



Short Communication

## Comparative Hematology of Captive Mugger Crocodiles (*Crocodylus palustris*)

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### Abstract

Hematological analysis was conducted on blood samples collected from mugger crocodiles ( $n = 28$ ) (*Crocodylus palustris*) using Supra-occipital plexus technique and/or Cardiocentesis technique. The hematological analysis revealed a mean value of  $22.75 \pm 1.16$  (%) for PCV,  $7.21 \pm 0.39$  (g/dl) for Hb,  $0.85 \pm 0.07$  ( $\times 10^6$ /Cmm) for RBC and  $10.14 \pm 0.48$  ( $\times 10^3$ /Cmm) for WBC. Similarly, the overall mean values for ESR, heterophils, lymphocytes, monocytes, basophils, eosinophils, thrombocytes and clotting time were also documented. No blood parasites were recorded in mugger crocodiles.

**Keywords:** Blood parasites, hematology, leucocytes, mugger crocodiles

### Introduction

The determination of hematological values is useful for understanding the state of animal health. The normal blood values in different domestic and pet animals are adequately available<sup>1</sup>. However the information on these values is very limited in reptilian species maintained in tropical region<sup>2, 3</sup> and not sufficient to establish the relation of age and sex with general health of these animals. The main objective of this study is to have a baseline data to provide basic information on normal hematological values of mugger crocodiles and for identifying abnormalities in blood parameters in hunch-backed crocodiles as a result of metabolic bone disorder kept under captivity in tropical region. This report will be useful to develop and evaluate health profiles of mugger crocodiles under various ecological conditions.

### Material and Methods

The study was carried out during 2006-2007 (November 2006 to January 2007). Blood samples were collected from twenty-eight apparently healthy crocodiles (13 Nos. from Arignar Anna Zoological Park, Vandalur, 7 Nos. from Guindy Snake Park and 8 Nos. from Amaravathy Crocodile farm), after careful physical restraint. The blood samples were collected using a 10ml disposable syringe and 16 gauge disposable hypodermic needle from the supra-occipital sinus and/or by cardiocentesis as per the method described by Mader<sup>4</sup>. Simultaneously blood smears were taken to rule out blood parasites and to estimate differential leukocyte count. The statistical analysis of data was carried out using non-paired t-test, as per the standard procedures given by Snedecor and Cochran<sup>5</sup>

### Results and Discussion

Out of thirty mugger crocodiles from which blood samples were obtained, Cardiocentesis was found to be more successful in 77% of the cases ( $n=23$ ) when compared to blood collection technique using the supra-occipital plexus technique. The mean  $\pm$  S.E. values of hematological parameters comprising PCV, Hb, ESR, RBC, WBC, heterophils, lymphocytes, monocytes, basophils, eosinophils, thrombocytes, clotting time, MCV, MCH and MCHC were furnished for both juvenile and adult mugger crocodiles in table 1. Highly significant decrease ( $p < 0.01$ ) was observed with basophils and eosinophils of adult mugger crocodiles when compared to juveniles and similarly, highly significant increase ( $p < 0.01$ ) was observed with thrombocytes in adult crocodiles. Similarly, in Table 2, mean  $\pm$  S.E. values of hematological profile are presented for male and female mugger crocodiles. Highly significant decrease ( $p < 0.01$ ) was observed with total WBC counts and heterophils in case of female mugger crocodiles, when compared to the males. Highly significant increase ( $p < 0.01$ ) was noticed in thrombocytes of female crocodiles when compared to the males. Similarly, significant increase ( $p < 0.05$ ) was noticed with clotting time in case of females.

The mean  $\pm$  S.E values in both juvenile and adult crocodiles revealed highly significant variations in differential leukocyte count involving eosinophils, basophils and thrombocytes (table 1). The highly significant reduction in adult crocodiles with regard to basophils was in agreement with the findings, reported by Brian and Whitaker<sup>6</sup>, when compared to the value in juveniles. The highly significant reduction of eosinophils in case of adult crocodiles under study (table 1) might be attributed to probable reduction in the allergic causes related with adult

crocodiles, treatments adapted *etc.* The finding of highly significant increase in thrombocytes of adult crocodiles (table 1) was in accordance with the findings reported by Brian and Whitaker<sup>6</sup> and the increased mean  $\pm$  S.E values of thrombocytes in female crocodiles might be attributed to metabolic variations, clotting factors, inclusion of juveniles also in this group *etc.*

Highly significant reduction in total WBC count and heterophils of female crocodiles, when compared to that of male crocodiles (table 2) was in agreement with the report furnished by Brian and Whitaker<sup>6</sup> who detailed various hematological and

biochemical profiles in crocodiles. This reduction might be attributed to the compromising levels of immunity, hormonal status, and different levels of antigenic stimulation within populations by various etiologies. Highly significant increase in mean values of thrombocytes in female crocodiles might be attributed to the metabolic demands for strengthened hemostatic mechanism in females. Role of thrombocytes in hemostasis was detailed by Coles<sup>7</sup>. Various overlapping metabolic factors might be attributed to the significant variations in clotting time between male and female crocodiles.

