The Pharma Innovation Journal 2023; 12(2): 2288-2291

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(2): 2288-2291

www.thepharmajournal.com
Received: 16-11-2022
Accepted: 19-12-2022

Suganya G
Associate Professor and Head, Department of Veterinary Physiology and Biochemistry, Veterinary College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Chennai, Tamil Nadu, India

Leela V
Professor and Head, Department of Veterinary Physiology, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai, Tamil Nadu, India

Corresponding Author:
Suganya G
Associate Professor and Head, Department of Veterinary Physiology and Biochemistry, Veterinary College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Chennai, Tamil Nadu, India

Influence of age on hematological parameters of emu birds

Suganya G and Leela V

Abstract
Clinical haematology provides an essential tool in avian medicine for evaluation of health status in the birds. There is scanty information available on reference haematological values of emu birds reared under Indian agro-climatic conditions. Hence, a study was conducted to evaluate the haematological parameters in different age groups of emu birds. The birds were divided into 3 groups namely chicks, growers and adults. Blood samples were collected in heparin coated tubes from 220 (chicks n = 40, growers n = 60 and adults n = 120) apparently healthy emu birds aged reared at commercial farms in Tamil Nadu, India. Haematological parameters such as haemoglobin, packed cell volume, total erythrocyte count, total leucocyte count, thrombocytes and differential count were estimated as per standard protocol. Blood smear was prepared for differential count. The data were subjected to one – way analysis of variance (ANOVA) and expressed as mean±S.E. The mean haemoglobin concentration was significantly lower in the adult birds whereas total leukocyte count was comparatively higher in the emu chicks. Differential leukocyte count revealed a higher percentage of heterophils and eosinphils in the emu chicks and significantly higher lymphocytes in the growers and adult emu birds. These values serve as a baseline reference tool for the veterinarians in the diagnosis and treatment of diseases.

Keywords: Emu, chicks, growers, adult, haematology parameters

Introduction
Emus are reared for their meat, leather and oil which has high economic value. Clinical hematology is used in avian medicine as a tool for evaluation of health in the birds. Hematological values are helpful in assessing infection, organ function and many diseases. Many physiological and pathological factors cause qualitative and quantitative changes in the hematological values which warrant the study of haematology in the diagnosis and monitoring of sick birds. For more accurate diagnosis, it is important to establish standard values for the various blood parameters and to interpret them according to age, sex, physiological state and stress level. Blood profiling is used in the detection of subclinical, clinical, metabolic conditions, incorrect feeding and managemental practices and also in the welfare of animals As there is scanty information available on reference haematological values for different age groups of emu birds reared under Indian agro-climatic condition, a study was conducted to evaluate the influence of age on haematological parameters of emu birds.

Materials and Methods
The study was conducted in Emu birds maintained at Commercial emu farms in Tamil Nadu. The birds were reared under intensive system with standard management practices. Blood samples were collected from apparently healthy emu birds of different age groups of both the sex in the morning hours. Based on their age, a total of 220 emu birds were divided into three groups as Group I, 40 unsexed chicks, Group II, 60 growers (1 – 2 years) and Group III 60 male and 60 female adult birds of different age (2 – 6 years) to study the influence of age on hematological parameters. About 1 ml of blood was collected from the right jugular vein (Reddy *et al.*, 2003) [14] in heparin coated tubes from apparently healthy chicks, growers and adult emu birds. Haematological parameters such as haemoglobin, packed cell volume, total erythrocyte count, total leukocyte count, thrombocytes and differential count were estimated as per standard protocol. Blood smears were also prepared to carry out Differential leukocyte count.

Statistical Analysis
The data were subjected to one – way analysis of variance (ANOVA) and post hoc analysis

were carried out using Duncan's test for multiple comparisons using SPSS software version 20 for windows.

Result

The haematological parameters in juvenile emu birds are presented in Table 1.

Haemoglobin concentration (Hb)

The overall mean Hb concentration in different age groups of emu was 13.55±0.19 g / dl. The Hb concentration was significantly decreased (p<0.01) in the adult birds with a concentration of 12.90±0.24 g /dl was noticed when compared to the chicks and growers.

Packed Cell Volume (PCV)

The overall mean value of PCV observed in different age groups of emu was 34.75±0.43 per cent. There was no significant difference noticed in the PCV concentration among the chicks, growers and adult birds.

