

# The effect of age on haematological studies in ostrich (*Struthio camelus*)

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## Abstract

Blood samples were collected from 56, 60 and 64-week old ostriches (8 birds per age group) from a private farm (Crossgee Farms) and the haematological profiles in the plasma of the birds determined. The White Blood Cells (WBC) counts significantly ( $P < 0.05$ ) decreased with increase in age. The WBC counts for 56-week old ostriches were higher than that for the 64-week olds ( $96.78 \times 10^9/L$  versus  $84.3 \times 10^9/L$ ), with an overall mean total count of  $90.77 \times 10^9/L$ . The Mean Corpuscular Volume (MCV) was significantly ( $P < 0.05$ ) affected by age. The 64 weeks old ostriches had a higher value than the 60 weeks old ostriches (105.20 fL versus 81.29 fL). The overall mean MCV level was 94.21 fL. Lymphocyte, granulocytes, red blood cells, Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), platelets, haemoglobin and packed cell volume were not significantly ( $P > 0.05$ ) affected by age. Results from this study demonstrate that age influences the WBC and MCV of the African Black Ostrich reared under humid tropical conditions as prevailing in Ghana.

**Keywords:** Ostrich, blood, haematological indices

## Introduction

Haematological indices are very important in assessing infection, organ function, and many diseases in animals by comparing the levels of haematological and biochemical indices in the blood with reference values (Scope et al. 2002; Raukar et al. 2007). Haematological and biochemical indices in birds according to, are influenced by factors such as the physiological state of the bird, species, age, sex, nutritional status, seasonal changes and conditions in particular geographic areas (Ferrer 1990; Kaneko et al. 1997; Campbell 2004; Eren et al. 2006; Raukar et al. 2007). Presently there is a dearth of information on the haematological indices of ostriches raised in Ghana in relation to age, sex, physiological status and husbandry conditions. Knowledge on the levels of these indices in the blood of the ostrich in Ghana would serve as a useful aid for the diagnosis of diseases, provide understanding of the physiology and adaptation of the species to environmental conditions as well as improve its production performance. This may eventually contribute to the success of ostrich farming in Ghana. The purpose of this study was to establish baseline hematology values for adult ostriches in three age groups reared under humid tropical conditions in Ghana.

## Materials and Methods

The study was carried out on a farm located within a semi-deciduous forest zone of Ghana. Twenty four adult African Black Ostriches (56, 60, 64 weeks of age) and apparently healthy kept on semi-intensive system of management were used in the study. Birds were kept under natural conditions of light and temperature and supplied with water *ad libitum* and fed a ration supplemented with *Panicum maximum* once a day.

Blood sample were collected from the jugular vein of the birds between 09:00 h and 12:00 h before feeding to reduce changes in the levels of blood constituents associated with nutrient absorption. Each bird was manually caught by hand and restrained. The blood was drawn into heparinised 10 ml vacutainer blood collection tubes. The samples were placed on ice after collection and sent to the laboratory immediately for analysis at the Clinical Pathology Laboratory in Accra using the CELL- DYN 1800 auto- analyser (Abbott Diagnostics, USA).

## Results

The WBC counts, lymphocyte, granulocyte, red blood cell count, Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), platelets, Haemoglobin and Packed Cell Volume in the different age groups of ostriches are presented in Table 1. The WBC counts significantly ( $P < 0.05$ ) decreased with age. The counts for 56-week old ostriches were higher than that for 64-week olds ( $96.78 \times 10^9/L$  versus  $84.3 \times 10^9/L$ ). Values for the 60 week-old ostriches fell in between values for 56 and 64 week olds. The overall mean WBC count was  $90.77 \times 10^9/L$ .

Age had no significant ( $P > 0.05$ ) effect on lymphocytes and granulocytes levels, although the values decreased with increasing age. The mean lymphocytes and granulocytes levels were 67.89% and 5.70% respectively. However there was a decrease in the two WBC differentials as age increased. RBC count averaged  $1.92 \times 10^{12}/L$  and was not significantly ( $P > 0.05$ ) affected by age. RBC values for the 56, 60 and 64 week-old ostriches were  $1.95 \times 10^{12}/L$ ,  $1.90 \times 10^{12}/L$  and  $1.92 \times 10^{12}/L$  respectively.

The MCV was significantly ( $P < 0.05$ ) affected by age. The 64 week- old ostriches had a higher value than the 60- week old ostriches (105.20 fL versus 81.29 fL). There was no

significant ( $P > 0.05$ ) difference between the 56 week old and the 60 week old ostriches and also between the 64 week old ostriches. The overall mean MCV value obtained in this study was 94.21 fL.

Table 1: Effect of age (means $\pm$  SE) on haematological variables in African Black Ostriches

