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Elizabeth VL Hmangaihzuai
Department of Veterinary
Anatomy, College of Veterinary
Science, AAU, Khanapara,
Guwahati, India

Kabita Sarma
Department of Veterinary
Anatomy, College of Veterinary
Science, AAU, Khanapara,
Guwahati, India

Jumi Dutta
Department of Veterinary
Biochemistry, College of
Veterinary Science, AAU,
Khanapara, Guwahati, India

Manmoth Talukdar
Department of Veterinary
Anatomy, College of Veterinary
Science, AAU, Khanapara,
Guwahati, India

Jiten Rajkhowa
Department of Veterinary
Anatomy, College of Veterinary
Science, AAU, Khanapara,
Guwahati, India

Arundhati Borah
Department of Veterinary
Physiology, College of
Veterinary Science, AAU,
Khanapara, Guwahati, India

Malsawmsangi
Department of Veterinary
Medicine, College of Veterinary
Science and Animal Husbandry,
CAU, Selesih, Mizoram, India

Corresponding Author:
Elizabeth VL Hmangaihzuai
Department of Veterinary
Anatomy, College of Veterinary
Science, AAU, Khanapara,
Guwahati, India

Estimation of the changes in serum enzyme and metabolites of male Pati duck (*Anas platyrhynchos*) during post natal development

Elizabeth VL Hmangaihzuai, Kabita Sarma, Jumi Dutta, Manmoth Talukdar, Jiten Rajkhowa, Arundhati Borah and Malsawmsangi

Abstract

The serum enzyme and metabolites from developing male Pati duck (*Anas platyrhynchos*) of Assam were analyzed using UV Spectrophotometry. A Total of 30 (thirty) numbers of apparently healthy *Pati* ducks (*Anas platyrhynchos*) were utilized for the study. The samples were collected at 1month, 6-8 weeks, 20 weeks, 30 weeks and 40 weeks, six (6) number of birds for each age group. ALP was the only serum enzyme which showed significant changes between age groups during the developmental stages. Serum metabolites *viz* total protein, albumin and creatinine showed significant changes among the different age group.

Keywords: Serum enzyme, metabolites, male Pati duck, *Anas platyrhynchos*

Introduction

Ducks are hardy bird requiring less care and management which makes it important for the upliftment of the socio-economic condition of the rural population of Assam (Sinha S. *et al.*, 2015) [20]. The marshy and waterlogged areas of the state provide a very congenial environment for rearing ducks. The 'Pati' duck population constitutes a major indigenous non-descript duck variety in the state of Assam (Deka A. *et al.*, 2014) [4]. The study of biochemical parameters of Pati duck is important to identify the baseline physiological parameters and how these vary with age during the post-natal development in male Pati duck.

Materials and Method

For biochemical parameter the serum samples of different age group were collected from jugular vein, in a vial with clot activator and kept in room temperature for 4 hours after which serum is separated using micropipette in a cryovial and stored at -20 °C. The serum samples were processed in biochemistry laboratory and biotechnology laboratory. The serum biochemistry values were estimated using UV spectrophotometry for Alkaline Phosphatase, Aspartate Transaminase, Alanine Transaminase, Lactate Dehydrogenase, Blood Urea Nitrogen, Creatinine, Total Protein and albumin.

The data were analysed using the Statistical Analyses System version 9.3 (SAS 2012) for Microsoft Windows.

Result and Discussion

The post-natal changes in the serum metabolites and enzymes were estimated on the serum of Pati duck of Assam collected at 1 month, 6-8 weeks, 20 weeks, 30 weeks and 40 weeks. The alkaline phosphatase, aspartate transaminase, alanine transaminase, total protein, albumin, creatinine, blood urea nitrogen and lactate dehydrogenase levels from 1 month to 40 weeks of male Pati duck of Assam were presented in Table 1.

Table 1: Average serum metabolites and enzymes of Pati duck during post-natal development

	AGE				
	1 Month	6-8 Week	20 Week	30 Week	40 Week
ALP (U/L)	326.49±19.83 ^{AB}	320.38±48.93 ^{AB}	230.54±23.95 ^{BC}	358.57±37.24 ^A	130.62±33.85 ^{BC}
AST (U/L)	14.97±6.31	20.8±6.8	35.02±11.33	16.21±3.12	18.85±4.58
ALT (U/L)	39.22±15.29	27.25±7.29	30.35±4.69	15.83±5.51	28.83±9.17
LDH (U/L)	302.71±73.95	196.24±52.14	209.83±76.25	153.66±44.23	218.54±63.48
Total Protein (g/dl)	4.65±0.033	5.27±0.76	5.69±0.86	6.73±0.93	4.24±0.18
Albumin (g/dl)	2.49±0.64 ^{AB}	2.76±0.64 ^{AB}	3.17±0.37 ^A	3.88±0.58 ^A	1.52±0.2 ^B
Creatinine (mg/dl)	6.14±2.58 ^A	0.81±0.25 ^B	1.48±0.59 ^B	0.90±0.20 ^B	2.62±1.95 ^{AB}
BUN (mg/dl)	99.59±24.89	126.00±26.63	86.47±19.05	87.83±33.19	55.91±16.12

