

A Comparison of Different Biochemical Parameters in Blood Serum of Healthy and Breast Blister Chickens

¹Jianzhou Shi, ²Yadong Tian, ¹Jianhua Wang and ²Xiangtao Kang

¹College of Veterinary Medicine, Northwest A&F University,
712100 Yangling, Shaanxi Province, P.R. China

²College of Animal Husbandry and Veterinary Science, Henan Agricultural University,
450002 Zhengzhou, Henan Province, P.R. China

Abstract: Breast blisters of poultry are usually more of a management problem than an infectious disease problem. The serum biochemical parameters of 90 breast blister chickens and 98 healthy chickens were tested. The determination of 17 kinds serum biochemical parameters including alkaline phosphatase, glucose, high-density lipoprotein, γ -glutamyl transpeptidase, amylase, total protein, glutamic-pyruvic transaminase, creatinine, cholinesterase, lactic dehydrogenase, triglyceride, glutamic-oxalacetic transaminase and so on. Results showed that serum Triglyceride (TG) and Cholinesterase (CHE) were statistically significantly difference between the healthy chickens and the chickens with breast blister ($p < 0.01$). The serum Triglyceride (TG) and Cholinesterase (CHE) content were significantly higher in the chickens with breast blister than the healthy chickens.

Key words: Breast blister (keel cyst), serum biochemical parameters, healthy chickens, infectious disease, chicken, serum

INTRODUCTION

Breast blisters (keel cysts) are an important factor affecting the carcass grade of broilers and economic impact. Breast blisters of poultry are usually more of a management problem than an infectious disease problem. The condition is not fatal but morbidity may reach >50% (McMullin, 2004). Broiler carcasses are often trimmed during evisceration to remove damaged areas of the carcass. The down-grading of meat quality not only slows down the production rate but also reduces the economic benefits at a large industrial production plant. In chickens, many factors suffering from breast blister such as heredity age, body weight, sex, size of rearing site and various feeding conditions (Zhao *et al.*, 2009; Furong *et al.*, 2006; Huang *et al.*, 2006; Herenda and Franco, 1966; Oikawa *et al.*, 1993; Cynthia and Lin, 2010; Castaneda *et al.*, 2005; Nielsen, 2004).

State of health is associated with a range of metabolic changes that manifest as a particular level of blood biochemical parameters. Serum biochemical parameters are important indicators of some diseases (Liu *et al.*, 1992).

MATERIALS AND METHODS

Chickens: The chickens from the Henan Innovative Engineering Research Center of Poultry Germplasm

Resources were used in this study. The serum biochemical parameters of 90 breast blister chickens and 98 healthy chickens were tested. The chickens were the F2 Gushi chicken and Ankao broilers. All Chickens were managed in cage according to standard practices.

Determination of serum biochemical parameters: At the age of 84 days, 90 breast blister chickens and 98 healthy chickens were dissected for blood from the jugular vein. Blood was collected from the tested chickens and put at room temperature for 30 min, the serum was taken out by transferpettor and then centrifuged at $13,000 \times g$ for 10 min. The biochemical parameters were determined with Hitachi 7600-020 automatic biochemical analyzer.

The analytic method of serum biochemical parameters: Glutamic-pyruvic transaminase (continuous monitoring assay) total protein (dual shrinkage of urine), glutamic-oxalacetic transaminase (continuous monitoring assay), γ -glutamyl transpeptidase (continuous monitoring assay), lactic dehydrogenase (continuous monitoring assay), alkaline phosphatase (continuous monitoring assay), cholinesterase (continuous monitoring assay), amylase (continuous monitoring assay), cholesterol (total cholesterol oxidase method), high-density lipoprotein (cholesterol oxidase method), low-density lipoprotein (cholesterol oxidase method) creatine phosphokinase

(enzyme coupling method), glucose (glucose oxidase method) albumin (bromine cresol green method), globulin (totalprotein-albumin), triglyceride (glycerin phosphokinase method), creatinine (creatinine enzyme available method).

