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Serum biochemistry of free-ranging black francolins (*Francolinus francolinus*) including sex-related differences

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Abstract

Black francolins (*Francolinus francolinus*) belong to the Phasianidae family. This species is native to the Indian subcontinent and is found in Turkey. Extensive biological studies have been conducted on the extreme biochemical differences between sexes. We have clinically followed the following: triglyceride, globulin, ...

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Introduction

Black francolin (*Francolinus francolinus*) is a well-known game bird involved in Phasianidae family. As a member of this family, they are terrestrial and they show sexual dimorphism. Black francolins have a wide geographic range from Southern Asian countries to Middle-East and Caspian region. Turkey is also a homeland for this bird. The population in Turkey is declining in recent years and special attention must be paid in order to understand and monitor this species more efficiently.

To establish reference values for free-ranging animals can be challenging due to limited access to sufficient numbers of samples and difficulties faced during capturing the animals. Nevertheless, it is very important to have this data since they can provide supportive information on the health status of animals individually or on population level. The number of researches on serum biochemistry of bird species, especially on phasianids, is limited. A few examples can be found on chukar partridges (Suchy et al. [2010](#); Nazifi et al. [2011](#)), ring-necked pheasants (Schmidt et al. [2007](#)) and Japanese quails (Scholtz et al. [2009](#)). To our knowledge, there are no previous records on serum biochemistry of black francolins.

The main aim of this study is to determine reference values of blood parameters for black francolin. In this study, the following parameters were measured: glucose, albumin, protein, aspartate aminotransferase (ALT), and creatinine.



Blood samples were collected from healthy, adult black francolins under the supervision of a veterinarian in the early morning hours of the day.

Mediterranean region of Turkey. The birds were put in a dark bag until the samples were received. Sampled animals were weighed and physically examined before blood samples received by the same veterinarian. Gender differentiation has been done according to the morphological features of the individuals. The blood samples were taken from cutaneous ulnar vein into lithium heparin tubes (Isotherm, Istanbul, Turkey). Contamination of the blood samples was avoided by the accurate conduction of the sampling procedure (Lumeij [2008](#)). The samples kept still for maximum 2 hours for clotting and centrifuged for 20 minutes at $4.000 \times g$ (Hettich Rotina 380, Tuttlingen, Germany). The serum samples were stored at -20°C until they are analysed. Serum samples were evaluated with an automated chemistry analyser (Roche Cobas 6000, Roche Diagnostics, Basel, Switzerland).

The results were recorded on a computer database (Excel, Microsoft Office XP, Microsoft Corporation, Washington, USA). They were then transferred to statistics software on which they analysed statistically using SAS package programme (SAS Institute [2002](#)). Mean, standard deviations and 5th and 95th percentiles for each serum parameter have been calculated. T-tests for independent samples were used to compare means and to evaluate significant differences attributable to gender for all measured parameters. P-values < 0.05 were considered to be statistically significant.

Results

In this study, we detected mean values and reference intervals for 13 biochemical parameters.

Table 1. Mean values and reference intervals for 13 biochemical parameters in male and female birds. Females had higher values for total protein, albumin, and calcium, while males showed higher levels of cholesterol, triglycerides, and urea.



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No comparison could have been made in terms of black francolins since we could not find any previous record on the serum biochemistry of this wild bird. Therefore, the results have been compared with the findings of taxonomically related species such as chukar partridges (*Alectoris chukar*), ring-necked pheasants (*Phasianus colchicus*), Japanese quails (*Coturnix coturnix japonica*), Indian peafowl (*Pavo cristatus*) and capercaillie (*Tetrao urogallus*). We observed that our results generally comply with the values of other phasianids with the exception of a few parameters.

We observed that serum AST and ALT levels in black francolins are generally lower than the levels shown in capercaillie, ring-necked pheasants, Japanese quails and chukar partridges (Lavin et al. [1992](#); Schmidt et al. [2007](#); Scholtz et al. [2009](#); Nazifi et al. [2011](#)). According to our findings, there is a statistically significant difference between sexes in terms of AST and ALT levels. Scholtz et al. ([2009](#)) indicated a sex-related difference in AST and ALT levels in Japanese quails as well. In contrast to their results, female black francolins had higher AST and ALT levels.

Serum glucose levels in black francolins were between the ranges given for wild turkeys (*Meleagris gallopova silvestris*) and Indian peafowl (*P. cristatus*) (Bounous et al. [2000](#); Samour et al. [2010](#)). The levels reported in other phasianids were lower than the results detected in black francolins (Schmidt et al. [2007](#); Scholtz et al. [2009](#); Suchy et al. [2010](#)). Black francolins are timid animals prone to capturing stress. It should be underlined that sampled animals were free-ranging wild animals and the increased levels of glucose can be explained by the stress of capture which ends up with increased levels of catecholamines and glucocorticoids and causes hyperglycemia.

Nazifi et al. (2011) reported serum glucose levels of 4.02 mmol/L in black francolins, which is similar to the results found in the present study. The results for the other species were also similar to the previous studies on black francolins. This indicates that black francolins are similar to other phasianids.

The serum glucose levels in black francolins were similar to the Japanese quail (*Coturnix coturnix japonica*) and grey partridge (*Coturnix coturnix*) and chukar partridge (*Alectoris chukar*). The results for the other species were also similar to the previous studies on black francolins. This indicates that black francolins are similar to other phasianids.

Albumin levels in black francolins were in a similar range to the Japanese quail (*Coturnix coturnix japonica*), chukar partridge (*Alectoris chukar*) and grey partridge (*Coturnix coturnix*). The results for the other species were also similar to the previous studies on black francolins. This indicates that black francolins are similar to other phasianids.

Serum mineral levels studied in this research were involved in narrow intervals. This has been observed in other game birds either. Sodium and potassium levels complied with the results received in helmeted guinea fowl, common pheasant and chukar partridge (Suchy et al. [2010](#)).

In conclusion, mean values and reference intervals for 13 serum parameters frequently checked in avian medicine have been calculated in black francolins. ALT, AST and cholesterol are the three analytes which showed statistically significant difference between male and female black francolins. Some of the sexual differences may appear due to metabolic changes in females since female birds lay eggs (Walzem et al. [1999](#)). In general, the results received in this study are coherent with those reported in the members of Phasianidae family. Some of the parameters might have been affected because of the excitability of the black francolins. Nevertheless, this situation applies any case of blood sampling from free-ranging black francolins.

Although sex-related differences have been found in this study, our knowledge on effects of age, circadian rhythm and season is still not enough. It is hoped that the data provided in this study will be valuable for the wildlife veterinarians and biologists in monitoring health status of black francolins.

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