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Comparison of some haematological parameters between three bird species from the *Columbidae* family - short communication

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Abstract

Investigations into some haematological values in birds from three *Columbidae* species e.g. pigeons, (*Columba livia domestica),* collared doves (*Streptopelia decaocto)* and African collared doves, (*Streptopelia roseogrisea*) have been performed. In all three species, high haemoglobin concentrations, and respectively high red blood cell counts were observed. In *S. decaocto* the red blood cell count was extremely high, corresponding to the high haemoglobin levels. RBC values in both Streptopelia species were significantly higher than in domestic pigeons. Higher white blood cell counts were present in freely living collared doves versus both species living in captivity. The heterophils/lymphocytes ratio in African collared doves was the highest – 1.05, followed by the ratios of collared doves and domestic pigeons.

Key words: white blood cells, red blood cells, pigeon, dove, haematology

Introduction

The values of haematological indices in domestic and wild birds could be an important source of information with valuable diagnostic meaning. They could provide or support an objective assessment of the health status and could support the correct diagnosis in different pathological states. This has motivated the publication of a large

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number of scientific reports in various free living or captured avian species (ERDOSE and FONTAINE, 1977; JANTOSOVIĆ et al., 1998; MILLER et al., 2001; SCOPE et al., 2002; HAUPTMANOVA et al., 2002; PAVLAK et al., 2005). Considering the significantly extended spectrum of animal species under veterinary care, the data about wild and exotic species are particularly important. In some cases, they could also be a signal for an impaired ecological equilibrium (SEISER et al., 2000; NAVA et al., 2001). In the available literature, there are few or no data published about the haematological parameters for healthy individuals of the two species from the *Streptopelia* genus (*Columbidae* family) - collared dove (*Streptopelia decaocto*) and African collared dove (*Streptopelia roseogrisea*). The data for domestic pigeons (*Columba livia*) include several reports giving information for the haematological parameters and the influence on them from different factors – age, season, stress, illnesses (ERDOSE and FONTAINE, 1977; JANTOSOVIĆ et al., 1998; GAYTHRI and HEGDE, 1994; SCOPE et al., 2002). This is also found to be common for other bird species (ABELENDA et al., 1993; CELDRAN et al., 1994; PIERSMA et al., 2000; VILLEGAS et al., 2004).

The present study aimed to compare the values of some haematological parameters of clinically healthy representatives of these three avian species, living in the same urbanized region.

Materials and methods

The experiments were performed on 20 sexually mature clinically healthy domestic pigeons (*Columba livia*) from various breeds from an experimental farm of Trakia University, Bulgaria, 18 sexually mature domesticated African collared doves (*Streptopelia roseogrisea*), from a private farm in the area of Stara Zagora city, and 14 freely living collared doves (*Streptopelia decaocto*), from the same area. The number of pigeons and African collared doves from both genders was equal. (It was defined on the basis of owner information and behaviour in family pairs.) The pigeons were housed in an aviary. The African collared doves were captured in individual family cages (80/80/60 cm) by pairs. Collared doves (also clinically healthy) were captured only for blood sampling and their gender was not determined, but they were also mature.

Blood samples (0.3 mL) were obtained once from each bird directly via brachial venipuncture during the time period between the end of September and November. No anticoagulant was used. Blood haemoglobin concentrations were assayed colorimetrically as cyanmethhaemoglobin (DRABKIN, 1945). The whole blood cells number as well the count of red blood cells (RBC), thrombocytes (Thr) and white blood cells (WBC) was counted in a Türk's chamber within an hour after blood sampling, taking into account their relation on blood smears, stained with May-Grünwald and Giemsa. The differential WBC counts were determined on the same blood smears, by counting 200 WBC from a

representative part of the smears. All data are presented as Mean ± SEM. The statistical significance of data among the three species was assessed by the Mann-Whitney test (using Satistica 6.1 computer program). A value of $P<0.05$ was considered significant.

Results

The values of haematological parameters of the three avian species, the subjects of the study are presented in Table 1.

Table 1. Some haematological parameters in three *Columbidae* species (mean ± SEM)

Parameters	Species		
	Columba livia	*Streptopelia decaocto*	*Streptopelia roseogrisea*
Haemoglobin (g/dL)	14.46 ± 0.19	15.01 ± 0.19[1]	13.36 ± 0.21
Erythrocytes ($1x10^{12}$/L)	3.96 ± 0.05	5.48 ± 0.15[1]	5.31 ± 0.20
Thrombocytes ($1x10^{9}$/L)	34.40 ± 1.33	32.45 ± 0.91	30.53 ± 0.28[1]
Leukocytes ($1x10^{9}$/l)	23.80 ± 1.27	35.12 ± 3.15[1]	23.01 ± 1.12
Heterophils (%)	38.85 ± 0.51	41.72 ± 0.59	44.46 ± 0.58[1,2]
Limphocytes (%)	57.85 ± 0.62	53.48 ± 0.39	47.69 ± 0.97[2]
Basophils (%)	0.9 ± 0.16	1.53 ± 0.20	2.43 ± 0.30[1]
Eosinophils (%)	1.5 ± 0.18	2.07 ± 0.14	3.55 ± 0.41[1]
Monocytes (%)	0.7 ± 0.19	0.46 ± 0.20	1.23 ± 0.31[1,2]
H/L ratio	0.673 ± 0.015	0.76 ± 0.023[1]	1.05 ± 0.038[1,2]
n	20	14	18

[1]Statistically significant difference versus domestic pigeons ($P<0.05$); [2]Statistically significant difference versus collared doves ($P<0.05$); H/L - Heterophils/lymphocytes ratio; n - number of birds examined.