**Table -1**  
**Mean  $\pm$  SE values for Hematology in Mugger Crocodiles (Age-Comparison)**

Parameters	JUVENILE (n=8)	ADULT (n=20)	t-Value	P-Value	Significance
PCV (%)	21.25 $\pm$ 2.32	23.35 $\pm$ 1.35	0.81	0.42	NS
Hb (g/dl)	6.45 $\pm$ 0.71	7.51 $\pm$ 0.45	1.25	0.22	NS
ESR (mm/hr)	4.04 $\pm$ 0.10	4.06 $\pm$ 0.05	0.17	0.87	NS
RBC ( $\times 10^6$ /Cmm)	0.94 $\pm$ 0.20	0.81 $\pm$ 0.06	0.86	0.40	NS
WBC ( $\times 10^3$ /Cmm)	11.48 $\pm$ 0.87	9.60 $\pm$ 0.55	1.82	0.08	NS
Heterophils ( $\times 10^3$ / $\mu$ l)	5.88 $\pm$ 0.61	4.54 $\pm$ 0.38	1.87	0.07	NS
Lymphocytes ( $\times 10^3$ / $\mu$ l)	2.35 $\pm$ 0.17	2.49 $\pm$ 0.12	0.65	0.52	NS
Monocytes ( $\times 10^3$ / $\mu$ l)	0.00 $\pm$ 0.00	0.02 $\pm$ 0.01	1.57	0.13	NS
Basophils ( $\times 10^3$ / $\mu$ l)	0.11 $\pm$ 0.04	0.01 $\pm$ 0.01	3.81	0.00	**
Eosinophils ( $\times 10^3$ / $\mu$ l)	0.11 $\pm$ 0.04	0.01 $\pm$ 0.01	3.81	0.00	**
Thrombocytes ( $\times 10^3$ / $\mu$ l)	20.82 $\pm$ 0.17	22.48 $\pm$ 0.20	4.84	0.00	**
Clotting Time (min)	9.63 $\pm$ 0.75	9.50 $\pm$ 0.45	0.15	0.89	NS
MCV (fl)	289.33 $\pm$ 44.41	306.87 $\pm$ 17.19	0.45	0.65	NS
MCH (pg)	86.09 $\pm$ 10.60	98.06 $\pm$ 5.38	0.11	0.28	NS
MCHC (%)	30.63 $\pm$ 1.18	32.08 $\pm$ 0.42	1.46	0.16	NS

NS - not significant; \*\* highly significant-p<0.01; data are presented as mean  $\pm$  standard error

**Table-2**  
**Mean  $\pm$  SE values for Hematology in Mugger Crocodiles (Sex-Comparison)**

Parameters	MALE (n=13)	FEMALE (n=15)	t-Value	P-Value	Significance
PCV (%)	24.54 $\pm$ 1.33	21.20 $\pm$ 1.78	1.47	0.15	NS
Hb (g/dl)	7.76 $\pm$ 0.47	6.73 $\pm$ 0.58	1.36	0.19	NS
ESR (mm/hr)	4.13 $\pm$ 0.08	3.98 $\pm$ 0.05	1.71	0.10	NS
RBC ( $\times 10^6$ /Cmm)	0.92 $\pm$ 0.09	0.72 $\pm$ 0.07	1.80	0.08	NS
WBC ( $\times 10^3$ /Cmm)	11.59 $\pm$ 0.74	8.87 $\pm$ 0.43	3.26	0.00	**
Heterophils ( $\times 10^3$ / $\mu$ l)	5.98 $\pm$ 0.52	3.99 $\pm$ 0.29	3.50	0.00	**
Lymphocytes ( $\times 10^3$ / $\mu$ l)	2.55 $\pm$ 0.18	2.42 $\pm$ 0.12	0.63	0.53	NS
Monocytes ( $\times 10^3$ / $\mu$ l)	0.02 $\pm$ 0.01	0.41 $\pm$ 0.40	0.91	0.37	NS
Basophils ( $\times 10^3$ / $\mu$ l)	0.62 $\pm$ 0.61	0.42 $\pm$ 0.40	0.28	0.78	NS
Eosinophils ( $\times 10^3$ / $\mu$ l)	0.95 $\pm$ 0.92	0.57 $\pm$ 0.53	0.36	0.72	NS
Thrombocytes ( $\times 10^3$ / $\mu$ l)	21.39 $\pm$ 0.17	22.55 $\pm$ 0.29	3.28	0.00	**
Clotting Time (min)	8.69 $\pm$ 0.59	10.27 $\pm$ 0.42	2.21	0.04	*
MCV (fl)	290.16 $\pm$ 25.71	307.86 $\pm$ 24.32	0.50	0.62	NS
MCH (pg)	90.53 $\pm$ 6.88	98.23 $\pm$ 7.02	0.78	0.44	NS
MCHC (%)	31.56 $\pm$ 0.57	31.79 $\pm$ 0.70	0.25	0.80	NS

NS-not significant; \* significant-p< 0.05; \*\* highly significant-p<0.01; data are presented as mean  $\pm$  standard error

## Conclusion

This is a preliminary study to evaluate health profiles of mugger crocodiles under various ecological conditions. The purpose of the study was to attain the baseline data and to study the blood parameters under captivity in tropical region. This study will further help to evaluate health of profiles of mugger crocodiles under various ecological conditions in India.

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