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Breed-specific biochemical parameters of healthy adult turkeys in humid tropics in Nigeria

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ABSTRACT. This study evaluated the serum biochemistry profile of apparently healthy B-not strain of indigenous turkeys and determined the influence of sex on parameters. A total of 50 apparently healthy B-not strain of turkeys of either sex were studied. The turkeys were kept in the animal house at the College of Veterinary Medicine in Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Blood samples were collected from the jugular vein and standard procedures were followed in all the serum biochemistry parameters determined. The overall mean for the serum biochemistry parameters were as follows: alkaline phosphatase (ALP): 207.71 ± 2.93 IU/L, aspartate amino transferase (AST): 82.51 ± 1.13 IU/L, alanine amino transferase (ALT): 8.80 ± 0.83 IU/L, total protein: 3.69 ± 0.18 g/dl, albumin: 1.94 ± 0.54 g/dl, globulin: 1.75 ± 0.14 g/dl, cholesterol: 140.82 ± 5.28 , bilirubin: 0.37 ± 0.07 mg/dl, urea: 4.29 ± 0.30 mg/dl, creatinine: 0.31 ± 0.38 mg/dl, triglycerides: 107.95 ± 7.55 mg/dl and glucose: 140.33 ± 0.52 mg/dl. In comparison to the female turkeys, the males had significant lower ($p < 0.05$) urea, cholesterol and triglycerides levels. It is thought that the baseline biochemical values will help veterinarians to interpret serum profile of sick animals and assist researchers in interpreting laboratory data.

Keywords: B-not strain, turkeys, biochemistry, indigenous, Nigeria

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INTRODUCTION

Poultry meat accounts for 33% of global meat production. Turkey production is a highly profitable agricultural industry and makes a major contribution to the poultry industry in Nigeria and the world over. It represents an important protein source to people in the country (FAO, 2010; Anandh et al., 2012; Yakubu et al., 2013; Amoa et al., 2014).

Blood biochemical constituents reflect the physiological responsiveness of the animal to its internal and external environments (Esonu et al., 2001; Iheukwumere and Okoli, 2002) and may be used to detect organ dysfunction or disease (Schmidt et al., 2007). Blood chemistry studies are usually undertaken to establish the diagnostic baselines of blood characteristics for routine management practices of farm animals (Aba-Adulugba and Joshua, 1990; Onyeyili et al., 1992; Tambuwal et al., 2002). It is imperative to determine the serum biochemistry of birds because the information will help in the selection of a new genetic strain which will improve production (Sholesberg, et al., 1996; Ladokun et al., 2008).

Serum biochemical values have been established in most domestic mammalian species (Jain, 1986; Adejumo et al., 2005) and avian species. However, limited information is available for indigenous B-not strain of turkeys. The present study was carried out to establish the serum biochemical baseline values for the B-not strain of indigenous turkeys under intensive management system and to determine the effect of sex on these parameters to facilitate the interpretation of laboratory data.

MATERIALS AND METHODS

Study Area

Ikwuano Local Government Area (ILGA) is located at longitude 7° 29' East and latitude 5° 32' North on an elevation of about 120m above sea level. It falls under the rain forest zone of Nigeria with average annual rainfall of 2200mm distributed over eight month period (March-November) which peaks in June/July with a short dry spell usually occurring in August. It has warm humid climate and temperatures that ranges from about 28°C in the wet season to slightly over 35°C in the hot season. The

vegetation is composed of trees, grasses, legumes and browse house.

Animals

Fifty adult B-not strain of apparently healthy indigenous turkeys of both sexes were used for this study (25 males and 25 females). They were reared in the poultry unit of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Feed and water were provided *ad libitum* to the turkeys. Vaccination and preventive medications were given to them under a comprehensive program recommended by the National Veterinary Research Institute (NVRI) Vom, Nigeria. Blood and faecal samples were collected from the turkeys and examined in the laboratory to check for parasites before the commencement of the study. Throughout the period of the study, the turkeys were cared for in accordance with the principles of humane laboratory animal care.

Blood collection

Blood was collected with a 5ml sterile plastic syringe and 21-gauge needle from the right jugular vein with the conscious animal physically restrained. The samples were cooled to approximately 4°C, using icepacks and during which the blood was allowed to clot. Serum was separated by centrifugation (1500g for 10 min) within 30 mins of collection. The samples were analyzed within 24 hours of collection. The serum samples were observed for moderate to marked hemolysis or lipemia so that they would be excluded from the study (Peck *et al.*, 2015).