** Means with the different superscript are significantly different.

Result

Serum enzymes

Serum Alkaline Phosphatase level of 1 month, 6-8 weeks and 30 weeks old were significantly higher than that of 20 and 40 weeks old male Pati duck. Maximum serum alkaline phosphatase level was observed at 30 weeks old which decrease thereafter and reach minimum level at 40 weeks. In male Pati duck serum Aspartate Transaminase did not vary significantly among the different age group. AST level increased with age from 1 month to 20 weeks of age, which declined at 30 weeks and 40 weeks of age. The level of alanine transaminase showed no significant difference between the age groups. The highest level of serum ALT was observed at 1 month age group where it decreased with increase in age till it reached minimum level at 30 weeks. There was no significant difference in serum lactate dehydrogenase during development in male Pati duck. The enzyme was highest at 1 month old and lowest at 30 weeks of age

Serum metabolites

Total protein level in male duck increased during development from 1 month till 30 weeks age with a drastic decrease at 40 weeks of age. The serum albumin level was significantly different ($p<0.05$) among the different age groups. Albumin level of 40 weeks was significantly lower from the other age group. 1 month and 6-8 weeks albumin level was also significantly different from 20 and 30 weeks. Serum creatinine levels were significant difference ($p<0.05$) among the different age groups. The serum creatinine of 1 month and 40 weeks was significantly higher than 6-8, 20 and 30 weeks age groups. Highest level of creatinine was observed in 1 month age group and minimum level at 30 weeks age group. The Blood Urea Nitrogen levels showed no significant difference ($p<0.05$) among the different age groups of male Pati duck. It was highest at 6-8 weeks age group, followed by 1 month age group. Minimum BUN level was observed at 40 weeks age group.

Discussion

The low level of serum Alkaline Phosphatase in male Pati duck at 20 weeks and 40 weeks may be due to decreased metabolism of liver as reported by Sinha *et al.* (2017)^[21]. The findings differed from observation by Sinha *et al.* (2017)^[21] in Pati duck where the serum ALP was in a decreasing trend from 2 weeks to 40 weeks. Similarly, Deka A. (2018)^[3] also observed a decreasing trend of ALP in Pati duck of Assam from 1 weeks old to 42 weeks old. The level of ALP observed in the study were comparatively higher than that of the findings reported by Deka A. (2018)^[3] when compared

between the same age groups. The ALT level at 40 weeks (130.62±33.85 U/L) recorded in the study was comparatively higher than the findings by Deka *et al.* (2017)^[5] in 42 weeks Pati duck (28.10±1.87 UL) and Chara-Chemabali duck (51.03±1.52 UL). Mahanta *et al.* (1994)^[13] observed the level of ALP in Pati duck to be 82.46±5.29 μ moles p-nitrophenol/min/liter. An ALP range of 51 – 202 U/L was observed by Franco *et al.* (2010)^[7] in Indian runner ducks with an average of 117±51.9 U/L which was lower than the findings observed. The difference in the findings observed in the study maybe due to difference in sex of birds used, as the study was conducted only in male Pati duck of Assam. The difference may also be due to difference in season of collection as Hochleithner *et al.* (1994)^[9] had reported the seasonal variation in ALP. The increased in ALP activity result from increased cellular synthesis. Juvenile birds have higher alkaline phosphatase activity in comparison to adult due to bone growth and development.

The serum Aspartate Transaminase value observed in male Pati duck was in the same range with the findings by Franco *et al.* (2010)^[7] in adult Indian Runner duck and El-katch *et al.* (2017)^[6] in growing Pekin duckling. However the value observed was in conflict with the findings of Sinha *et al.* (2017)^[21] where the AST level increased from 2 weeks till 40 weeks of age in Pati duck. The levels of AST observed in the study were very low in comparison to the findings by Sinha *et al.*, (2017)^[21] in Pati duck of Assam; Franco *et al.* (2010)^[7] in American Flamingoes; Mulley (1979)^[15] in black duck; Bowes *et al.* (1988)^[2] in 1 month old Broiler and White Leghorn; and Mostagni *et al.* (2005)^[14] in Flamingo and Black headed gull. The increase in AST value from 1 month to 20 weeks may due increased in body weight with age as Satish (2013)^[19] reported an increase in AST enzyme activity with body weight.

