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## Serum Biochemical Parameters of Female Bronze Turkeys (*Meleagris gallopavo*) During Egg-Laying Season

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**Abstract:** Serum biochemical values of uric acid, urea, total proteins, albumin, globulin, Aspartate Aminotransferase (AST) and Gama Glutamyltransferase (GGT) were estimated in blood samples collected from 15 female Bronze Turkeys during the laying season (32-52 weeks of age). Significant differences were observed for total proteins, globulins, AST, urea and uric acid during the laying period evaluated. The major differences noted were due to elevations on total protein, globulins and uric acid concentrations in 52 week-old females.

**Key words:** Serum biochemical parameters, Bronze Turkey (*Meleagris gallopavo*), laying season

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### INTRODUCTION

Domestic Turkeys (*Meleagris gallopavo* Linnaeus, 1758, *Galliformes*, *Phasianidae*) are descended from the North American wild Turkeys, which at one time were found ranging over a large part of Central and North America (Feltwell, 1992). They are selected for breeding stock to produce high nutritive meat, feathers and for breeding flocks (Brant, 1998).

Serum biochemical values can be obtained easily and are useful in determining the health and general condition of birds. A review of the literature reveals a lack of data on the composition of turkey blood. Some studies were reported with a small number of birds and give no details concerning the age, sex, state of reproduction, or other conditions (Kirshner *et al.*, 1951). Also, clinical chemistries can be a useful adjunct in the development of a diagnosis and prognosis in avian species (Lewandowski *et al.*, 1986) and may provide useful information about the physical condition of individuals. Thus, the objective of this study was to determine reference intervals for serum total protein, albumin, globulins, uric acid, urea, AST and GGT of adult female Bronze Turkeys and to investigate the variation in these values arising from the laying season.

### MATERIALS AND METHODS

Blood samples were taken biweekly from 32-52 weeks of age, from the ulnar superficial vein of 15 female Bronze Turkeys, during the laying period.

Aliquots of each blood sample were transferred immediately to a 10-mL plain glass tube containing no anticoagulant for serum chemistry analyses. The serum chemistry parameters (uric acid, urea, total proteins, albumin, AST and GGT) were determined with a semi-automated (spectrophotometer) chemistry analyzer (Labquest®, Labtest®). The globulin value was determined by difference between total protein and albumin. The control of the chemical analysis was made using Qualitrol-N.

Turkeys were allocated in experimental floor-pen housed, receiving water and feed *ad libitum*. The feed was formulated with corn and soybean for growing birds according to NRC (1994) recommendations for the laying period.

The data were analyzed by ANOVA and those with statistical differences were submitted to the Tukey's test at 0.05%, using Statview® (version 5.0).

### RESULTS AND DISCUSSION

Serum biochemical values for female Turkeys at different weeks during egg-laying are shown in Table 1. There were no statistical differences in albumin and GGT serum concentrations. Although it is reported that GGT is a good mirror for the overall body enzymatic and metabolic process in broiler chickens, some studies in birds showed that serum concentrations are often to low (Schmidt *et al.*, 2007; Schmidt *et al.*, 2009) and it is value as an index of liver disease needs further investigations, since GGT values of 0-10 U/L are considered "normal"

Table 1: Serum biochemical values for female Bronze Turkeys during the laying season (32, 36, 40, 44, 48 and 52 weeks of age) (Mean  $\pm$ SD)

