

## Pathological observations on diseased cockerels in rural areas of Bangladesh

Md-Aminul Ehsan\*, Md-Siddiqur Rahman\*\*, Byeong-Kirl Baek\*, Byeong-Su Kim\*\*\*,  
Joon-Seok Chae\*\*, Seong-Kug Eo\*\*, John-Hwa Lee<sup>1,\*\*</sup>

*\*Department of Medicine, Faculty of Veterinary Science, Bangladesh Agricultural  
University, Mymensingh-2202, Bangladesh.*

*\*\*College of Veterinary Medicine, Chonbuk National University, Jeonju 561-756,  
South Korea.*

*\*\*\*Department of Pet Science, Sohae College, Kunsan, 573-717, South Korea.*

(Received 07 September 2004, accepted in revised from 12 October 2004)

### Abstract

The poultry farmers of rural area in Bangladesh usually prefer raising cockerel to broiler due to availability, low price of chicks, requirement of less space and feed, and high price of meat and the farmers believe that the cockerels are less susceptible to diseases in comparison to broilers. This study was carried out to observe the pathology of diseased cockerel in 3 farms of rural area in Bangladesh. A total of 974 birds were examined and the diagnoses of different disease/conditions were based on the history, clinical signs, characteristic gross, tissue alterations, clinical pathology and isolation and identification of the pathogenic organisms. The diseases in this study included infectious bursal disease, yolk sac infection, vitamin E deficiency, coccidiosis, and other diseases. The proportionate mortality rate were 7.29%, 0.62%, 0.72%, 0.21% and 0.10%, respectively, which indicated that most of the fatal causes of death were due to infectious bursal disease. Age group of 2-8 week old were the most susceptible to this disease and *E coli* was suggested as a cause of yolk sac infection. The data also suggested that the coccidiosis in rural areas of Bangladesh has decreased due to awareness of the farmers and routine use of coccidiostates.

---

Key words : Pathology, Cockerel, Bangladesh

---

<sup>1</sup>Corresponding author

Phone : +82-63-270-2553, Fax : +82-63-270-3780

E-mail) johnhlee@chonbuk.ac.kr

## Introduction

Poultry industry in Bangladesh has made significant progress during the last two decades and still it is considered as a growing industry. Poultry meat mainly comes from local fowls, broilers and cockerels in Bangladesh. The poultry farmers of rural area in Bangladesh usually prefer raising cockerel to broiler due to availability, low price of chicks, requirement of less space and feed, and high price of meat and the farmers believe that the cockerels are less susceptible to diseases in comparison to broilers. Although the farmers begin cockerel farming with great enthusiasm they occasionally become discouraged when there is great mortality of cockerels due to disease outbreak. A thorough knowledge about the pathological observation of disease is a prerequisite for the proper prevention or control of a disease as well as for the proper diagnosis of the malady. Various aspects of the poultry have been described in Bangladesh<sup>1-10)</sup>. The pathology of poultry diseases varies with the breeds, sex, age and ecology of a particular area<sup>8,9,11-13)</sup>. In the present study the pathological observations on diseased cockerels in rural areas of Bangladesh were performed.

## Materials and Methods

The investigation was conducted at three different farms in rural area of Mymensingh district in Bangladesh. This investigation was performed from day-old chicks to adult cockerels. The morbidity, mortality and susceptibility by ages at

various disease/ conditions were recorded. The diseased or dead birds were collected for necropsy and diagnosed the diseases. The diagnoses of different disease were based on the history, clinical signs and characteristic gross, tissue alterations, clinical pathology, and isolation and identification of the organisms.

### Clinical signs

The clinical signs exhibited by the individual bird during illness were recorded in detail in a prescribed form provided by the respective poultry farm's owner. In addition, several diseased birds were maintained under careful observation with feed and water *ad libitum* until death to record the detailed clinical signs along with other abnormalities. These birds were necropsied soon after death.

### Gross pathology

At necropsy, gross tissue changes were observed and recorded. Representative tissue samples containing lesions were fixed in 10% buffered neutral formalin for histopathological studies.

