

Hematology and Blood Chemistry Values in Juvenile Ostriches (*Struthio camelus*) Under Sub-Tropical Conditions of India

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Abstract: An accurate hematology and biochemical value is an indicator of its impending health condition. Information available on the physiological conditions in ostriches is very scanty. An attempt was made to assess the hematologic and biochemical values of ostriches reared in this institute. Juvenile ostriches (12-16 weeks) were selected for this purpose. Blood was collected from the brachial vein. The following mean values were obtained: Total erythrocyte count = $1.68 \pm 0.02 \times 10^{12} \text{ L}^{-1}$, Packed cell volume = 34.16 ± 0.79 , Hemoglobin Concentration = $112.5 \pm 3.35 \text{ g L}^{-1}$, Total leukocyte count = $7.95 \pm 0.53 \times 10^9 \text{ L}^{-1}$, Erythrocyte sedimentation rate = $1.68 \pm 0.17 \text{ mm h}^{-1}$, Heterophils = $62.17 \pm 0.94\%$, Monocytes = $1.50 \pm 0.22\%$, Lymphocytes = $31.17 \pm 0.79\%$, Eosinophils = $1.33 \pm 0.21\%$ and Basophils = $3.83 \pm 0.31\%$, Total protein = $3.80 \pm 0.17 \text{ g dL}^{-1}$, SGOT = $17.32 \pm 0.37 \text{ IU dL}^{-1}$, Alkaline phosphatase = $15.46 \pm 0.44 \text{ KA units}$, Glucose = $185.25 \pm 10.06 \text{ mg dL}^{-1}$, Cholesterol = $54.69 \pm 2.57 \text{ mg dL}^{-1}$, Albumin = $2.25 \pm 0.06 \text{ g dL}^{-1}$ and Globulin = $1.55 \pm 2.57 \text{ mg dL}^{-1}$. These blood values would enable us to monitor the health status of the ostriches.

Key words: Assess, ostriches, purpose, monitor, health status

INTRODUCTION

As per Campbell and Coles (1986), veterinary clinical hematology is a useful tool for the diagnosis of diseases in both mammals and birds. Blood profiling is used to ascertain the metabolic conditions in any species. In spite of conducting external examinations, internal systemic disturbances are seldom detected. In ostriches, external examination along with internal assessment would help in prompt diagnosis of the conditions, especially the young ones where the death is comparatively higher. Treatment in birds is most effective when the conditions are detected early. In spite of clinically observing the animals, laboratory evaluation would give a greater insight in to the actual prevailing conditions. Blood profiling along with related tests would give better results of the metabolic condition of the birds. Metabolic profiling would be quite useful in medium and large sized farms when the production capacity of the animal is not up to the expected level. A minor adjustment in the diet may bring about a major positive effect in its performance. Sometimes blood chemistry is the only available means by which metabolic and nutritional problems can be diagnosed. According to Tullio (1998), dietary

deficiencies are common among the birds due to error in feed formulation, mixing and stocking. Blood chemistry profiles are extremely important in the health management of these species. There are numerous health related problems encountered when the birds are raised in captivity, they may be infectious (viral, bacterial, parasitical, etc.) or non infectious syndromes associated with diet, incubation, husbandry and metabolism. Ostrich (*Struthio camelus*) rearing in India is relatively new and data available on their serum profile is scanty, though some research in serum has been carried out in other parts of the world. Hematological values of Masai ostriches have been reported as early as 1875 (De Villiers, 1938). Blood profile would vary depending upon the age, feeding, location, genetics, etc. No two places would have the same profile and within the birds, the age would. Documentation of the blood picture and chemistry would help in determining the normal condition of the ostrich and during the time of deviation causes can be found. Physical properties of ostrich blood have been studied extensively (De Villiers, 1938; Leonard, 1982; Levi *et al.*, 1977; Palomeque *et al.*, 1991; Stoskopf *et al.*, 1982). This current study was aimed to determine the baseline values of juvenile ostriches.

MATERIALS AND METHODS

Location: The study was carried out at the Post Graduate Research Institute in Animal Sciences (formerly Livestock Research Station), Kattupakkam, a Premier Research Institute of Tamil Nadu Veterinary and Animal Sciences University (TANUVAS) Chennai, Tamil Nadu, India.

Age and number of birds: This study was carried out in 20 juvenile unsexed ostriches (12-16 weeks). The birds were being raised in fenced paddocks. All the birds were in good health condition. The birds were fed with specially formulated diet prepared at the Central Feed Mixing Unit, Kattupakkam. The birds consumed a feed of 900-965 g day⁻¹ during the study period.

