

Haematology of the Malaysian Jungle Fowl (*Gallus gallus spadiceus*)

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ABSTRAK

Nilai-nilai haematologi dan kepekatan jumlah protein plasma telah dianalisis daripada darah ayam hutan (*Gallus gallus spadiceus*) jantan dewasa yang ditangkap di dalam hutan tambahan di Malaysia Barat. Nilai purata bagi jumlah sel darah merah ialah $2.7 \times 10^6/\mu\text{l}$, kepekatan Hb 11.4 g/dl dan PCV 43.3%. Nilai purata bagi MCV ialah $159.4 \mu^3$, MCH 42.0 pg dan MCHC 26.4%. Nilai purata bagi jumlah sel darah putih ialah $27.5 \times 10^3/\mu\text{l}$. Kiraan pembezaan dan kiraan mutlak bagi sel-sel darah putih ialah: heterofil, 51.3% dan $14.0 \times 10^3/\mu\text{l}$; limfosit, 31.3% dan $8.6 \times 10^3/\mu\text{l}$; monosit, 8.6% dan $2.5 \times 10^3/\mu\text{l}$; esinofil, 4.3% dan $1.2 \times 10^3/\mu\text{l}$; basofil, 4.6% dan $1.2 \times 10^3/\mu\text{l}$. Nilai purata bagi jumlah kepekatan protein plasma ialah 4.2 g/dl. Kajian ini menunjukkan ayam hutan mempunyai peratus limfosit yang rendah berbanding dengan ayam domestik.

ABSTRACT

Haematological values and total plasma protein concentration were determined from blood samples obtained from seven adult male jungle fowls (*Gallus gallus spadiceus*) trapped in the secondary forests of West Malaysia. The mean values for total RBC count, Hb concentration and PCV were $2.7 \times 10^6/\mu\text{l}$, 11.4 g/dl and 43.3% respectively. The mean values for MCV, MCH and MCHC were $159.4 \mu^3$, 42.0 pg and 26.4% respectively. The mean of total WBC count was $27.5 \times 10^3/\mu\text{l}$. The mean differential and absolute counts for WBC were: heterophils, 51.3% and $14.0 \times 10^3/\mu\text{l}$; lymphocytes, 31.3% and $8.6 \times 10^3/\mu\text{l}$; monocytes, 8.6% and $2.5 \times 10^3/\mu\text{l}$; eosinophils, 4.3% and $1.2 \times 10^3/\mu\text{l}$; and basophils, 4.6% and $1.2 \times 10^3/\mu\text{l}$. The mean total plasma protein concentration was 4.2 g/dl. This study shows that the jungle fowl has a higher percentage of heterophils and lower percentage of lymphocytes than the domestic chicken.

INTRODUCTION

The South-east Asian region is recognized as the natural habitat of the red jungle fowl (*Gallus gallus*), the ancestor of the domestic fowl. Although the haematology of the domestic chicken and other avian species has been studied and documented (Lucas and Jamroz, 1961), no haematological study has been made on the jungle fowl. The present study was, therefore,

undertaken to characterize the normal haematological parameters of the Malaysian red jungle fowl (*Gallus gallus spadiceus*).

MATERIALS AND METHODS

Seven adult male jungle fowls were trapped using a female jungle fowl as a decoy over a one-year period in the secondary forests of West Malaysia. They were kept in wooden cages and

slaughtered the next day after trapping. Blood samples were collected into test-tubes containing EDTA as an anticoagulant and analysed the same day.

Total red blood cell (RBC) and white blood cell (WBC) counts were determined by the procedures of Natt and Herrick (1952). Hemoglobin (Hb) concentrations were determined by the cyanmethemoglobin method using a haemoglobinometer (Model HGBRT, Coulter Electronics Ltd., England). Packed cell volumes (PCV) were determined by the microhaematocrit method and mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated as described by Schalm *et al.* (1975).

Differential WBC counts were performed on blood smears stained with May-Grunwald-Giemsa Stains (Lucas and Jamroz, 1961). Total plasma concentrations were estimated using a refractometer (model 208, Bellington and Stanley Ltd., England).

RESULTS AND DISCUSSION

Results of the parameters examined for RBC and WBC are shown in Tables 1 and 2.

There is a wide variability in the haematological values in avian species, which could be due to inherent breed differences, environmental factors and differences in analytical techniques. These impose a constraint when making comparisons between avian haematological studies.