Statistical analysis: All statistical analysis were performed using the Statistical Analysis Systems Institute (SAS 6.0) (SAS, 1999). The datas of serum biochemical parameters were analyzed using the ANOVA procedures. Duncan's multiple range test was used to compare treatment means. Experimental data were expressed as the mean±standard errors. Differences were considered statistically significant at $p<0.01$.

RESULTS AND DISCUSSION

The changes of blood serum protein sugar and lipid with breast blister is shown in Table 1. There was an increase in serum triglyceride, cholesterol, high and low density lipoprotein level in the blood serum of chickens with breast blister in comparison with healthy chickens. The content of serum triglyceride increase significantly compared with breast blister chickens and there are significant differences ($p<0.01$), the changes of other serum biochemical parameters are not significantly different ($p<0.01$). On the contrary, there was a fall in total-protein, globulin, albumin and creatinine level in the blood serum of chickens with breast blister in comparison with healthy chickens.

The changes of blood serum enzyme with breast blister is shown in Table 2. Serum cholinesterase contents increase significantly compared with breast blister chickens and there are significant differences ($p<0.01$), the changes of other serum biochemical parameters are not significantly different ($p<0.01$). As well, there was an increase in glutamic-pyruvic transaminase, γ -glutamyl transpeptidase, creatine phosphokinase and lactic dehydrogenase level in the blood serum of chickens with breast blister in comparison with healthy chickens. In addition, there was a fall in glutamic-oxalacetic transaminase, alkaline phosphatase and amylase level in the blood serum of chickens with breast blister in comparison with healthy chickens.

It was reported that the occurrence of various diseases is related to blood metabolites including creatinine, total cholesterol, cholinesterase, triglyceride, glucose and so on in organisms (Rosenblat *et al.*, 2008; Zelko *et al.*, 2002). The body's metabolism lead to breast blister or a variety of enzyme synergy effect these will be further analyzed.

Table 1: A comparison of blood serum protein, sugar and lipid of healthy and breast blister chickens

Related characters	TP (g L ⁻¹)	GLO (g L ⁻¹)	ALB (g L ⁻¹)	CREA (μmol L ⁻¹)
Healthy chickens	43.61±0.42	26.79±0.33	16.84±0.12	6.32±0.79
Breast blister chickens	42.79±1.23	26.49±0.97	16.58±0.33	4.30±2.73

Related characters	GLU (mmol L ⁻¹)	CHO (mmol L ⁻¹)	TG (mmol L ⁻¹)	HDL (mmol L ⁻¹)	LDL (mmol L ⁻¹)
Healthy chickens	8.86±0.14	3.15±0.03	0.41±0.004	1.98±0.02	1.02±0.02
Breast blister chickens	8.85±0.41	3.20±0.08	0.44±0.01 ^{***}	2.01±0.05	1.04±0.05

Each value represent mean±SE. ^{***}There are extremely significantly different. The level of significance used in all studies was $p<0.01$. Total Protein (TP), Globulin (GLO), Albumin (ALB), Creatinine (CREA), Glucose (GLU), Cholesterol (CHO), Triglyceride (TG), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL)

Table 2: A comparison of blood serum enzyme of healthy and breast blister chickens

Related characters	AST (U L ⁻¹)	ALT (U L ⁻¹)	γ -GGT (U L ⁻¹)	AKP (U L ⁻¹)
Healthy chickens	88.52±2.98	2.22±0.07	15.55±0.23	780.36±25.99
Breast blister chickens	84.79±8.66	2.30±0.20	15.64±0.65	773.38±75.33

Related characters	CHE (KU L ⁻¹)	CK (IU L ⁻¹)	LDH (U L ⁻¹)	AMY (U L ⁻¹)
Healthy chickens	1.89±0.02	7219.51±78.20	2787.60±20.05	458.69±11.63
Breast blister chickens	2.04±0.06 ^{***}	7395.88±226.12	2799.68±58.06	419.78±33.63

