



**International Journal of Biology, Pharmacy  
and Allied Sciences (IJBPAS)**

*'A Bridge Between Laboratory and Reader'*

[www.ijbpas.com](http://www.ijbpas.com)

---

**INVESTIGATION OF PRODUCTION PERFORMANCE AND MEASUREMENT OF  
SOME SERUM BIOCHEMICAL PARAMETERS IN BROILER BREEDER FARM  
WITH GOUT SYNDROME**

**MEYSAM BEHTARI<sup>1</sup> AND ADEL FEIZI<sup>2\*</sup>**

**1:** Department of Veterinary Medicine, Tabriz Branch, Islamic Azad University, Tabriz, Iran

**2:** Department of Clinical Science, Collage of Veterinary Medicine, Tabriz Branch, Islamic Azad University, Tabriz, Iran

**\*Corresponding Author's E Mail: [A\\_Feizi@iaut.ac.ir](mailto:A_Feizi@iaut.ac.ir)**

**ABSTRACT**

Gout is a common metabolic disorder that results in abnormal accumulation of urates in domestic birds. The aim of present study was to Assessment of clinical and necropsy manifestation, losses and some biochemical factors in broiler breeder with gout syndrome. In present study, a broiler breeder farms to gout syndrome were selected. The losses rate by focus on necropsy signs were recorded, also, blood sampling to determination of biochemical factors such as Uric acid, Creatinine, total protein, calcium, phosphorus and sodium and potassium was done. Also, the percentage of egg production during a period of 25 to 64 weeks in both farms were recorded and compared. Blood samples were obtained from wing vein separation of their serum by centrifuging in 3000 rpm for 15 min, then the samples freezed in -19°C. Data examined and analyzed by SPSS statistical software, version 17 with T-test in significant level of  $\alpha= 0.05$  and confidence level of 95%. Data showed that there is a significant differences between measured parameters in two farms  $P<0.001$ . Our data showed that there was significant increase in serum values of creatinine, total protein, uric acid, phosphorous and potassium and significant decrease in serum values of calcium and sodium ( $P=0.001$ ). Also, Data showed that there is no significant reduction in production rate in chickens affected by gout ( $p=0.569$ ). Also, there is significant

---

difference in losses rate in our study in compared with standard level which is 7.5 fold greater than standard level ( $p=0.000$ ).

**Keywords: Clinical and Necropsy Manifestation, Losses, Biochemical Factors, Broiler Breeder, Gout Syndrome**

## INTRODUCTION

Gout is a common metabolic disorder that results in abnormal accumulation of urates in domestic birds (**Damodaran et al., 1978**). It occurs as two distinct forms, namely visceral and articular gout. Visceral gout has been reported in various caged and aviary birds from different parts of the world. It is among the most commonly diagnosed causes of mortality in poultry (**Brown, 1996; Riddell, 1997**). Typical clinicopathology of visceral gout is hyperuricaemia. Early attempts to determine the cause of visceral gout were focused on conditions in the layer house. However, field reports have made it apparent that immature birds also experience outbreaks of visceral gout. Many factors, such as exposure of birds to nephrotrophic strains of infectious bronchitis virus, influenza virus, cryptosporidium, high crude protein diets, diets containing oospore, vitamin A deficiency, water deprivation or metabolic alkalosis induced by elevated dietary sodium plus potassium over chloride ratios have been reported to be associated with visceral gout (**Siller, 1981; Chong and Apostolv, 1982; Slomens et al., 1990; Trampel et al., 2000;**

**Hocking, 1989; Hocking and Bernard, 1997; Pegram and Wyatt, 1981; Sharma and Kaushid, 1986; Mubarak and Sharkawy, 1999**).