TABLE 1
Red blood cell parameters and total plasma protein concentration of the jungle fowl

	Mean + S.D.
RBC ($\times 10^6/\mu\text{l}$)	2.7 \pm 0.27
Hemoglobin (g/dl)	11.4 \pm 0.99
PCV (%)	43.3 \pm 0.78
MCV (μ^3)	159.4 \pm 13.8
MCH (pg)	42.0 \pm 2.55
MCHC (%)	26.4 \pm 1.55
Total plasma protein (g/dl)	4.2 \pm 0.87

TABLE 2
White blood cell parameters (mean \pm S.D.) of the jungle fowl

	Differential count (%)	Total (absolute) values ($\times 10^3$ cells/ μl)
WBC	—	27.5 \pm 3.72
Heterophils	51.3 \pm 7.16	14.0 \pm 2.07
Lymphocytes	31.3 \pm 5.55	8.6 \pm 1.84
Monocytes	8.6 \pm 4.79	2.5 \pm 1.63
Eosinophils	4.3 \pm 1.80	1.2 \pm 0.57
Basophils	4.6 \pm 3.26	1.2 \pm 3.26

In this study the values for total RBC count ($2.7 \times 10^6/\mu\text{l}$). Hb concentration (11.4 g/dl) and PCV (43.3%) are within the range (total RBC, 2.72 to $3.8 \times 10^6/\mu\text{l}$; Hb concentration, 8.1 to 13.5 g/dl; PCV, 20 to 48%) reported for the domestic chicken by various investigators (Bell and Freeman, 1971; Sturkie, 1965). No values for MCV, MCH and MCHC are available for the domestic chicken for comparison with the jungle fowl. However, the values for the jungle fowl observed in this study compare favourably with those reported for the Japanese quail (Nirmalan and Robinson, 1971).

The total plasma protein concentration (4.2 g/dl) in the jungle fowl is similar to those for the domestic chicken (range, 3.3 to 4.7 g/dl; Sturkie, 1965) and other avian species (range, 2.8 to 8.5 g/dl; Defalco, 1942).

The total WBC count and the absolute and differential counts for monocytes, eosinophils and basophils do not deviate greatly from those reported for domestic chicken (Lucas and Jamroz, 1961; Bell and Freeman, 1971; Sturkie, 1965) and Japanese quail (Nirmalan and Robinson, 1971). However, the values for the heterophil and lymphocyte counts in the jungle fowl differ from those of the domestic chicken. In the domestic chicken the percentage of lymphocytes, comprising 40 to 70 percent of the total WBC count, is higher than any other white cell type. The heterophils constitute the second most numerous group. However, in this study the opposite was true for the jungle fowl. Lymphocytes and neutrophils comprised 31.1 percent and 51.3 percent of the total WBC count respectively. This trend was observed in all blood samples. In this respect the results are similar to the values reported for the ostrich, the pheasant, the laboratory pigeon and the Mallard duck (Lucas and Jamroz, 1961). The significance of the difference between the jungle fowl and the domestic chicken is not known. Probably during domestication a change in the ratio of lymphocytes and heterophils could have taken place in the present breeds of the domestic chicken. It is also possible that changes in the environment might induce stress with the subsequent release of adrenal corticosteroids. Newcommer (1958)

showed that in chickens, physical restraint and other stressful agents produced a relative increase in the number of heterophils. Shapiro and Schechtman (1949) demonstrated that adrenal cortical extracts caused a transient lymphopenia and leucocytosis in the adult fowl, the increase in white blood cells being mainly in the number of heterophils. Other studies by Glick (1961) and Hublé (1955) demonstrated that the stress hormones, ACTH and cortisol, caused an increase in heterophils and a decrease in lymphocytes. The caged jungle fowls exhibited a high degree of excitability. Thus, the trapping and the caging of the jungle fowls could produce a significant stress effect on these animals, which probably explains the higher heterophil count observed in this study for the jungle fowl as compared to the domestic chicken.

CONCLUSION

A difference in the relative distribution of heterophils and lymphocytes between the jungle fowl and the domestic chicken was observed. In this study it was noted that the jungle fowl had a higher percentage of heterophils and a lower percentage of lymphocytes. The reverse has been reported for the domestic chicken. The other haematological parameters and the total plasma protein concentration of the jungle fowl are within the values reported for the domestic chicken.

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