Collection of blood: Blood collection was done during the morning time (07.00-09.00 h). The birds were caught along their wings and their face was covered with a black colored hood. Blood was collected by venipuncture from the brachial (wing) vein after cleansing the area with an antiseptic. Brachial vein (v. ulnaris subcutanea) was selected because of its larger size and prominence. Jugular vein is commonly used for blood collection but collection of blood from brachial vein is easier in the sense that possible front kick from the birds can be avoided. Pressure Method was used to raise the vein. The vein was found to be too superficial and upon puncture the blood was collected immediately. Blood was collected in both heparinized containers and in sodium citrated tubes. Thin blood smears were made for microscopic examination of blood cells. The blood samples were centrifuged within one hour of collection of blood to obtain the serum.

Laboratory analysis: Analysis of the blood was carried out within 4 h of collection of blood. Hematological parameters like Hemoglobin concentration (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leukocyte Count (TLC), Erythrocyte Sedimentation Rate (ESR), Heterophils, Lymphocytes, Eosinophils, Monocytes and Basophils were studied. Biochemical parameters like alkaline phosphatase, sgot, glucose, total protein, albumin, globulin and cholesterol were studied.

These tests were carried out at the Centralised Clinical Laboratory, Madras Veterinary College, Chennai. All the tests were carried out as per the standard protocols using the diagnostic kits supplied by M/s. Span diagnostic Ltd. Sachin (Surat), Gujarat, INDIA. The results were statistically analysed as per Snedecor and Cochran (1994).

RESULTS

Clinical hematology and chemistry is a useful aid for the diagnosis of disease and illness in caged birds (Woerpel and Rosskopf, 1984). Moniello *et al.* (2005) reported similar blood parameter values in ostriches from the samples collected from both the sources (jugular vein and brachial vein). The results pertaining to the research carried out in ostriches are presented.

Hematological parameters: The results of the hematological parameters are shown in Table 1. The lowest and highest Total Erythrocyte Count (TEC) obtained was 1.59×10^{12} and 1.78×10^{12} L⁻¹, respectively with a SD of 0.06. The Hemoglobin (Hb) concentration was varying between 100-120 g L⁻¹. Packed Cell Volume (PCV) ranged from 31-36 with the mean being $34.16 \pm 0.79\%$. Values for Total Leukocyte Count (TLC) ranged from minimum of 6.5×10^9 L⁻¹ to maximum of 9.8×10^9 L⁻¹ with the mean being $7.95 \pm 0.53 \times 10^9$ L⁻¹. Erythrocyte Sedimentation Rate (ESR) showed a maximum value of 2.5 mm h⁻¹ and a minimum value of 1.3 mm h⁻¹. The standard deviation was 0.42 with the mean being 1.68 ± 0.17 mm h⁻¹. Among the differential count percentage, heterophils was the highest at $62.17 \pm 0.94\%$ followed by lymphocytes (31.17 ± 0.79), basophils (3.83 ± 0.31), monocytes (1.50 ± 0.22) and the lowest value was seen in eosinophils (1.33 ± 0.21).

Biochemical parameters: The results of biochemical parameters are shown in Table 2. The observed mean values of Alkaline Phosphatase was 15.46 ± 0.44 IU dL⁻¹, SGOT 17.32 ± 0.37 IU dL⁻¹, glucose 185.25 ± 10.06 mg dL⁻¹,

Table 1: Hematological parameters as observed in ostriches

Parameters	Min.	Max.	SD*	Mean±SE
Total erythrocyte count ($\times 10^{12}$ L ⁻¹)	1.59	1.78	0.06	1.68±0.02
Hemoglobin concentration (g L ⁻¹)	100.00	120.00	8.21	112.5±3.350
Packed cell volume (%)	31.00	36.00	1.91	34.16±0.79
Total leukocyte count ($\times 10^9$ L ⁻¹)	6.50	9.80	1.29	7.95±0.53
Erythrocyte sedimentation rate (mm h ⁻¹)	1.30	2.50	0.42	1.68±0.17
Heterophils (%)	59.00	66.00	2.43	62.17±0.94
Lymphocytes (%)	29.00	34.00	1.88	31.17±0.79
Eosinophils (%)	1.00	2.00	0.51	1.33±0.21
Monocytes (%)	1.00	2.00	0.55	1.50±0.22
Basophils (%)	3.00	5.00	0.75	3.83±0.31

*Standard deviation

Table 2: Biochemical parameters as observed in ostriches

Parameters	Min.	Max.	SD*	Mean±SE
Alkaline phosphatase (IU dL ⁻¹)	14.08	16.61	1.090	15.46±0.44
SGOT (IU dL ⁻¹)	16.09	18.38	0.880	17.32±0.37
Glucose (mg dL ⁻¹)	147.87	212.72	24.65	185.25±10.06
Total protein (g dL ⁻¹)	3.32	4.48	0.420	3.80±0.17
Albumin (g dL ⁻¹)	2.02	2.40	0.170	2.25±0.06
Globulin (mg dL ⁻¹)	1.23	2.46	0.490	1.55±0.19
Cholesterol (mg dL ⁻¹)	46.30	61.74	6.300	54.69±2.57

*Standard deviation

total protein 3.80 ± 0.17 g dL⁻¹, albumin 2.25 ± 0.06 g dL⁻¹, globulin 1.55 ± 0.19 mg dL⁻¹ and cholesterol level was 54.69 ± 2.57 mg dL⁻¹.

