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Evaluation of Serum Biochemical Parameters in Juvenile Bronze Turkeys (*Meleagris gallopavo*)

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Abstract: The influence of age on serum biochemical parameters (AST, GGT, urea, uric acid, urea/uric acid ratio, total proteins, albumin, globulins and A/G ratio) was investigated in juvenile turkeys. Statistical comparisons were made for differences in values among different ages, from 76-148 day-old turkeys. Significant variations were observed in the analyses in relation to age of the birds for urea, AST and total proteins. This study also aimed to determine serum biochemical values for turkeys.

Key words: Turkeys, *Meleagris gallopavo*, serum biochemistry

INTRODUCTION

The Bronze turkey (*Meleagris gallopavo*, Linnaeus, 1758) is a breed of domestic turkey. They are the product of crossing domestic turkeys brought from Europe by colonists with the wild turkey, created in the 18th century. They are selected for breeding stock in many countries to produce high nutritive meat, feathers and for breeding flocks (Brant, 1998).

Serum biochemical analyses may be used to detect organ dysfunction and disease and reports of bird blood ranges rarely state age. Our objective was to determine the variation in blood chemistry values (total protein, albumin, globulins, albumin/globulin ratio, urea, uric acid, urea/uric acid ratio, Aspartate Aminotransferase (AST) and Gama Glutamyltransferase (GGT) arising from differences among ages in juvenile turkeys. An additional objective was to establish reference values for the species.

MATERIALS AND METHODS

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.

Blood samples were collected from the ulnar superficial vein of 70 Bronze Turkeys (26 turkeys of 76 days of age, 13 turkeys of 118 days of age, 20 turkeys of 133 days of age and 11 turkeys of 148 days of age). 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 ratio albumin/globulin was calculated and the ratio urea/uric acid was also calculated: urea (mmol/L) x 1000/uric acid (µmol/L) (Lumeij, 2000). The control of the chemical analysis was made using Qualitrol-N. 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 turkeys at different ages are shown in Tables 1, 2 and 3. There were no statistical differences in the serum biochemical values (albumin, globulins, A/G ratio, GGT, uric acid and urea/uric acid ratio) between ages. Bounous *et al.* (2000) reported similar results for albumin, uric acid and AST in juvenile wild turkeys and Scott *et al.* (1933) also reported similar results for uric acid concentrations in 7 month-old Bronze turkeys.

Significant differences in total serum protein values were found among different ages of juvenile turkeys (Table 1). In this study, total protein values for 76 day-old turkeys were lower than the values for 118, 133 and 148 day-old turkeys. These values, for 76 day-old turkeys, were also lower than values reported for 4 month-old wild juvenile

Table 1: Serum protein values in juvenile Bronze Turkeys (*Meleagris gallopavo*) (76, 118, 133 and 148 days old) (Mean±SD)

Age (days)	Total serum protein (g/dL)	Albumin (g/dL)	Albumin/Globulins (g/dL)	Globulin ratio
76	3.4±0.6 ^b	1.0±0.1	2.4±0.7	0.4±0.1
118	3.9±0.5 ^a	1.2±0.2	2.7±0.6	0.5±0.1
133	3.6±0.4 ^{ab}	1.2±0.7	2.5±0.4	0.5±0.1
148	4.0±0.7 ^a	1.2±0.3	2.9±0.8	0.5±0.1

Means followed by different letters in the same column are significantly different (p<0,05)

Table 2: Serum biochemical values (AST and GGT) for juvenile Bronze Turkeys (*Meleagris gallopavo*) (76, 118, 133 and 148 days old) (Mean±SD, min-max)

Age (days)	AST (U/L)	GGT (U/L)
76	371.9±77 ^a	5.3±5.1
118	409.3±128.8 ^a	7.0±7.2
133	272.3±73.5 ^{bc}	6.9±10.5
148	322.1±100.5 ^{ac}	6.1±7.0

Means followed by different letters in the same column are significantly different (p<0,05)

Table 3: Serum biochemical values (urea, uric acid and urea/uric acid) for juvenile Bronze Turkeys (*Meleagris gallopavo*) (76, 118, 133 and 148 days old) (Mean±SD, min-max)

Age (days)	Urea (mmol/L)	Uric Acid (µmol/L)	Urea/Uric Acid
76	1.1±0.3 ^a	304.5±171.3	4.4±2.7
118	1.0±0.1 ^a	400.1±297.5	3.6±1.7
133	0.9±0.2 ^{ab}	337.7±265.9	4.3±2.9
148	0.7±0.1 ^b	341.7±160.4	2.5±1.0

Means followed by different letters in the same column are significantly different (p<0,05)

turkeys (Bounous *et al.*, 2000). Although determination of total proteins seldom leads to a specific diagnosis, these findings demonstrates that age and stage of development strongly influences the concentration of total serum proteins in birds (Hochleithner, 1994; Schmidt *et al.*, 2007; Lumeij, 2008).

AST values were significantly different (Table 2) mainly for 133 day-old turkeys. Aspartate aminotransferase values are age-dependent to varying degrees among different species and the cause of this age-dependent increase activity has not been defined (Hochleithner, 1994). Moreover, fluctuations in serum levels of AST are difficult to interpret because of the wide distribution of this enzyme in avian tissue (Amand, 1986).

Although no statistical difference was observed for GGT values, the standard deviation results (Table 2) were sometimes higher than the mean values. This situation commonly occurs in birds because enzyme activity in normal birds typically falls below the sensitivity range of most analyzers (Hochleithner, 1994). Reference intervals have not been established for all bird species, thus GGT values of 0-10 U/L are considered "normal" (Harr, 2002).

There was evidence for age-related differences in urea concentrations (Table 3). Older turkeys (148 day-old) had lower values than 76, 118 and 133 day-old turkeys. Urea is considered to have limited diagnostic value in the detection of renal disease in birds compared to that of uric acid, but in this study there was no significant difference among uric acid values among different ages. Although according to Campbell (2004) the blood uric acid concentration is influenced by species, age, diet, juvenile birds tend to have lower blood uric acid values than adults. In a different way, it seems reasonable to speculate that age influences the concentration of urea in turkeys. The ratio of serum urea and uric acid can be used to differentiate prerenal and renal causes of azotemia (Lumeij, 2000). This ratio was calculated in this study because according to Lierz (2003) normal ratios must be established for each bird species and there is no previous report on urea/uric acid ratio available for turkeys.

Conclusion: Many of the evaluated parameters differed significantly (AST, urea and total serum protein) among ages. The effect of age should therefore be considered to avoid undesirable sources of variation and thus misjudgment for some blood parameters. The clinical chemistry results of Bronze juvenile turkeys obtained in this study can be considered as representative values for this species.

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