ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

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International Journal of Poultry Science 6 (6): 459-461, 2007
ISSN 1682-8356
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The Effect of Age on Hematological and Serum Biochemical Values on Juvenile Ring-Necked Pheasants (*Phasianus colchicus*)

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Abstract: The influences of age on hematological and serum biochemical parameters were investigated in juvenile ring-necked pheasant. Statistical comparisons were made for differences in values among different ages. A variety of blood parameters showed significantly age related differences. Juvenile ring-necked pheasants of all ages had lymphocytes as the major circulating leukocyte. RBC values for 60 day-old pheasants were lower than the values for 74, 88 and 102 day-old pheasants. The hemoglobin value was higher for 88 day-old pheasants. The WBC, the heterophil and the lymphocyte values were significantly higher for 60 day-old pheasants. Total serum protein, albumin and globulin values for 25 and 60 day-old pheasants were significantly lower than the values for 42, 88 and 102 day-old pheasants.

Key words: Pheasant, *Phasianus colchicus*, avian hematology, serum biochemistry

Introduction

The ring-necked pheasant (*Phasianus colchicus* Linnaeus, 1758, *Galliformes*, *Phasianidae*) are birds, originally from Asia, introduced nearly worldwide including North and South America, Europe, Australia and New Zealand. They are selected for breeding stock in many countries to produce high nutritive meat.

Hematological and serum biochemical analyses may be used to detect organ dysfunction or disease and reports of bird blood ranges do not state age. Although blood analyses have been used to assess the health of several domestic birds species, limited information is available for young pheasants.

This work was conducted to investigate hematological and serum biochemical values (uric acid, gamma glutamyl transferase, protein, albumin and globulins) of juvenile ring-necked pheasants to establish data on them presenting the effect of age on blood values.

Materials and Methods

The juvenile ring-necked pheasants (*Phasianus colchicus*) were allocated in experimental floor-pen housed, receiving water and feed *ad libitum*. The feed was formulated with corn and soybean according with NRC (1994) recommendations.

Eight young pheasants were used in this study. Blood samples were obtained from these birds on days 25, 42, 60, 74, 88 and 102.

Blood samples were collected from the jugular vein on day 25. On days 42, 60, 74, 88 and 102 blood samples were collected from the ulnar superficial vein. Hematological analyses were performed on days 60, 74, 88 and 102. Total serum protein, albumin and globulins values were determined on days 25, 42, 60, 88 and 102. Serum uric acid and gamma glutamyl transferase values were determined on days 25, 74, 88 and 102.

Aliquots of each blood sample were transferred immediately to a 2-ml glass tube containing ethylenediaminetetraacetic acid (EDTA) for hematological analyses and to a 10-ml plain glass tube containing no anticoagulant for serum chemistry analyses. Thin smears were made immediately after the blood collection to avoid any interference on cell structure.

The hematological analyses were performed according to Jain (1986). Total Red Blood Cells (RBC) and total White Blood Cells (WBC) counts were performed by a manual method using hemocytometer with blood diluted on 0.01% of toluidine blue stain. The hemoglobin concentration was measured by cyanmethemoglobin method. Microhematocrit centrifugation (2500 rpm for 5 minutes) was used to determine the Packed Cell Volume (PCV). Leukocyte differential counts were made on blood films stained with Wright´s stain, using average of 200 leukocytes.

The serum chemistry parameters: uric acid, Gamma Glutamyl Transferase (GGT), serum total protein and albumin were determined with an automated chemistry analyzer. The globulin value was determined by difference between serum total protein and albumin. The control of the chemical analysis was made using Qualitrol-N.