The level of Alanine Transaminase in male Pati duck was in the same range to the findings by Franco *et al.*, (2010)^[7] in Indian Runner duck and American Flamingoes; by Mulley (1979)^[15] in male black duck; and by El-katcha *et al.*, (2017)^[6] in growing Pekin duckling. However the finding was in contrast to the findings by Sinha *et al.* (2017)^[21] in Pati duck of Assam where ALT levels were observed to increase from 2 weeks to 40 weeks. The finding in Pati duck was higher than the findings by Mostagni *et al.*, (2005)^[14] in Flamingo and Black headed gull. ALT levels tends to below the level of detection for an analyzer in some avian species Hochleithner *et al.*, (1994)^[9] which maybe the reason for the low ALT level observed in Pati duck of Assam.

Serum Lactate Dehydrogenase was similar with the findings by Mulley (1979)^[15] in Black duck male. The observation was also similar to Bell (1971)^[1] in domestic fowl where

higher level of LDH was observed in young birds. However the finding in 1 month old was much lower than the findings by Bowes *et al.* (1988)^[2] in 1 month old broiler and white leghorn. Skeletal and cardiac muscle can be significant sources of LDH in serum (Bowes *et al.* 1988)^[2] where an increased skeletal and cardiac workload in younger birds may result in higher level of LDH.

The total protein level in male Pati duck was similar to the findings of Sinha *et al.* (2017)^[21] in *Pati* duck where total protein levels increased from 2 weeks till 40 weeks. It was also similar to the findings by Mulley (1979)^[15] in male Black duck and El-katcha *et al.* (2017)^[6] in growing Pekin duckling. However, the total protein observed in 1 month age group *Pati* duck was lower than the findings by Rezende *et al.* (2017)^[18] in male broiler of 1 month old; by Bowes *et al.* (1989)^[2] in 1 month old broiler and white leghorn. The total protein observed in adult *Pati* duck was also much lower than the findings of Mostaghni *et al.* (2005)^[14] in adult Flamingo and Black-headed gull. The lower total protein in male than female was attributable to higher albumin level in female (Rezende *et al.*, 2017)^[18]. According to Bell (1971)^[1], total serum protein is influenced by breed, age, physiological state, environment and antigen exposure and levels can be extremely variable. The total protein observed in *Pati* duck of Assam was within or close to the normal total protein level in bird *i.e.* 3-5 g/dl (Gee *et al.* 1981; Lewandowski *et al.*, 1986; Palomeque *et al.*, 1991 and Mostagni *et al.*, 2005).^[8, 11, 17, 14]

Serum albumin level were slightly lower than the observations by El-katcha *et al.*, (2017)^[6] in growing duckling. However the albumin level observed in the study were much lower than the findings by Olayemi *et al.*, (2006)^[16] in adult Nigerian duck and Nigerian laughing; by Rezende *et al.* (2017)^[18] in broiler of 1 month old male and female; Jerabek *et al.* (2018)^[10] in Hybrid mallard duck; Bowes *et al.* (1988)^[2] in 1 month old Broiler and white Leghorn; and Mostagni *et al.* (2005)^[14] in Flamingo and Black-headed gull. According to Bowes *et al.* (1988)^[2] serum albumin increased when protein intake exceeds the amount required for growth and maintenance

The Creatinine level observed was similar to the finding by El-katcha *et al.* (2017)^[6] in growing Pekin duckling. The finding was in contrast to the findings by Sinha *et al.* (2017)^[21] in *Pati* duck of Assam where minimum level was observed in 2 weeks and maximum level at 40 weeks. This might be due to the fact that creatinine is mainly produced by the metabolism of creatine or creatine phosphate in skeletal muscle (Sinha *et al.*, 2017)^[21]. The creatinine level observed in the study was much lesser than the findings by Bowes *et al.* (1988)^[2] in 1 month old broiler and white leghorn. Creatine dehydrating mechanism were absent in fowl (Bowes *et al.*, 1988)^[2] which can be the reason for the low level of creatinine observed in *Pati* duck of Assam.

Blood Urea Nitrogen in 40 weeks *Pati* duck was in similar range with the findings by El-katcha *et al.* (2017)^[6] in growing Pekin duckling. However the observation was in conflict with the findings by Franco *et al.* (2010)^[7] in flamingos and Indian runner ducks where serum BUN were <2 mg/dL. Urea levels can be highly increased in dehydration in birds (Hochleithner, 1994)^[9] and were reported to be useful in diagnosing renal failure in pigeons (Lumeij, 1997)^[12] which help in the diagnosis of many diseases.

Conclusion

It can be concluded that the observations in the present study

establish a major role in recording blood biochemistry with advancement of age in *Pati* ducks of Assam. It will furthermore, help the researchers for further study and also in diagnosis of certain disease condition.

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