Sample Analysis

Standard procedures were followed strictly as provided in the test kits for the serum biochemistry determinations. Quimica Clinica Applicada (QCA) test kits (QCA, Spain) were used for the serum aspartate amino transferase (AST), alanine amino transferase (ALT), alkaline phosphatase (ALP), total bilirubin, total protein, albumin, creatinine, urea, cholesterol, glucose and triglyceride. Serum AST and ALT activities were determined by the by the Reitman-Frankel method (Reitman and Frankel,

1957). Serum ALP activity was determined by the phenolphthalein monophosphate method (Klein et al., 1960; Babson et al., 1973). Serum total proteins were determined by the direct Biuret method (Lubran, 1978). Serum albumin was determined by the bromocresol green method (Doumas et al., 1971). Serum globulin was calculated as the difference between the serum total proteins and serum albumin (Johnson, 2008). Serum total bilirubin was determined by the modified Jendrassik-Grof method (Doumas et al., 1973). Serum urea was determined by the modified Berthelot-Searcy method (Fawcett and Scott, 1960). Serum creatinine was determined using Modified Jaffe method (Blass et al., 1974). Serum cholesterol was determined by the enzymatic colorimetric method (Allain et al., 1974). Serum glucose was

determined by the GOD POD method (Trinder, 1969) serum triglyceride was determined GPO Method (Trinder, 1969).

STATISCAL ANALYSIS

The results were presented as mean \pm standard error. The differences between the sexes (males and females) were analyzed by using the Student's T-test. Significant differences were accepted at $P < 0.05$.

RESULTS

The overall means for the biochemical parameters determined are presented (Table 1). There were significant differences ($P < 0.05$) in the urea, cholesterol and triglycerides in the male and female turkeys used for this study (Table2).

Table 1. The biochemical variables of apparently healthy B-not strain of indigenous turkeys (*Meleagris gallopavo*)

Parameters	Mean \pm standard error (n=50)	Minimum and Maximum values
AST(IU/L)	82.51 \pm 1.13	75.66 – 88.66
ALT (IU/L)	8.80 \pm 0.83	2.45 – 12.25
ALP (IU/L)	207.71 \pm 2.93	198.00 – 229.99
Bilirubin (mg/dl)	0.37 \pm 0.07	0.11 – 0.86
Glucose (mg/dl)	140.33 \pm 0.52	137.80 – 144.24
Urea (mg/dl)	4.29 \pm 0.30	2.16 – 5.79
Creatinine (mg/dl)	0.31 \pm 0.38	0.09 – 0.56
Total proteins (g/dl)	3.69 \pm 0.18	2.50 – 4.39
Albumin (g/dl)	1.94 \pm 0.54	1.47 – 2.18
Globulin (g/dl)	1.75 \pm 0.14	0.73 – 2.28
Cholesterol (mg/dl)	140.82 \pm 5.28	113.33 – 163.03
Triglycerides (mg/dl)	107.95 \pm 7.55	81.75 – 184.46

AST Aspartate amino transferase

ALT Alkaline amino transferase

ALP Alkaline phosphatase

Table 2: Sex differences in the biochemical variables of apparently healthy B-not strain of indigenous turkeys (Meleagris gallopavo)