	Total serum proteins (g/dL)	Albumin (g/dL)	Globulins (g/dL)	GGT (U/L)	AST (U/L)	Urea (mg/dL)	Uric acid (mg/dL)
32 weeks	4.5 $\pm$ 0.9 <sup>a</sup>	1.5 $\pm$ 1.0	2.9 $\pm$ 0.9 <sup>a</sup>	7.1 $\pm$ 7.0	249 $\pm$ 46 <sup>a</sup>	5.6 $\pm$ 0.8 <sup>a</sup>	1.8 $\pm$ 1.8 <sup>a</sup>
36 weeks	4.6 $\pm$ 1.0 <sup>a</sup>	1.4 $\pm$ 0.2	3.1 $\pm$ 1.0 <sup>ab</sup>	8.4 $\pm$ 2.4	259 $\pm$ 113 <sup>ac</sup>	3.7 $\pm$ 0.8 <sup>bc</sup>	4.9 $\pm$ 1.1 <sup>bc</sup>
40 weeks	5.5 $\pm$ 0.8 <sup>ac</sup>	1.4 $\pm$ 0.2	4.1 $\pm$ 0.7 <sup>bc</sup>	10.3 $\pm$ 4.9	243 $\pm$ 38 <sup>a</sup>	5.0 $\pm$ 0.9 <sup>a</sup>	5.2 $\pm$ 2.1 <sup>bc</sup>
44 weeks	5.9 $\pm$ 1.0 <sup>ac</sup>	1.6 $\pm$ 0.2	4.3 $\pm$ 0.9 <sup>bc</sup>	11.9 $\pm$ 10.8	433 $\pm$ 180 <sup>bc</sup>	5.2 $\pm$ 1.2 <sup>a</sup>	4.3 $\pm$ 1.6 <sup>acd</sup>
48 weeks	5.3 $\pm$ 1.1 <sup>a</sup>	1.7 $\pm$ 0.3	3.6 $\pm$ 0.9 <sup>ab</sup>	6.2 $\pm$ 5.0	352 $\pm$ 187 <sup>ac</sup>	4.9 $\pm$ 1.3 <sup>ac</sup>	3.9 $\pm$ 2.0 <sup>ac</sup>
52 weeks	6.6 $\pm$ 1.5 <sup>bc</sup>	1.8 $\pm$ 0.6	4.7 $\pm$ 1.1 <sup>c</sup>	5.3 $\pm$ 3.6	332 $\pm$ 204 <sup>ac</sup>	5.6 $\pm$ 1.0 <sup>a</sup>	6.4 $\pm$ 3.1 <sup>bd</sup>

Means followed by different letters in the same column are significantly different ( $p < 0.05$ )

and the clinical utility of GGT in the diagnosis of biliary conditions in birds has not been adequately evaluated (Campbell, 2004). According to Harr (2006), differences in methodologies for measuring GGT may account for differences in reference values and enzyme activity in normal birds typically falls below the sensitivity range of most analyzers (Hochleithner, 1994).

Uric acid concentrations were significantly elevated at 52 weeks of age. Table 1 demonstrates an increase in uric acid values during the egg laying period. According to Lewandowski *et al.* (1986), hyperuricemia has been documented during ovulatory activity. However, this is a physiological response because the normal blood uric acid value for most birds ranges between 2 and 15 mg/dL. Sturkie (1961) suggested that the level of circulating estrogens may influence plasma uric acid concentrations in chickens. The uric acid values were similar to those reported for adult White Holland female Turkeys in production (Kirshner *et al.*, 1951). In general, urea concentrations were not significantly different between the evaluated ages (Table 1) and Kirshner *et al.* (1951) reported similar values for female Turkeys.

Serum concentrations of AST (Table 1) were significantly elevated in Bronze hens with 44 weeks of age. Several physiological changes may occur in the metabolism of female birds due to egg-laying. AST values are age-dependent to varying degrees among different species and the cause of this age-dependent increase in activity has not been defined (Hochleithner, 1994). Published reference values vary according to breeding activity, sex, age and time of year (Lewandowski *et al.*, 1986). Increases in AST concentrations were found during transport in Turkeys, suggesting that stress also influences blood concentrations of this enzyme (Huff *et al.*, 2008). We found that the mean value for AST concentrations obtained in this study were similar to those reported for 16 week-old female Japanese quails (Scholtz *et al.*, 2009).

Significant differences in serum total protein and globulins were found (Table 1) and the main difference was found in 52 week-old hens. Blood protein concentrations may vary due to breeding season, indicating that egg production is associated with a marked increase in total protein concentrations induced by estrogens (Campbell, 2004; Lumeij, 2008). In

oviparous females, vitellogenin, which is a beta-globulin fraction and other proteins used in egg formation can increase dramatically during reproductive activity (Harr, 2006). According to Lewandowski *et al.* (1986), serum globulin concentrations may be affected by egg production. Chickens show a variable change during egg production and Brown Pelicans show elevated serum albumin and globulins during egg production. Gayathri and Hegde (2006) reported that laying has considerable influence on plasma protein content of pigeons but soon after egg-laying, there was a considerable decrease in the levels of plasma proteins (Gayathri *et al.*, 2004). The mean value for protein concentrations obtained in this study were similar to those reported for free-ranging female western wild Turkeys (*Meleagris gallopavo silvestris*) during breeding season (Martin *et al.*, 1981) and to female breeder Turkeys (Mukherjee *et al.*, 1969).

Established reference values for serum biochemical parameters of domestic Turkeys are very limited (Bounous *et al.*, 2000) and the significance of many of these physiologic values remains to be determined, but the values to be expected in apparently healthy female Bronze Turkeys during breeding season may be useful for assessing disease conditions.

**Conclusion:** No statistical differences were found for albumin and GGT serum concentrations during breeding season. However, uric acid, AST, total protein and globulins blood concentrations showed significant differences during egg-laying in female Bronze Turkeys.

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