| Blood parameters              | Age (weeks)                   |                               |                               | Mean  |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------|
|                               | 56 (n = 8)                    | 60 (n = 8)                    | 64 (n = 8)                    |       |
| WBC( $\times 10^9/L$ )        | 96.78 <sup>a</sup> $\pm$ 2.9  | 91.23 <sup>ab</sup> $\pm$ 2.9 | 84.30 <sup>b</sup> $\pm$ 2.9  | 90.77 |
| Lymphocyte (%)                | 68.75 $\pm$ 1.6               | 67.66 $\pm$ 1.2               | 67.66 $\pm$ 1.1               | 67.89 |
| Granulocytes (%)              | 6.70 $\pm$ 1.1                | 5.99 $\pm$ 0.8                | 4.95 $\pm$ 0.8                | 5.70  |
| RBC( $\times 10^{12}/L$ )     | 1.95 $\pm$ 0.1                | 1.90 $\pm$ 0.1                | 1.92 $\pm$ 0.05               | 1.92  |
| MCV(fL)                       | 96.15 <sup>ab</sup> $\pm$ 6.2 | 81.29 <sup>b</sup> $\pm$ 6.2  | 105.20 <sup>a</sup> $\pm$ 6.2 | 94.21 |
| MCH (pg)                      | 96.41 $\pm$ 0.8               | 96.50 $\pm$ 0.9               | 96.90 $\pm$ 0.9               | 96.59 |
| MCHC (g/dL)                   | 95.33 $\pm$ 4.6               | 82.20 $\pm$ 9.1               | 85.66 $\pm$ 4.1               | 89.18 |
| Platelets ( $\times 10^9/L$ ) | 10.63 $\pm$ 1.2               | 11.87 $\pm$ 1.2               | 8.00 $\pm$ 1.2                | 10.17 |
| Haemoglobin (g/dL)            | 18.79 $\pm$ 0.4               | 18.60 $\pm$ 0.4               | 18.84 $\pm$ 0.4               | 18.74 |
| PCV (%)                       | 18.73 $\pm$ 1.4               | 15.43 $\pm$ 1.4               | 20.28 $\pm$ 1.4               | 18.14 |

Means in the same row bearing different superscripts (a, b) are significantly ( $P < 0.05$ ) different

The MCH and MCHC were not significantly ( $P > 0.05$ ) affected by age. The overall mean values for MCH and MCHC were 96.59 pg, and 89.18 g/dL respectively. Blood platelets were also not significantly ( $P > 0.05$ ) affected by age. Absolute highest blood platelet value was however recorded in the 60 week-old ostriches ( $11.87 \times 10^9/L$ ) while the 64-week olds recorded the lowest ( $8.00 \times 10^9/L$ ). The overall mean for blood platelet was  $10.17 \times 10^9/L$ .

Age did not significantly ( $P > 0.05$ ) affect haemoglobin concentration. The overall mean haemoglobin concentration obtained in this study was 18.74 g/dL. Similarly, age did not also significantly ( $P > 0.05$ ) affect PCV. The overall mean value for PCV was 18.14%.

## Discussion

WBC counts in this study were very high ranging from  $84.30 \times 10^9/L$  to  $96.78 \times 10^9/L$  with an overall mean of  $90.77 \times 10^9/L$ . This could be an indication of infection in the experimental birds although they seem healthy in appearance and none of them died during the study. The birds were exposed to the high temperatures with no ample or adequate shade to protect them from inclement weather. Also, they went through a lot of stress during blood sampling as they had to be chased around during the retraining process. This could also partly contribute to the high WBC counts as WBC counts could be increased by stress as reported by Zapata et al. (2003) and Dujowich et al. (2005).

The WBC count decreased in birds from 56 weeks of age to 64 weeks of age. This may be attributed to the fact that younger birds are more prone to diseases and are immunologically challenged. The decrease in WBC count as age increased corroborates with reports by Levi et al. (1989), Mushi et al. (1999), Dujowich et al. (2005), Raukar and Simpraga (2005) who found out that WBC counts were generally higher in younger ostriches than in adults. The overall mean WBC count obtained in this study was however higher than the  $5.0 \times 10^9/L$  (Mushi et al. 1999) in 11 to 18 month old ostriches and  $5.20 \times 10^9/L$  (Levi et al. 1989) in 12 to 72 months old ostriches.

According to Raukar et al. (2007) haematological indices such as MCV, MCH and MCHC are important indicators in the determination of morphological characteristics of anaemia and that MCV may be an indicator of the haematopoietic activity. Age influenced the level of MCV in the blood of the ostrich with 60 week olds having a lower value than 64 weeks olds. The low MCV value for the 60 week-old ostriches may be a reflection of their low RBC count. MCV values range from 90 to 200 fL in the ostrich as reported by Weiss and Wardrop, 2010, thus the MCV values of 96.15 fL, 81.29 fL and 105.20 fL obtained in the 56, 60 and 64 week olds in this study were within the normal physiological range for the ostrich. The Hb and PCV levels indicate the nutritional status of animals (Aikhumboghbe and Orheruata, 2006). Both Hb and PCV levels were similar in all the three age groups studied. The overall mean Hb and PCV values were 18.74 g/dL and 18.14% respectively. The overall mean Hb value recorded in this study was higher than earlier values reported on by Levi et al. (1989) were 13.8g/dL and 15.6 g/dL (Palomeque et al. 1991). The variation could be due to differences in diet and management systems under which the birds were raised. The PCV value was lower than the 40% as reported by Levi et al. (1989) and 48% by Aikhumboghbe and Orheruata (2006) for the ostrich and was outside the normal physiological range (35 - 55%) reported for birds by Pendl (2006). The low PCV level may be an indication of anaemia or mineral deficiency. A positive correlation between PCV value and Hb values was observed in the present study confirming earlier reports by Palomeque et al. (1991) and Raukar et al. (2007).

## Conclusion

The present study evaluated the effect of age on haematological values in the African Black Ostrich. The results of this study indicated that age had a significant effect on total WBC count and MCV but not the other parameters examined. The WBC counts decreased with increasing age of the ostriches but were higher than those reported in literature. MCV levels were higher in the 64-week old ostriches than the 60 and 56 week olds in the African Black Ostrich.

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