Total Erythrocyte Count (TEC)

The overall mean value of TEC observed in different age groups of emu was 1.60±0.02 x 10^6/µl. The TEC showed no significant differences among the chicks, growers and adult birds.

Thrombocyte count

The influence of age on thrombocyte count is presented in the Table 1. The overall mean thrombocyte count in different age groups of emu was 22.51±0.14 x 10^3/µl. The thrombocyte count was significantly higher (p<0.05) in the growers (23.12±0.23 x 10^3/µl**)** when compared to chicks (22.16±0.25 x 10^3/µl**)** and the adult (22.32±0.21 x 10^3/µl), however, there was no significant difference in the thrombocyte count between the chicks and adult emu birds.

Total Leukocyte Count (TLC)

The overall mean value of TLC in different age groups of emu birds was 19.17±0.18 x 10^3/µl. The TLC was significantly (p<0.01) higher in the emu chicks with a value of 22.31±0.26 x 10^3/µl when compared to growers and adult birds.

Differential Leukocyte Count (DC)

The overall mean values of heterophils, lymphocytes and eosinophils observed in different age groups of emu birds were 69.91±0.19 per cent, 27.35±0.18 per cent and 2.72±0.07 per cent, respectively. Significantly higher (p<0.01) heterophils (71.70±0.28 per cent) and eosinophils (3.02±0.16 per cent) were observed in the chicks when compared to growers and adults. The lymphocytes were significantly higher (p<0.01) in growers (27.83±0.35 per cent) and adults (27.80±0.25 per cent) than the chicks.

The monocytes and basophils were statistically nonsignificant and hence not included in the table.

Discussion

Haemoglobin concentration (Hb)

The Hb concentration observed in the present study was within the range reported by Reddy *et al*. (2003) [14] in the emu. The average Hb concentration observed in the adult emu in this study was similar to the value obtained by Levi *et al*. (1989) [10] and Agaoglu *et al*. (2003) [1] in the adult ostriches, whereas Mushi *et al*. (1999) [11] and Palomeque *et al*. (1991) [12] recorded a higher Hb values in the adult ostriches.

The average Hb values observed in the chicks and growers in the present study were in accordance with the report of Levi *et al*. (1989) [10], Palomeque *et al*. (1991) [12], Mushi *et al*. (1999) [11], Durgun *et al*. (2005) [5] in ostrich chicks and growers. Selvan *et al*. (2012) [17] reported a lower Hb value in the juvenile ostriches of 12 to 16 weeks than the value obtained in this study. There was decrease in the Hb concentration as the age of the bird advanced which was contradictory to those reported in the ostriches (Levi *et al*., 1989; Palomeque *et al*., 1991; Mushi *et al*., 1999; and Durgun *et al*., 2005) [10, 12, 11, 5].

Emus show greater rate of growth with rapid metabolism, both, demands for more oxygen supply to the tissues. As the hemoglobin is the principal carrier of oxygen, it is expected to increase during this process. The decreased Hb concentration in the adults may be attributed to relatively high plasma volume.

Packed Cell Volume (PCV)

The overall mean PCV value observed in the present study was in agreement with that reported in the two year old emu birds (Reddy *et al*., 2003) [14] and in the ostriches (Levi *et al*., 1989 and Bonadiman *et al*., 2009) [10, 3]. The average PCV value of emu chicks observed was similar to the value reported by Selvan *et al*. (2012) [17] in 12 to 16 weeks old ostriches. Palomeque *et al*. (1991) [12] and Durgun *et al*. (2005) [5] reported a PCV value of 37.0±2.1 per cent and 36.47±3.78 per cent, respectively in the ostriches which were similar to that observed in the present investigation. No significant differences were observed in the PCV value among the chicks, growers and adults in this study, whereas an increase in PCV as the age of the bird increased was reported in the ostriches (Levi *et al*., 1989; Mushi *et al*., 1999; Durgun *et al*., 2005 and Sabino *et al*., 2011) [10, 11, 5, 16]. Mushi *et al*. (1999) [11] reported a PCV value in the 1 to 10 months old juvenile ostriches which was similar to the value of the present study in growers of less than 1 year old. In the adults, the PCV value of this study was lower than that reported by Kumar *et al*. (2009) [9] in four year old emu birds which could have been due to the existing bio-climatic and managemental practices in Tamil Nadu.

Total Erythrocyte Count (TEC)

The ratite erythrocyte is an oval nucleated cell that is much larger than most other avian species or common domestic animals. The number of erythrocytes is influenced by age, sex, hormones, hypoxia and other factors.