### Histopathology

The well fixed tissues were placed under running tap water and after proper washing they were dehydrated through a series of ascending grades of alcohol. Then the dehydrated tissues were cleaned in chloroform and impregnated in melted paraffin. Finally the tissues were embedded in paraffin. The paraffin embedded tissues were sectioned at 4 to 6  $\mu\text{m}$  thickness by using a rotary microt

ome. The histologic tissue sections were stained with Hematoxylin and Eosin (H&E) following the routine procedures for histopathological studies<sup>8)</sup>.

#### Serological diagnosis

Various viral infections were examined using chicken sera at the Central Disease Investigation Laboratory, Dhaka district of Bangladesh.

#### Examination for parasites

Smears made from fecal contents and/or caecal scrapings were observed under microscope for detection of coccidial/protozoal oocysts.

#### Isolation and identification of bacteria

The yolk sac content samples were collected aseptically from the cockerel with yolk sac infection. The samples were inoculated in the nutrient agar plat using streak plate methods and incubated at 37°C for 48 hours for primary pure culture. Individual single colony from nutrient agar plate was isolated. Special attention was given to the *E coli*. The isolates were grown in subculture on the Eosin

Methylene Blue (EMB) agar plate incubated at 37°C for 24 hours for detection of characteristic colony of *Escherichia*. Individual single colony from EMB agar plate was isolated and identified by API identification system (Biomerieux, Lyon, France).

## Results

The present pathologic investigation identified a number of maladies respon sible for morbidity and mortality of cockerels. Diseases of cockerels diagnosed in 3 rural areas along with morbidity, mortality patterns are shown in Table 1. The diseases observed in this study were infectious bursal disease (IBD), yolk sac infection, vitamin E deficiency, coccidiosis, and other diseases. The overall prevalence of diseases of cockerels with their age susceptibility and proportionate mortality rate are shown in Table 2. The highest cockerel proportionate mortality was 7.29% due to IBD. This was followed by vitamin-E deficiency 0.72%, yolk sac infection 0.62%, coccidiosis 0.21% and other diseases, 0.10%.

Table 1. Diseases of cockerel diagnosed and morbidity, mortality patterns in 3 farms of rural areas of Bangladesh

Farm no.	Total no.	Diseases	No. of diseased	No. of death	Morbidity (%)	Mortality (%)
1	224	Infectious bursal disease	224	64	100	28.57
2	250	Yolk sac infection	9	6	3.6	2.4
		Vitamin-E deficiency	11	5	4.4	2
		Coccidiosis	21	2	8.4	0.8
		Other disease	1	1	0.4	0.4
3	500	Infectious bursal disease	43	7	8.6	1.4
		Vitamin-E deficiency	6	2	1.2	0.4

Table 2. Overall (n=974) prevalence of diseases of cockerels with their age susceptibility and proportionate mortality rate in 3 farms of rural areas of Bangladesh

Diseases	Age (weeks)			No of cases encountered	Mortality (%)
	0-2	2-8	8-20		
Infectious bursal disease	0	71	0	71	7.29
Yolk sac infection	6	0	0	6	0.62
Vitamin-E deficiency	2	5	0	7	0.72
Coccidiosis	0	0	2	2	0.21
Other diseases	1	0	0	1	0.10

n= total number of birds examined.

### Infectious bursal disease

By serological diagnosis at the Central Disease Investigation Laboratory, Dhaka district of Banbladesh, 267 cockerels found to be affected by IBD in two different cockerels farms (farm no. 1 and 3) of which 71 birds died. Mortality varied from 1.4 to 28.57%.

The clinical signs were, as reported by the poultry farmer and detected during farm visiting and in the laboratory, were soiled vent feathers, whitish or watery diarrhoea, drowsiness, anorexia, trembling, severe prostration and death.

The affected birds showed hemorrhage in the thigh, bursa and pectoral muscles. There was increased mucus in the intestine. The bursa of fabricius was filled with yellowish caseous mass. Haemorrhage was observed at the junction between proventriculus and gizzard. Lungs were also congested.