Each value represent mean±SE. ^{***}There are extremely significantly different. The level of significance used in all studies was $p<0.01$ glutamic-oxalacetic Transaminase (AST), glutamic-pyruvic transaminase (ALT), γ -Glutamyl transpeptidase (γ -GGT), Alkaline-Phosphatase (AKP), Cholinesterase (CHE), Creatine phosphokinase (CK), Lactic Dehydrogenase (LDH), Amylase (AMY)

CONCLUSION

In this study, researchers first determine of 17 kinds serum biochemical parameters in blood serum of healthy and breast blister chickens. The occurrence of breast blister chickens was associated with the metabolism of sugar lipid and protein. This study lays a foundation for further study on the mechanism of suffering breast blisters of chickens.

ACKNOWLEDGEMENTS

Researchers would like to express their sincere gratitude and appreciation to Northwest A&F University and Henan Innovative Engineering Research Center of Poultry Germplasm Resources for this research supports. These two researchers were equally contributed to this research.

REFERENCES

Castaneda, M.P., E.M. Hirschler and A.R. Sams, 2005. Early postmortem carcass trim effects on the tenderness of broiler breast fillets. *Poult. Sci.*, 84: 951-954.

- Cynthia, M. Kahn and S. Line, 2010. Breast Blisters. The Merck Veterinary Manual. 10th Edn., MERCK.NJ, USA.
- Furong, Z., L. Baoming, S. Zhengxiang, G. Ailian and Z. Yajun, 2006. Mechanism and factors of breast blister of the caged broilers. *China Poultry*, 28: 57-60.
- Herenda, D.C. and D.A. Franco, 1966. Breast Cyst (Breast Blister, Keel Cyst). In: *Poultry Diseases and Meat Hygiene: A Color Atlas*, Herenda, D.C. and D.A. Franco (Eds.). Wiley-Blackwell, New York, USA., ISBN-13: 9780813824635, pp: 166.
- Huang, Y.Q., W. Chen, X.T. Kang, G.R. Sun and R.X. Han *et al.*, 2006. Correlation analysis of breast blister's incidence on F₂ generation population crossed by Gushi and Ankao under cage raising. *J. Northwest Sci-Tech Univ. Agric. For.*, 34: 63-65.
- Liu, K.Z., T.E. Cuddy and G.N. Pierce, 1992. Oxidative status of lipoproteins in coronary disease patients. *Am.Heart J.*, 123: 285-290.
- McMullin, P., 2004. Breast Blister. *Poultry Health and Disease*, New York, USA.
- Nielsen, B.L., 2004. Breast blisters in groups of slow-growing broilers in relation to strain and the availability and use of perches. *Br. Poult. Sci.*, 45: 306-315.
- Oikawa, S., S. Tanaka and Y. Seimiya, 1993. Factors affecting the incidence of a breast blister in broilers and countermeasures towards the disease. *J. Jpn. Soc. Poult. Dis.*, 29: 40-45.
- Rosenblat, M., N.Volkova, R. Coleman, Y. Almagor and M. Aviram, 2008. Antiatherogenicity of extra virgin olive oil and its enrichment with green tea polyphenols in the atherosclerotic apolipoprotein-E-deficient mice: Enhanced macrophage cholesterol efflux. *J. Nutr. Biochem.*, 19: 514-523.
- SAS, 1999. *Statistical Analysis System Institute*, incorporation. SAS, Cary, USA.
- Zelko, I.N., T.J. Mariani and R.J. Folz, 2002. Superoxide dismutase multigene family: A comparison of the CuZn-SOD (SOD1), Mn-SOD (SOD2), and EC-SOD (SOD3) gene structures, evolution and expression. *Free Radic. Biol. Med.*, 33: 337-349.
- Zhao, F.R., A.L. Geng, B.M. Li, Z.X. Shi and Y.J. Zhao, 2009. Effects of environmental factors on breast blister incidence, growth performance and some biochemical indexes in broilers. *J. Applied Poultry Res.*, 18: 699-706.