In the chicks, the average TEC recorded in the present study are in agreement with that reported in the ostrich chicks (Levi *et al*., 1989; Durgun *et al*., 2005; Selvan *et al*., 2012 and Sabino *et al*., 2011) [10, 5, 17, 16]. In the present study, the average TEC observed in the growers was in accordance with the values of Patodkar *et al*. (2008) [13] in the emu birds and Sabino *et al*. (2011) [16] in juvenile ostriches. Palomeque *et al*. (1991) [12], Mushi *et al*. (1999) [11] and Durgun *et al*. (2005) [5] reported higher TEC values in the juvenile ostriches. The average TEC observed in the adult birds of this study was in agreement with that of Levi *et al*. (1989) [10] and Bonadiman *et al*. (2009) [3] in the adult ostriches. However, the observed values were found to be lower than that reported by Kumar *et al*. (2009) [9] in emu birds, Palomeque *et al*. (1991) [12] and

Wilson *et al*. (2012) [18] in the adult ostriches.
In the current study, there were no significant differences among the three age groups which were contradictory to that reported in the ostriches (Levi *et al*., 1989 and Durgun *et al*., 2005) [10, 5]. The grower birds of 1 to 2 years of age had a significantly higher TEC value and the value agrees with that of Patodkar *et al*. (2008) [13] in emu birds and Durgun *et al*. (2005) [5] in the grower ostrich birds.

Thrombocyte count
Avian thrombocytes play a major role in hemostasis similar to mammalian platelets. They also play a role in phagocytosis by removing foreign materials from the blood (Campbell, 2013).
In present investigation, the overall average value of thrombocyte count was within the range reported by Bonadiman *et al*. (2009) [3] in ostriches. Whereas, Wilson *et al*. (2012) [18] observed a higher blood platelet count in the ostriches. Mushi *et al*. (1999) [11] also reported a higher thrombocyte value in the ostriches without any significant difference between the juvenile and adult ostriches which were contradictory to the current report wherein the growers had a significantly higher thrombocyte count when compared to the adult emu birds. The behavioural pattern is reported to be specific in emus that they have to maintain social dominance and peck order. The blood parameters especially thrombocytes which are concerned with hemostasis are increased so as to withstand and exhibit aggressive behaviour. This is true because to ensure hemostasis in case of physical damage during such behaviour.

Total Leukocyte Count (TLC)
In the present study, the overall average value of TLC observed was in accordance with the range reported by Reddy *et al*. (2003) [14] in the emu birds. The average TLC value in the emu chicks observed in this study was in agreement with the findings of Durgun *et al*. (2005) [5] in the ostrich chicks, whereas Selvan *et al*. (2012) [17] reported a lower TLC in the 12 to 16 weeks old ostrich chicks.
The average TLC value of 18.94±0.36 x10^3/µl observed in the growers of this study was similar to the finding reported in grower emu birds (Patodkar *et al*., 2008) [13] and in the juvenile ostriches (Palomeque *et al*., 1991 and Durgun *et al*., 2005) [12, 5]. On the other hand, Mushi *et al*. (1999) [11] recorded a much lower value in the juvenile ostriches.
In the present investigation, the average value of TLC observed in the adult emu birds was 18.23±0.20 x10^3/mm^3. Similar findings were reported in the four year old adult emu birds (Kumar *et al*., 2009) [9] and in the adult ostriches (Palomeque *et al*., 1991; Agaoglu *et al*., 2003 and Hassim *et al*., 2006) [12, 1, 6], whereas, Wilson *et al*. (2012) [18] reported a high TLC value in the adult ostriches.
In the current study, the TLC value was highest in the emu chicks when compared to the growers and adult birds which was in accordance with that reported by Levi *et al*. (1989) [10], Mushi *et al*. (1999) [11] and Wilson *et al*. (2012) [18] in the ostriches, whereas Palomeque *et al*. (1991) [12] and Durgun *et al*. (2005) [5] did not find any significant difference between the age groups in the ostriches. Higher TLC in the chicks could be due to the protective nature as the young ones have unstable immune environment. This could be attributed to the fact that the younger birds are more prone to infections and are immunologically challenged (Wilson *et al*., 2012) [18]. Physiological leucocytosis may also occur as a result of epinephrine release in which marginal pools of neutrophils and or lymphocytes are mobilized into the general circulation raising the total leucocyte count and absolute neutrophil and or lymphocyte numbers. It is common in young animals, which is triggered generally by emotional and physical disturbances. Rarely, monocyte and eosinophil numbers may also increase (Jain, 1993) [7].

