL)	38.52±3.15 ^a	26.09 - 57.54
MCHC (g/dL)	34.09±0.08 ^a	33.79 - 34.55
Mean values bearing superscript "a" do not differ significantly within parameters among different individuals		
Table 2. White blood cell counts of ten male Spotted Deer		
Parameter	Mean±SE	Range
TLC (×10³/μL)	5.00±0.53 ^a	2.80 - 7.90
Neutrophils (%)	55.80±4.02 ^a	42.00 - 82.00
Lymphocytes (%)	35.90±3.93 ^a	14.00 - 50.00
Monocytes (%)	6.00±0.82 ^a	3.00 - 10.00
Basophils (%)	0.30±0.15 ^a	0.00 - 1.00
Eosinophils (%)	1.00±0.15 ^a	0.00 - 2.00
Mean values bearing superscript "a" do not differ significantly within parameters among different individuals		

Chapple *et al.* (1991) observed that there was 10 to 20 per cent increase in the haemoglobin concentration, erythrocyte count and haematocrit values in Chital Deer which were physically restrained for blood collection. Marco and Lavin (1999) reported that there was marked difference in the differential leucocyte count between physically restrained deer and chemically immobilised ones. Read *et al.* (2000) suggested that activation of the autonomic nervous system activated during stress resulted in the release of catecholamine from adrenal medulla leading to contraction of spleen and resultant haemoconcentration.

SUMMARY

Haematological parameters were studied in 10 captive adult male Spotted Deer which underwent vasectomy. Under xylazine and ketamine anaesthesia the haemoglobin concentration, volume of packed red cells and total erythrocyte count were 12.38 ± 0.68 g/dL, 36.30 ± 1.96 % and $9.75 \pm 0.60 \times 10^6/\mu\text{L}$ respectively. The total leucocyte count was $5.00 \pm 0.53 \times 10^3/\mu\text{L}$ and the counts of neutrophil, lymphocyte, monocyte, basophil and eosinophil were 55.80 ± 4.02 %, 35.90 ± 3.93 %, 6.00 ± 0.82 %, 0.30 ± 0.15 % and 1.00 ± 0.15 % respectively.

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