Table 1: Age-specific variation in hematological values for juvenile ring-necked pheasants (Mean±SD)

Age (days)	RBC (/mm³)	PCV (%)	Hemoglobin (g/dL)	WBC	Heterophils	Lymphocytes	Eosinophils	Monocytes	Basophils
60	1,880,000^{b}±240,650	32.3^{a}±3.3	14.16^{b}±0.43	29,875^{a}±10,162	12,268^{a}±4,233	15,310^{a}±5,234	126^{a}±178	476^{a}±305	1695^{a}±1447
74	2,500,000^{a}±236,992	33.5^{a}±2.4	15.03^{ab}±2.00	18,000^{b}±2,138	4,722^{b}±615	10,573^{ab}±2,565	240^{a}±124	705^{a}±459	1580^{a}±891
88	2,360,000^{a}±114,354	33.6^{a}±0.9	15.95^{a}±0.85	20,875^{b}±3,796	5,670^{b}±876	12,346^{ab}±2,178	200^{a}±219	750^{a}±207	1908^{a}±1399
102	2,530,000^{a}±336,210	33.2^{a}±2.5	15.43^{ab}±1.27	18,125^{b}±3,870	5,566^{b}±2,317	10,225^{b}±3,157	555^{a}±996	651^{a}±551	1075^{a}±740

Means followed by different letters in the same column are significantly different (p<0,05)

Table 2: Serum biochemical values in juvenile ring-necked pheasants (Mean±SD)

Age (days)	Total serum protein (g/dL)	Albumin (g/dL)	Globulins (g/dL)	Uric acid (mg/dL)	GGT (U/L)
25	3.15^{b}±0.33	1.81^{ab}±0.18	1.33^{c}±0.22	5.93^{a}±2.64	8.12^{a}±2.51
42	3.78^{a}±0.28	2.08^{a}±0.19	1.70^{bc}±0.11	---	---
60	2.81^{b}±0.18	1.55^{b}±0.23	1.26^{c}±0.17	---	---
74	---	---	---	6.87^{a}±0.67	5.86^{a}±1.23
88	4.11^{a}±0.42	1.85^{ab}±0.22	2.26^{a}±0.34	6.13^{a}±0.21	6.66^{a}±1.97
102	4.03^{a}±0.36	1.96^{a}±0.47	2.07^{ab}±0.59	7.06^{a}±2.11	5.77^{a}±1.63

Means followed by different letters in the same column are significantly different (p<0,05)

The dates were analyzed by ANOVA and those with statistical differences were submitted to the Tukey's test at 0.05% using Statistics for Windows®.

Results and Discussion

The relation of age to hematological values in juvenile ring-necked pheasants is presented in Table 1. The present study showed that there were no significant differences in PCV, eosinophils, monocytes and basophils among different ages of juvenile ring-necked pheasants. Schmidt *et al.* (2007) reported similar results for these parameters in 5 week-old pheasants. Pujman and Hanusova (1970) also found similar results for PCV in 12 week-old pheasants.

Significant differences in hematological values were found among different ages of juvenile ring-necked pheasants. In this study, RBC values for 60 day-old pheasants were lower than the values for 74, 88 and 102 day-old pheasants. The RBC values in this study were also lower than values reported for 12 week-old pheasants (Pujman and Hanusova, 1970) but similar to those reported for 5 week-old pheasants (Schmidt *et al.*, 2007) and for 40 and 52 day-old broiler chickens (Kohayagana *et al.*, 2001; Kanashiro *et al.*, 2002). The hemoglobin values were higher for 88 day-old pheasants than the values for 60, 74 and 102 day-old pheasants. Schmidt *et al.* (2007) reported higher hemoglobin concentration values for 5 week-old pheasants. However, 12 week-old pheasants, 40 and 52 day-old broiler chickens had lower values (Pujman and Hanusova, 1970; Kohayagana *et al.*, 2001; Kanashiro *et al.*, 2002). Reference ranges for avian RBC and hemoglobin vary significantly among reports and among species sampled (Fudge, 2000). In general, the total erythrocyte count increases with age (Thrall, 2004) and the red cell mass of birds is also influenced by sex and environmental factors (Herbert *et al.*, 1989). Slight increases in the peripheral RBC mass may occur in the excited or stressed avian patient (Fudge, 2000).