Differential Leukocyte Count (DC)
The heterophils are the most numerous leukocytes in ratite blood and have similar functions to their counterparts in mammalian blood. The average value of heterophils observed in the present study was within the range reported in emu birds (Reddy *et al*., 2003) [14] and in the ostriches (Romdhane *et al*., 2000; Selvan *et al*., 2012 and Bonadiman *et al*., 2009) [15, 17, 3]. The heterophils were decreased as the age of the birds advanced. The chicks had a significantly higher heterophils count when compared to the growers and adults. This was consistent with the findings of Durgun *et al*. (2005) [5] in the ostriches. On the other hand, Levi *et al*. (1989) [10] reported that the heterophils were increased with increase in the age of the bird which was contradictory to the present observation, whereas, Mushi *et al*. (1999) [11] did not find any significant difference in the heterophils between the juvenile and adult ostriches.
Lymphocytes are the second most common leukocyte in normal ratites. Lymphocyte morphology is similar to that of other avian species (Blue-McLendon and Green, 2010) [2].
The average value of lymphocytes observed in the present investigation was in accordance with the findings reported in emu birds (Reddy *et al*., 2003 and Patodkar *et al*., 2008) [14, 13] and in the ostriches (Mushi *et al*., 1999; Durgun *et al*., 2005; Selvan *et al*., 2012 and Bonadiman *et al*., 2009) [11, 5, 17, 3]. The emu chicks had a lower lymphocyte count when compared to the growers and adults, similar to that reported by Durgun *et al*. (2005) [5] in ostrich chicks and growers, whereas Levi *et al*. (1989) [10] observed a decrease in the number of lymphocytes with increasing age in the ostriches. The lymphocytes were found to be increased in the growers and in the adults up to 6 years of age.
Eosinophils are low in numbers in blood from normal ratites. Parasitism causes eosinophilia less commonly in ratites than in mammals or in other avian species (Blue-McLendon and Green, 2010) [2].
In the chicks, the average value of eosinophil count was significantly higher when compared to growers and adult birds. This finding was in accordance with Fudge (2003) and Reddy *et al*. (2003) [14] in the emu birds, Durgun *et al*. (2005) [5] and Selvan *et al*. (2012) [17] in the ostriches. No significant difference was observed in the eosinophil count within the growers and adult birds. On contradictory to the current study, Levi *et al*. (1989) [10] reported that in the ostriches, the eosinophil increased with increase in age.
Increased heterophils and eosinophils in the chicks might be to protect the emu chicks from bacterial infections, parasitic infections, respectively. The age of the bird and the impact of stress on the total number of leukocytes affect the differential blood count (Jelena *et al*., 2007) [8].

Table 1: Influence of age on hematological parameters of emu birds

Groups	Hb (g/dl)	PCV (%)	TEC ($x10^6$/µl)	Thrombocyte Count ($x10^3$/µl)	TLC ($x10^3$/µl)	Heterophils (%)	Lymphocytes (%)	Eosinophils (%)
Chicks (n = 40)	14.75 ± 0.32^{b}	34.55 ± 0.38^{a}	1.63 ± 0.03^{a}	22.16 ± 0.25^{a}	$22.31\pm0.26^{b**}$	$71.70\pm0.28^{b**}$	25.32 ± 0.27^{a}	$3.02\pm0.16^{b**}$
Growers (n = 60)	14.07 ± 0.43^{b}	35.22 ± 0.94^{a}	1.62 ± 0.04^{a}	$23.12\pm0.23^{b*}$	18.94 ± 0.36^{a}	69.73 ± 0.34^{a}	$27.83\pm0.35^{b**}$	2.41 ± 0.12^{a}
Adults (n =120)	$12.90\pm0.24^{a**}$	34.58 ± 0.64^{a}	1.59 ± 0.03^{a}	22.32 ± 0.21^{a}	18.23 ± 0.20^{a}	$69.40^{a}\pm0.27^{a}$	$27.80\pm0.25^{b**}$	2.77 ± 0.10^{ab}
Pooled Mean±SE (n = 220)	13.55±0.19	34.75± 0.43	1.60±0.02	22.51±0.14	19.17±0.18	69.91±0.19	27.35±0.18	$2.72^{\pm}0.07$

**- Highly significant ($p<0.01$)

*- Significant ($p<0.05$)

Mean values having same superscript within a column do not differ significantly

Conclusion

The present revealed the haematological parameters of emu in different age group of birds and will serve as a useful tool in guiding the veterinarians in the analysis of blood of normal and diseased emu birds.