Visceral gout in birds is an economically important disease in China. Case histories of affected bird flock often, but not always, showed that excessive calcium and protein had been fed and that visceral gout could be induced by feeding growers on a commercial layer ration containing 36 to 38 g Ca/kg compared with the normal range of 8 to 10 g Ca/kg). An experiment in adult feed-restricted broiler breeder males showed that plasma uric acid concentration increased linearly above 106 g crude protein (CP)/kg and gout was observed in birds fed on 400 g CP/kg (**Hocking, 1989**). The concentrations of CP in grower diets are in the range 160 to 180 g CP/kg, according to **National Research Council (1998)** recommendations. To date, little experimental research has been conducted on the relationship between the disease and independent and combined dietary calcium and protein concentrations and previous investigations of gout have little

clinicopathological evaluation. The aim of present study was to Assessment of clinical and necropsy manifestation, losses and some biochemical factors in broiler breeder with gout syndrome.

## MATERIALS AND METHODS

In present study, an affected broiler breeder farms to gout syndrome with 30000 birds were selected. The losses rate by focus on necropsy signs were recorded, also, blood sampling to determination of biochemical factors such as Uric acid, Creatinine, albumin, total protein, calcium, phosphorus and sodium and potassium was done. Also, the percentage of egg production during a period of 25 to 64 weeks in both farms were recorded and compared. Blood samples were obtained from wing vein separation of their serum by centrifuging in 3000 rpm for 15 min, then the samples freezed in  $-19^{\circ}\text{C}$ . the relevant experiments then conducted for evaluating of uric acid, urea, total Protein, Albumin, creatinine, Calcium, Phosphorus, Magnesium, Alkaline phosphatase; Ziestchem co.(Iran) kits were used in all cases. Darman Kave co.(Iran) kits were used in order to evaluating the rate of serum calcium and creatinine. The Spectrophotometer model Biowave made by U.k was utilized for all samples. Consequently, raw data examined and analyzed by SPSS statistical software, version

17 with T-test in significant level of  $\alpha= 0.05$  and confidence level of 95%.

## RESULTS

Data related to measurement of blood parameters with losses and product rates are given in **Table 1**. The serum value of creatinine was varied between  $0.42\pm 0.06$  to  $0.27\pm 0.01$  with average of  $0.33\pm 0.01$ . Data showed that there is significant increase in creatinine serum value in affected chicks in production period in compared rearing period. The serum value of protein was varied between  $5.78\pm 0.09$  to  $4.97\pm 0.16$  with average of  $5.55\pm 0.06$ . Data showed that there is significant increase in protein serum value in affected chicks in production period in compared rearing period. The serum value of uric acid was varied between  $3.11\pm 0.40$  to  $2.45\pm 0.11$  with average of  $2.73\pm 0.11$ . Data showed that there is significant increase in uric acid value in affected chicks in production period in compared rearing period. The serum value of calcium was varied between  $12.15\pm 0.55$  to  $9.74\pm 0.26$  with average of  $11.11\pm 0.16$ . Data showed that there is significant decrease in calcium serum value in affected chicks in production period in compared rearing period. The serum value of phosphorous was varied between  $2.91\pm 0.07$  to  $2.59\pm 0.03$  with average of  $2.79\pm 0.02$ . Data showed that there is

significant increase in phosphorous value in affected chicks in production period in compared rearing period. The serum value of sodium was varied between  $153.00 \pm 1.04$  to  $145.84 \pm 1.53$  with average of  $148.61 \pm 0.56$ . Data showed that there is significant decrease in sodium value in affected chicks in production period in compared rearing period. The serum value of potassium was varied between  $5.14 \pm 0.29$  to  $4.40 \pm 0.22$  with average of  $4.89 \pm 0.10$ . Data showed that there is significant increase in potassium value in

affected chicks in production period in compared rearing period. Data showed that there is no significant reduction in production rate in chickens affected by gout ( $p=0.569$ ). Also, there is significant difference in losses rate in our study in compared with standard level which is 7.5 fold greater than standard level ( $p=0.000$ ).

After necropsy and approving of gout syndrome we aimed to capture images from losses to clarify the clinical signs. Some of these images are given bellow **Figure 1-4**.