Heterophils are the most abundant leukocyte in the peripheral blood of most species of birds in most studies, whereas some avian species are lymphocytic (have lymphocytes as the predominant cell type in the differential count) (Fudge, 2000; Latimer and Bienzle, 2000). Juvenile ring-necked pheasants of all ages had lymphocytes as the major circulating leukocyte. Hematological studies of chickens and domestic turkeys showed a similar condition (Bounous *et al.*, 2000). However, a similar distribution of heterophils and lymphocytes in adult and young pheasants was reported (Schmidt *et al.*, 2007).

The WBC, the heterophil and the lymphocyte values were significantly higher for 60 day-old pheasants than the values for 74, 88 and 102 day-old pheasants. Younger pheasants (35 day-old), 40 and 52 day-old broiler chickens had lower values for WBC, heterophils and lymphocytes (Schmidt *et al.*, 2007; Kohayagana *et al.*, 2001; Kanashiro *et al.*, 2002) when compared with 60 day-old pheasants but similar values when compared with 74, 88 and 102 day-old pheasants. The WBC and the different types of leukocytes are influenced by age, hormones and stress (Maxwell, 1993; Latimer and Bienzle, 2000). Although young birds demonstrate a great variability in total leukocyte count until 4 to 6 months of age (Fudge, 2000), birds often become excited when handled. Thus, the blood collection process usually results in a physiologic leukocytosis, that represents a transient phenomenon and this physiologic response increases the concentration of heterophils and lymphocytes in the peripheral blood (Thrall, 2004). This phenomenon may explain the higher values in 60 day-old pheasants.

Table 2 shows the effect of age on serum biochemical levels in juvenile ring-necked pheasants. There were no significantly differences in the serum biochemical values of uric acid and GGT among different ages of juvenile ring-necked pheasants.

The uric acid values were similar to those reported for 5 week-old ring-necked pheasants (Schmidt *et al.*, 2007), for 4 month-old wild turkeys (Bounous *et al.*, 2000) and for 4 week-old SPF brown leghorns (Ross *et al.*, 1978). On the other hand, Bakhiet *et al.* (2006) reported that young Sudanese geese (8-10 weeks old) had higher uric acid values. The blood uric acid concentration is influenced by bird species and diet (Lumeij, 1997). The GGT values of this study were similar to those reported for 5 week-old pheasants (Schmidt *et al.*, 2007).

The present study showed that there were significant differences in total serum protein, albumin and globulin values among different ages for juvenile ring-necked pheasants. Total serum protein, albumin and globulin values for 25 and 60 day-old pheasants were significantly lower than the values for 42, 88 and 102 day-old pheasants. Young pheasants (5 week-old) (Schmidt *et al.*, 2007), young Sudanese geese (8-10 week-old) (Bakhiet *et al.*, 2006) and juvenile wild turkeys (4 month-old) (Bounous *et al.*, 2000) had higher values for total serum protein, albumin and globulin when compared with 25 and 60 day-old pheasants but similar values when compared with 42, 88 and 102 day-old pheasants. Control (unvaccinated) broiler chickens (21 day-old) (Talebi, 2006) had lower values for total serum protein and albumin than 25 day-old pheasants. The explanation for the total serum protein, albumin and globulin values being lower in 25 and 60 day-old pheasants might reside in the fact that age and stage of development strongly influences the concentration of total protein in birds (Hochleithner, 1994).

Acknowledgements

The authors wish to thank Hospital Veterinário da Universidade Federal do Paraná, Curitiba, Brazil, especially Dr. Rogério Ribas Lange for his help to allocate the birds; Dr Joelma Moura for her help in statistical analyses; Dr Elizabeth M. S. Schmidt wishes to thank CNPq for the assistantship.

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