Histologic section of bursa showed pyknotic nuclei of lymphocytes (Fig 1) and at the advanced stage, liquefaction necrosis was observed in the medullary area of the follicles. Cystic cavities in the medullary area of the follicles and ghosts

of some follicle surrounding the heterophils were found. There was haemorrhage and congestion in the follicles. Section of thigh muscles showed haemorrhage in between the muscle fibers. Section of spleen exhibited necrosis of lymphocytes in the white and red pulps. Section of liver occasionally showed lymphocytic infiltration in portal areas. Section of lungs showed broncho-interstitial pneumonia, bronchitis and pleuritis characterized by haemorrhage, congestion and infiltration of lymphocytes, neutrophils, macrophages and plasma cells in the wall

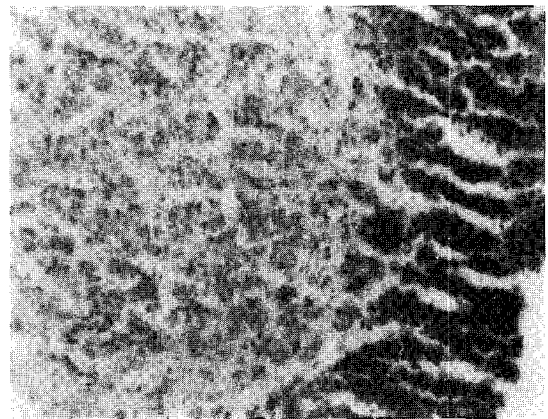


Fig1. Bursa of infected bursal disease (IBD) showing the dead and pyknotic nuclei of lymphocytes and hemorrhage in the follicles (H&E, x 84).

of bronchiole, bronchi, alveoli and pleura. Section of kidneys showed severe haemorrhage and congested blood vessels. Section of heart exhibited light pink colored edematous fluid with fibrin network and congested blood vessels in the myocardium. Section of proventriculus exhibited necrosis of the secondary duct of the follicles, congested interfollicular blood vessels with thickened walls.

#### Yolk sac infection

Six (2.4%) chicks died due to omphalitis or yolk sac infection in a farm (farm no. 2). There were no significant clinical signs. However, the few affected chicks showed lethargic, less feed intake, swollen vent region and found depressed with poor growth performance.

At necropsy all the birds appeared to be highly emaciated and cachectic. Lesions were mainly observed in the yolk sac, which was considerably thickened with unabsorbed yolk in all chicks. The wall of the yolk sac was inflamed, thickened and edematous. There were congested blood vessels around the yolk. The yolk sac contents appeared to be cheesy, yellow-brown in color. The livers of the affected few chicks were pale.

The wall of the infected yolk sac was thickened due to fibroblastic proliferation and mononuclear infiltration in association with normal fat cells. Section of liver showed necrosis of hepatocytes with distortion of hepatic cords. Section of lungs revealed reactive cells (heterophils and lymphocytes) in the alveoli.

#### Vitamin-E deficiency

Seven birds died due to vitamin-E deficiency in farm no. 2 and 3. In two different occasions, the affected chicks showed nervous signs characterized by ataxia, backward or downward or lateral twisting and retraction of head, incoordination in movement, contraction and relaxation of legs, prostration and finally death.

On postmortem examination, vitamin-E deficient birds exhibited softened, swollen and focal haemorrhage on the cerebellum, edematous meninges and also congested cerebral blood vessels indicating characteristic encephalomalacia.

In brain, there was proliferation of huge number of glial cells and some several vacuoles were found around the glial cells. The blood vessels were markedly congested.

#### Coccidiosis

An outbreak of coccidiosis was recorded in farm no. 2. The total number of cockerels in this farm was 250. A total of 2 (0.8%) of 21 affected cockerels died due to coccidiosis.

The clinical signs recorded were droopiness, depression, ruffled feathers and diarrhoea which was often mixed up with blood.

The changes observed at necropsy in all affected cockerels were confined to the caecum. The affected caeca were swollen and haemorrhagic, the walls of caeca appeared thickened firmer in consistency; the lumen of caeca filled with blood tinged exudate. The semisolid contents were mixed up with blood and blood

stained necrotic tissue debris.