**Table 1: statistical analysis of data obtained from two farms**

Parameter measured	Group	Mean $\pm$ SE	P-value
Creatinine (mg/dl)	Rearing period	$0.33 \pm 0.01$	0.001
	Production period	$0.41 \pm 0.01$	
Total protein (g/dl)	Rearing period	$5.55 \pm 0.06$	0.001
	Production period	$5.71 \pm 0.12$	
Uric acid (mg/dl)	Rearing period	$2.73 \pm 0.11$	0.001
	Production period	$9.24 \pm 0.42$	
Calcium (mg/dl)	Rearing period	$11.11 \pm 0.16$	0.001
	Production period	$9.83 \pm 0.30$	
Phosphorus (mg/dl)	Rearing period	$2.79 \pm 0.02$	0.001
	Production period	$3.13 \pm 0.17$	
Sodium (mEq/l)	Rearing period	$148.61 \pm 0.56$	0.001
	Production period	$143.68 \pm 1.52$	
Potassium (mEq/l)	Rearing period	$4.89 \pm 0.10$	0.001
	Production period	$5.05 \pm 0.08$	
Product rate (%)	Rearing period	$66.80 \pm 2.15$	0.569
	Production period	$64.89 \pm 2.55$	
Losses rate (%)	Standard	8	0.001
	Production period	$15.53 \pm 0.37$	



**Figure 1: Urate deposition on the surface of the liver in broiler breeder farm with Gout Syndrome**



**Figure 2: Urate deposition on the surface of the kidneys in broiler breeder farm with Gout Syndrome**



**Figure 3:** Urate deposition on the surface of the kidneys, Inflammation and the modification of kidneys in broiler breeder farm with Gout Syndrome



**Figure 4:** Urate deposition on the surface of the heart in broiler breeder farm with Gout Syndrome

## DISCUSSION AND CONCLUSION

Like any other living creatures, in birds the kidneys health is necessary for fulfilling physiologic tasks of the body. Any factor, which causes kidney's damage, leads to differences in kidneys' physiologic tasks and eventually causes some disorders in total physiology of the body. One the most

important factors, is gout syndrome (Suryashe and Deshmukh, 1997).

What is important about incidence of gout syndrome is the percentage of dietary calcium, which its standard rate for broiler chicks is 1% (Leeson and Summers, 2008).

In the current study, complications resulted of double rate of calcium in broiler chicks' dietary was investigated.

Kidneys' Uric acid clearance is used as an important index in functional evaluations of kidneys. Therefore, the rate of Uric acid in blood sample is one of the indices for health of kidney. **Kimuara et al., 1991** reported the normal rate of uric acid 5.8 mg/dl which confirms our findings in non-affected group. Hence, in control group which were fed with standard rate of dietary calcium (1%), uric acid rate of blood sample varied between 4-8 mg/dl.

**Patel et al., 2007** fed the broilers with 1.7% calcium dietary; they observed also triple of normal rate in uric acid on day 15 and the plaster colored urates deposition in viscera. Their findings conform to our findings except the mortality that began in our study on day 35.

**Ansar et al., 2004** in a study fed the broiler chicks with high calcium (2% & 3%) and phosphorous (0.5%) dietary. The chicks fed by high calcium dietary revealed increase of serum calcium concentration, decrease of serum phosphorous concentration, increase of FCR and ureter dilation caused by urates accumulation. Their findings conform to our findings.

The rate of serum calcium in most of birds is 8-18 mg/dl (Chandra et al., 1984) and in our study, this rate in control group was maximum  $8.70 \pm 0.12$  mg/dl and maximum  $10.09 \pm 0.25$  mg/dl in affected group that is significant, statistically ( $P < 0.001$ ). The increase of serum calcium in treatment group is related to increase in dietary calcium. The increase of serum calcium and its decrease in our study confirms the findings of **Ansar et al., 2004; Ismail, 1989; wideman et al., 1989**.

Normal rate of serum phosphorous is 2 – 4/5 mg/dl (**Kimuara et al., 1991**). In our study also the rate of serum phosphorous in control group was  $3.88 \pm 0.02$  mg/dl on 42nd day and in affected group was  $3.58 \pm 0.04$  mg/dl on 42nd day that the decrease of phosphorous is significant statistically.

**Ansar et al., 2004; Chang and Fun, 1992 and Ogura, 1981** observed the decrease of serum phosphorus with increasing of dietary calcium in broilers that conforms to our findings.