References

1. Agaoglu Z, Yuksek N, Altug N, Kaya A. Studies on some haematological and biochemical parameters in clinically healthy ostriches. Turk. J Vet. Anim. Sci. 2003;27:161-163.
2. Blue-McLendon A, Green RA. Hematology of ratites. In: Schalm's Veterinary Haematology, chapter 125, 6th ed, D. J. Weiss and K. Jane Wardrop. Wiley Blackwell; c2010. p. 987-993.
3. Bonadiman SF, Stratievsky GC, Machado JA, Albernaz AP, Rabelo G, Damatta RA. Leukocyte ultrastructure, haematological and serum biochemical profiles of ostriches (*Struthio camelus*). Poult. Sci. 2009;88:2298-2306.
4. Campbell TW. Avian hematology. In: Avian medicine; c2013. p. 176-198. http://avianmedicine.net/content/uploads/2013/03/9.pdf
5. Durgun Z, Keskin ER Col, Col B, Atalay B. Selected haematological and biochemical values in ostrich chicks and growers. Arch. Gefluglek. 2005;69(2):62-66.
6. Hassim HA, Yusoff R, Abdullah R, Amat AC. A preliminary study on haematological and serum biochemistry values of captive ostrich (*Struthio camelus*) in Malaysia. In Proceedings of 2nd symposium of the Asian Zoo and Wildlife Medicine and 1st workshop on Asian Zoo and Wildlife Pathology (AZWMP). Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand; c2006. p. 59.
7. Jain C Nemi. Interpretation of leucocyte parameters. In: Essentials of Veterinary Hematology. Lea and Febiger, U.S.A; c1993. p. 295-306.
8. Jelena R, Simpraga M, Zadro R, Stiffler VL. Haematological status of one day old ostriches (*Struthio camelus domesticus*). Acta Veterinaria. 2007;57(2-3):231-239.
9. Kumar BK, Swapna E, Lakshman M, Rajashekar Reddy V, Ravindra Reddy A. Haemato-biochemical observations in emu (*Dromaius novaehollandiae*). Indian. J Vet. Path. 2009;33(2):238-239.
10. Levi A, Perelman B, Waner T, Van Grevenbroek M, Van Creveld C, Yaqil R. Haematological parameters of the ostrich. Avian Path. 1989;18(2):321-327.
11. Mushi EZ, Binta MG, Chbo RG, Isa JFW, Kapata RW. Selected haematologic values of farmed ostriches (*Struthio camelus*) in Botswana. J Vet. Diagn. Invest. 1999;11:372-374.
12. Palomeque J, Pinto D, Viscor G. Haematologic and blood chemistry values of the Masai ostrich (*Struthio camelus*). J Wildlife Dis. 1991;27(1):34-40.
13. Patodkar VR, Somkuwar AP, Rahane SD, Shejal MA, Belhekar DR. Effect of sex on hematological parameters in emu (*Dromaius novaehollandiae*). Vet. World. 2008:1(6):171-172.
14. Reddy YR, Viroji Rao ST, Veerabrahmaiah K, Satishkumar K, Shakila S. Haematological parameters of emu, Indian. Vet. J. 2003;80:1308-1309.
15. Romdhane BM, Romdhane MN, Mhiri S, Miled MAB, Kortas M. Biochemical and heamatological blood parameters of the ostrich (*Struthio camelus*) in Tunisian breeding. Revue de Medicine Veterinaire. 2000;3:231-238.
16. Sabino AJ, Trevelin SC, Almeida BFM, Peiro JR, Ciarlini PC. Erythrogram and erythrocytes measurement of ostriches (*Struthio camelus*) in Sao Jose do Rio Preto – SP, Brazil. J Vet. Pres. Anim, Sci. 2011;48(3):234-238.
17. Selvan ST, Gopi H, Vairamuthu P, Hematology and blood chemistry values in juvenile ostriches (*Struthio camelus*) under sub-tropical conditions of India. Res. J Poult. Sci. 2012;5(4-6):60-63.
18. Wilson A, Barnes AR, Obese FY, Agyei-Henaku KA. The effect of age on haematological studies in ostrich (*Struthio camelus*). J Livestock Sci. 2012;3:67-71.