The data revealed statistically significant interspecies differences concerning haemoglobin and RBC values. Higher haemoglobin concentrations were observed in *Streptopelia decaocto* and *Columba livia.* The RBC count was higher in both *Streptopelia* species. The relationships between haemoglobin levels and RBC count were not equal for the three species.

The WBC count in freely living collared doves was the highest ($35.12.10^{9}$/L) whereas in the other two species the values were similar ($23.80.10^{9}$ and $21.01.10^{9}$/L in pigeons and African collared doves, respectively). The differences were statistically significant. Differences between the separate WBC classes were also found. The relation between heterophils and lymphocytes (H/L) was higher in the *Streptopelia* species (Table 1).

Discussion

The information referring to haematological data in different wild and exotic species is limited or missing for some of them. Generally species were registered belonging to one and the same genus or family (BOUNOUS et al., 2000; LASHEV et al., 2007) or birds of prey (POLO et al., 1992) having similar values of studied haematological parameters. The birds examined in this study, three *Columbidae* species, have similar or higher haemoglobin content and RBC count than those of the birds preying on them (POLO et al., 1992; DUTTLINGER and BIRD, 1995) and also in most cases higher than those found for other bird species (ERDOSE and FONTAINE, 1977; JANTOSOVIC et al., 1988; ABELENDA et al., 1993; CELDRAN et al., 1994; BOUNOUS et al., 2000; PIERSMA et al., 2000; MILLER et al., 2001; SCOPE et al., 2002; HAUPTMANOVA et al., 2002; VILLEGAS et al., 2004; LASHEV et al., 2007). Considering that the measured values of the studied species were higher than those in most avian species, studied by different authors, it could be assumed that in the three species, the subjects of our experiment, the values investigated were in the upper limits of the avian range. More definite conclusions could however be drawn after study including a larger number of individuals from the three species.

The interspecies differences in our study are not large, in spite of the existing statistical significances. No significant gender-related differences were observed in the domestic pigeons and African collared doves and therefore, the data in males and females were presented as averages.

The WBC counts observed in our study were similar to the data reported previously for racing pigeons (SCOPE et al., 2002) and feral free living pigeons (PAVLAK et al., 2005). There were also differences among the leukocyte classes. The heterophils/lymphocytes (H/L) ratio, considered by many authors as providing important information for immune system tension, following the prolonged effect of stress factors, was the highest in the African collared doves (1.05) and the least in domestic pigeons (0.673). A considerable change in heterophils/leukocytes proportion and increased H/L ratio following stress was observed by the same authors (SCOPE et al., 2002). In respect to heterophils and lymphocytes, our data are within the range specified by the same authors in pigeons, prior to and after stress, but closer to the last results. Our opinion is that the reason for this could be the difference in the way of life.

Taking into account the small percentage and the broad range of variation in the other WBC types (eosinophils, monocytes and basophiles) it is difficult to make a conclusion about any tendencies or correlations. The relatively high basophil, eosinophil and monocyte percentages in African collared doves should be emphasized.

Unlike the representative species of other families as Galliformes (MIHAILOV et al., 1999; LASHEV et al., 2007), the percentages of the different classes WBC counts in the three studied species were not very different, especially in those living in captivity.

Our data evidenced the relatively weak effect of the rearing method upon the studied haematological parameters. Yet, the highest haemoglobin levels and higher RBC counts were measured in freely living birds. The highest H/L ratio was that in the African collared doves reared in captivity that could possibly reflect a restraint stress.

Due to the lack of similar haematological studies on collared doves and African collared doves, despite the effect of factors such as gender, age, season and the relatively small bird number, our data could be accepted as tentative values in healthy individuals with regard to their use in diagnostics or other studies. Our results showed similar values of haematological parameters along with some differences in RBC counts, total and differential WBC counts, probably influenced by the mode of living.

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SAŽETAK

Provedeno je istraživanje hematoloških vrijednosti triju vrsta ptica porodice Columbidae, i to goluba (*Columba livia domestica*), gugutke (*Streptopelia decaocto*) i sahelske gugutke (*Streptopelia roseogrisea*). U sve tri vrste ustanovljena je velika koncentracija hemoglobina i velik broj crvenih krvnih stanica. U gugutke je broj eritrocita bio iznimno velik, i odgovarao je velikoj razini hemoglobina. Broj eritrocita bio je u obje vrste roda *Streptopelia* veći nego u goluba. Veći broj bijelih krvnih stanica ustanovljen je u slobodno živućih gugutki u odnosu na one držane u zatočeništvu. Omjer heterofila i limfocita u sahelske gugutke bio je najveći (1,05), srednji u gugutke, a najmanji u goluba.

Ključne riječi: bijele krvne stanice, crvene krvne stanice, golub, gugutka, hematologija