Haematological parameters	Males		Females	
	Mean \pm standard error (n = 25)	Minimum and maximum values	Mean \pm standard error (n =25)	Minimum and maximum values
AST (IU/L)	85.42 \pm 1.16	82.37 - 88.66	79.60 \pm 1.19	75.66 - 83.62
ALT (IU/L)	8.96 \pm 1.29	4.70 - 12.25	8.64 \pm 1.15	2.45 – 11.46
ALP (IU/L)	205.14 \pm 3.85	198.00 - 219.99	210.28 \pm 4.50	198.00 – 229.99
Bilirubin (mg/dl)	0.45 \pm 0.11	0.22 – 0.86	0.29 \pm 0.07	0.11 – 0.55
Urea (mg/dl)	4.06 \pm 0.25 ^a	3.16 – 4.74	4.52 \pm 0.56 ^b	2.16 – 5.79
Creatinine (mg/dl)	0.20 \pm 0.04	0.09 – 0.33	0.42 \pm 0.03	0.33 - 0.56
Glucose (mg/dl)	139.03 \pm 0.50	137.80 – 140.75	141.63 \pm 0.59	139.95 – 144.24
Total proteins (g/dl)	3.52 \pm 0.26	2.50 – 3.96	3.85 \pm 0.23	2.50 – 4.39
Albumin (g/dl)	1.93 \pm 0.05	1.77 – 2.04	1.95 \pm 0.09	1.47 – 2.18
Globulin (g/dl)	1.59 \pm 0.22	0.73 – 2.03	1.90 \pm 0.16	1.03 – 2.28
Cholesterol (mg/dl)	129.96 \pm 8.39 ^a	113.33 – 161.82	151.69 \pm 3.30 ^b	141.82 - 163.03
Triglycerides (mg/dl)	92.09 \pm 2.74 ^a	81.75 – 98.39	123.82 \pm 12.47 ^b	86.82 - 184.49

AST Aspartate amino transferase

ALT Alkaline amino transferase

ALP Alkaline phosphatase

Different superscripts show significant differences at $p < 0.05$

DISCUSSION

Comprehensive serum biochemical parameters were determined for clinically healthy B- not strain of indigenous turkeys in the present study. The AST, ALT, ALP, total proteins, albumin, globulin, and creatinine values of the males did not vary from the females ($P > 0.05$). This finding is similar to the report by Ibrahim et al. (2012) and Agina et al. (2015) who reported that sex does not affect the parameters listed above. The total bilirubin did not differ significantly ($P > 0.05$) in both sexes which agree with the report of Ibrahim et al. (2012) who also reported a similar observation in their report.

The total cholesterol is significantly ($P < 0.05$) higher in the females than the males. This finding corroborates the report of Lisano and Quay (1977) of

total serum cholesterol in male and female turkeys. However, previous studies in turkeys (Agina et al, 2015; Ogundu et al., 2013; Priya and Gomathy, 2008) have shown higher ($P > 0.05$) cholesterol level in males than females. Also, a study in indigenous chicken in Northwest of Iran reported higher cholesterol levels in males than females (Abdi-Hachesoo et al., 2013). The difference in the cholesterol values of the male and female turkeys in the present study with some previous findings, further confirms the observation of Soliman and Houston (1974) who reported that genetic and sex differences affect cholesterol level, in birds. The overall cholesterol value obtained in the present study was within the range reported by Gomathy and Priya (2008) in turkeys and Coles (1986) in most birds.

Numerically the serum glucose level of the males was slightly lower ($P > 0.05$) than the females in the present study. However, other reports showed that males have significantly lower glucose level (Isidahomen et al., 2013). Other breeds of turkeys: local (174.00 ± 5.44), crossbred (207.11 ± 4.66) and exotic (206.63 ± 3.95) have higher glucose levels (Isidahomen et al., 2013) when compared to the turkeys used in this study. This variation could be attributed to the differences in the breed of turkeys which affects most parameters. It is important that normal range representing a population breed be established to avoid misinterpretation of data in animals. The females in the present study had higher urea levels which corroborate the findings of Isidahomen et al. (2013) who reported a similar finding. Ibrahim et al. (2012) recorded a far higher values of urea in the males (23.11 mg/dl) and females (32.56mg/dl) when compared with the present study but the urea value in the female was significantly ($P < 0.05$) higher than that of the males. The lower urea values recorded in this present study could be due to breed and environmental differences. Ovulatory activity was suggested to be the reason for higher urea in females than males (Ritchie et al., 1994; Ibrahim et al., 2012; Agina et al., 2015).

Triglycerides value in the present study was significantly higher in the females than the males. This finding is similar to what was reported in

chickens (Abdi – Hachesoo et al., 2013) but the females had higher values than the males which were not significant.

CONCLUSION

From the result of the present study, it would be observed that significantly higher values of urea, cholesterol and triglycerides were recorded in females when compared with the males in B-not strain of turkeys managed intensively. The other biochemical values determined were similar in both sexes. The result of this study would be useful in the interpretation of laboratory data and serve as a guide in determining the prognosis in sick B-not strain of turkeys in the humid tropics.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests concerning the publication of this paper.

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