In present study, serum creatinine in affected group was  $1.06 \pm 0.02$  mg/dl; however, its rate in control group was  $0.41 \pm 0.01$  mg/dl. This increase is significant in affected group, statistically ( $P < 0.001$ ).

The increase of creatinine level in treatment group because of the increase in dietary

---

calcium conforms to **Ansar *et al.*, 2004 and Wideman, 1987 and Wideman *et al.*, 1989.**

In our study there was no significant difference about serum magnesium concentration between two groups ( $P < 0.05$ ) that conforms to findings of 0.3.

**Chadra *et al.*, 1984.** The rate of alkaline phosphatase has been increased in treatment group significantly in the current study ( $P < 0.05$ ). About the relationship between renal insufficiency and the rate of alkaline phosphatase in birds, any data was not obtained from other researchers.

The increase of serum urea in treatment group compared with control group was significant statistically ( $P < 0.05$ ) however, there is no report herein from other researcher.

The normal rate of total protein in poultry blood samples has been reported 3-5 g/dl (**Dein, 1986**). In our study the increase of total protein and albumin in treatment group compared with control group was observed that was significant statistically ( $P < 0.001$ ) and conforms to the findings of **Beckman *et al.*, 1995.**

In our study, the FCR was 2 in control and 2.15 in treatment group which shows the increase of feeding in treatment group; these results conforms to findings of **Ansar *et al.*, 2004.**

The rate of mortality resulting from gout syndrome in treatment group was 2% more than control group; its rate calculated from 35th to 42nd days. The rate of lameness and paralytic disability was 1% and 4.5% in control and treatment group, respectively; however, there has been no report from other researchers.

We began to necropsy by starting of clinical signs on 35th day and observed urates depositions around heart and necrosis in renal tissue, which conforms to findings of **Randall, 1991 and Siller 1981.**

The results of this study showed that 2% calcium in broilers' dietary increase the rate of serum uric acid, urea, total Protein, Albumin, Creatinine, Calcium, Alkaline phosphatase that have significant difference compared with control group. The rate of phosphorous also in treatment group decreased significantly compared with control group. There was no significant difference between two groups about the rate of magnesium.

Then, it can concluded that the physiologic process of kidneys encountered some disorders and consequently resulted in urates depositions on serous surfaces of viscera especially kidneys which are the symptoms of gout syndrome that makes vast mortality in herd. This phenomenon is very important economically so much attention must give in

setting the broilers' dietary especially the rate of dietary calcium for preventing of gout syndrome incidence and its consequences.

## REFERENCES

- [1] Ansar, M., Khan, S.A., Chaudhary, Z.I Mina.(2004): Effect Of High Dietary Calcium And Low Phosphorus On Urinary System Of Broiler Chicks, Pakistan Vet. J., 24(3), Pp: 113-116.
- [2] Beckman, B.,(1995): Avian Urolithiasis( Renal Or Visceral Gout ) Zootechnica International, 18, Pp: 42-45.
- [3] Brown, T.P. (1996) Urinary System. In: Riddell, C. (Ed.), Avian Histopathology, Second. American Association Of Avian Pathologists, Pp. 167-181.
- [4] Chandra, M.Singh, G. Soni, S. Ahujm, P. (1984): Renal And Biochemical Changes In Broiler Produced By High-Calcium, Urea Containing, And Vitamin A Deficient Diets. Avian Dis. 28, Pp: 1-11.
- [5] Chang, J.K. Fun, G.X. (1992): The Pathology Of Chicken Gout Induced By High Dietary Calcium And Low Dietary Phosphorus, Acta-Veterinaria, Zootechnica Sinica, 23(1), Pp: 80-86.
- [6] Chong, K.T. & Apostolv. (1982) The Pathogenesis Of Nephritis In Chickens Induced By Infectious Bronchitis Virus. Journal Of Comparative Pathology 92:199-211.
- [7] Damodarn. S., Viswanathau, S., Mohalingam. P. (1978) Gout In Cage And Aviary Birds. Indian Veterinary Journal 55: 193-194.
- [8] Dein, F.J.(1986): Clinical Avian Medicine And Surgery. 1sted. W.B. Saunders Co. Philadelphia. Pp: 174-191.
- [9] Hocking, P.M. (1989) Effect Of Dietary Crude Protein Concentration On Semen Yield And Quality In Male Broiler Fowls. British Poultry Science,30:935-945
- [10] Hocking, P.M., & Bernard, R. (1997) Effect Of Dietary Crude Protein Content On The Prevalence Of Articular Gout In Different Lines Of Broiler Males. British Poultry Science, 38 S21-S23.
- [11] Ismail, M.(1989): A Study Of Pathology Of Higher Dietary Levels Of Calcium In Broiler Chicks Mscthesis. Dept. Pathology. College Of Veterinary Sciences. Lahare.
- [12] Kimuara, T. Odawara, Y. Iid, K. (1991): Determination Of Blood Constituents In Chickens Using A Dry