DISCUSSION

Hematological parameters: Palomeque *et al.* (1991) conducted a study in the juvenile ostriches of Spain and reported the results of total erythrocyte count, packed cell volume, hemoglobin concentration and leukocytes as 1.91×10^{12} L⁻¹, 37%, 133 g L⁻¹ and 19.5×10^{12} L⁻¹, respectively. Mushi *et al.* (1999) reported hematological values in juvenile ostriches of Botswana as total erythrocyte count ($1.8 \pm 0.2 \times 10^{12}$ L⁻¹), hemoglobin (109 ± 1.2 g L⁻¹), packed cell volume ($36 \pm 1.2\%$), total leukocyte count ($3.8 \pm 1.7 \times 10^9$ /L), erythrocyte sedimentation rate (2.5 ± 0.5), heterophils ($62 \pm 1.2\%$), lymphocytes ($29 \pm 1.6\%$), eosinophils ($1 \pm 0.2\%$), monocytes (1 ± 0.6), basophils (7 ± 1.4). The variation in the values especially of Total Leukocyte count and basophils may be due to the fact that the values belong to wider age groups in the study conducted at Botswana (1-10 months). The differences in the values may be due to variation among the ostriches in cellular response to the stress of handling (Maxwell, 1993). The values pertaining to the haematology ought to be recorded accurately to make a good diagnosis about the etiology and causes of the affection.

Biochemical parameters: Palomeque *et al.* (1991) conducted a study in the juvenile ostriches of Spain and reported the results of total protein, glucose, cholesterol, alkaline phosphatase as 6.22 g dL⁻¹, 263.5 mg dL⁻¹, 14.82 mg dL⁻¹ and 33.9 IU dL⁻¹, respectively. Quintavalla *et al.* (2001) reported biochemical values of both male and female ostriches (3-12 months) separately; total protein, albumin, SGOT and alkaline phosphatase level were 3.88 g dL⁻¹, 2.07 g dL⁻¹, 16.40 IU dL⁻¹ and 30.0 IU dL⁻¹ units in males and 4.25 g dL⁻¹, 1.93 g dL⁻¹, 16.66 IU dL⁻¹ and 25.8 IU dL⁻¹ units in females, respectively. The results observed in the study are also within the range. Low values of total protein in young age could be associated with high incidence of leg deformities and poor weight gain hence, this age birds must be provided with good quality of protein rich feed. The serum albumin level reported in this study was 2.25 ± 0.06 and this is in accordance to Quintavalla *et al.* (2001) who reported a value of 2.07 and 1.93 g dL⁻¹ in male and female ostriches. Serum albumin levels are also reflected by the total serum protein level. He also reported alkaline phosphatase level in male and female ostriches to be 30.0 and 25.8 KA units, respectively. This value should normally be higher in younger animals than in older

animals due to higher bone metabolism. The lower level recorded in the case may be due to the fact that the bone metabolism could be in the end stage of formation. More researchers can be taken up to assess the exact age of fall of alkaline phosphatase level in the ostriches to have wider perspective. Alkaline phosphatase is present in all tissues and organs and it is associated with osteoblastic process. Values tend to fall with increase in age and it is stabilized in adults. The SGOT level (IU dL⁻¹) obtained in the study was in the range of 16.09-18.38 with a mean of 17.32 ± 0.37 . Quintavalla *et al.* (2001) reported a similar value of 16.4 and 16.6 in male and female ostriches. Higher levels of SGOT are noticed when extensive destruction to hepatic tissue occurs hence, this can be good diagnostic tool for assessing cardiologic, muscular and hepatic disease. According to Bertoni *et al.* (2006), blood profiling which was initially used to detect sub clinical metabolic disorders due to incorrect feeding has recently been applied more widely to evaluate the effects of different treatment on metabolic, nutritional and animal welfare conditions.

CONCLUSION

More detailed research in different age groups is required to study the complete blood chemistry in ostriches. In ostriches, it would be of great value because it is difficult to restrain the bird for a longer time for observation and further, the true picture present in the body system is seldom elucidated externally. Similarly, a complete blood profile involving different age groups and under different conditions would be of great value in quantifying the exact amount of changes caused in the body.

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