- Chemistry Analyzer. J.Jap. Vet. Med. Asso. 44, Pp: 796-801.
- [13] Leeson, S. Summers, J.D.(2008): Commercial Poultry Nutrition, 3th Edi, Gulf Ontario, Canada, Pp: 156-158.
- [14] Mubarak, M. & Sharkawy, A.A. (1999) Toxopathology Of Gout Induced In Laying Pullets By Sodium Bicarbonate Toxicity. Environmental Toxicology And Pharmacology, 7: 227-236.
- [15] Nutrient Research Council. National Of Academy Press. Washington D.C. 1998.
- [16] Ougra, Y. (1981): Leg Abnormality Associated With Dietary Excessive Calcium Carbonate In Broiler Chicks. National Institute Of Animal Health Quarterly. Japan, 21(3), Pp: 141-147.
- [17] Patel, A. Godasara, D. Dave, C. Jani, P. (2007): Experimetnal Studies On Etiopathology Of Visceral Gout In Broiler Chicks. Indian Journal Of Veterinary Pathology, Vol: 31, Pp: 4746-4758.
- [18] Pegram, R.A. & Wyatt, R.D. (1981) Avian Gout Caused By Oosporem, A Mycotoxin Produced By Caetomium Trilaterate. Poultry Science, 60:2429-2440.
- [19] Randall, J. (1991): A Colour Atlas Diseases And Disorders Of The Domestic Fowl And Turkey. Wolf Publishing Ltd, Pp: 142-150.
- [20] Riddell, C. (1987) Urinary System. In: Avian Histopathology American Association Of Avian Pathologists Of Pennsylvania. New Bolton Center, 67-73.
- [21] Sharma, N. K & Kaushid. R. K. (1986) Surveilance Of Diseases In Poultry In Haryana State. Indian Journal Of Animal Sciences, 56: 660-662.
- [22] Siller, W.G. (1981) Renal Pathology of the Fowl-A Review. Avian Pathology, 10: 188-261.
- [23] Slomens, R.D., Locke, L.N., Sheerar, M.G., Duncan, R.M., Hinshaw, V.S. & Easterday, B.C. (1990) Kidney Lesions Associated With Mortality in Chickens Inoculated With Waterfowl Influenza Viruses. Avian Disease. 34(1): 120-8.
- [24] Suryashe, B.D., Deshmukh, S.G. (1997): Visceral Gout Strikes Layers And Broilers, World Poult – Misset, Vol: 13, Pp: 48-50.
- [25] Trampel, D.W., Pepper, T.M. & Blagburn, B.L. (2000) Urinary Tract Cryptosporidiosis In Commercial

- Laying Hens. *Avian Disease*, 44(2): 479-484.
- [26] Wideman, R. Milinson, E. Rothen, H.(1983): Kidney Function Of Pullets And Laying Hens During Autbreak Of Urolithiasis, *Pult Sci*, 62, Pp: 1954-1970.
- [27] Wideman, R. Roush, W.Stanick, L. Glahn, T. Oldroyd, N. (1989): Methionine Hydroxyl Analog (Free Acid) Reduces Avian Kidney Damage And Urolithisis Induced By Excess Calcium. *H. Nutri*. 119,Pp: 818-828.
- [28] Wideman, R.(1987): Renal Regulation Of Avain Calcium And Phosphorus Metabolism. *J. Nutri*, 117, Pp: 808-815.