The examination of the scraping taken from the affected caecal wall revealed the presence of large number of oocysts under microscope in all the cases. Moreover, smears made with caecal contents showed the presence of large number of oocysts.

The histologic section of the carcass shows haemorrhage, congestion, necrosis and varying degrees of inflammatory reaction. The lining of the villi exhibited necrosis, distortion and resulted in the denuding of the caecal villi.

#### Other diseases

In the present investigation, the cause of death of one case from farm no. 2 could not be ascertained. At necropsy, there was no gross lesion. Microscopically, section of the lungs exhibited marked infiltration of mononuclear cells and lymphocytes in the alveoli, bronchi and in the interstitial and parabronchiole filled with exudate and reactive cells. Section of liver showed vacuolar degeneration, congested sinusoid and reactive cells in hepatic parenchyma and in the lumen of blood vessels. There was also infiltration of inflammatory cells in myocardium and in the wall and lumen of the blood vessels.

#### Isolation and identification of bacteria

In the nutrient agar media, the organism of yolk sac contents produced convex, smooth and colour less colonies. In the EMB agar media, the yolk sac isolate produced smooth colonies with metallic sheen and was identified by API identification system (Biomerieux, Lyon,

France). So it was suggested that cockerels were dead due to yolk sac infection caused by *E coli* in farm no. 2.

## Discussion

The highest cockerel proportionate mortality in the present investigation was recorded 7.29% due to IBD. This was followed by Vitamin-E deficiency 0.72%, yolk sac infection 0.62%, coccidiosis 0.21% and other disease, 0.10%.

Kutubuddin<sup>1)</sup>, Sarker<sup>2)</sup> and Kamal<sup>3)</sup> conducted the pathologic investigations on the mortality of chickens in Bangladesh Agricultural University poultry farm. None of the above mentioned authors detected the prevalence of IBD in the chickens. However, Bhattacharjee et al<sup>4)</sup> recorded the highest mortality of chickens due to IBD (10.99%) diagnosed at the Central Disease Investigation Laboratory, Dhaka district of Bangladesh. Islam et al<sup>5)</sup> recorded IBD (16.0%) and Talha<sup>6)</sup> recorded the highest mortality of poultry due to IBD (19.16%) in Mymensingh district of Bangladesh. The gross and microscopic lesions noted in IBD are similar to those described by Helmboldt and Garner<sup>14)</sup> and Lukert and Hitchner<sup>15)</sup>. However, fibrin network in myocardium and severe haemorrhage and congestion in kidneys were noted microscopically in several cases in the present investigation which has not been reported earlier by other authors.

Kamal<sup>3)</sup> recorded 12.54% yolk sac infection or omphalitis cases, Mayes<sup>16)</sup> recorded 0.1 to 7% cases and Byrne and Lowndes<sup>17)</sup> recorded 4.5% cases in chickens. The gross and microscopic

lesions noted in yolk sac infection were similar to those described by Calnek et al<sup>18)</sup> and Kamal<sup>3)</sup>. However, necrosis in liver, and fibroblastic proliferation and infiltration mononuclear cells in lumen of alveoli were noted microscopically in some cases in the present study, which was not reported earlier by the other authors.

Vitamin-E deficiency disorder was recorded in 0.72% cases of cockerels in the present study with maximum mortality at 2-8 week age group of cockerels. Talha<sup>6)</sup> reported 2.89% cases of birds died due to vitamin-E deficiency. Islam et al<sup>5)</sup> recorded 6.10% and Bhattacharjee et al<sup>4)</sup> reported 8.22% cases related to malnutrition. The clinical signs exhibited by the vitamin-E deficient cockerels and associated pathologic lesions in the present study in this malady were almost similar to those recorded by Sarker<sup>2)</sup>.

Coccidiosis, the only investigated protozoal disease was found to cause an outbreak among 8-20 week old cockerels. Kutubuddin<sup>1)</sup>, Kamal<sup>3)</sup>, Bhattacharjee et al<sup>4)</sup>, Islam et al<sup>5)</sup> and Talha<sup>6)</sup> recorded 14.66%, 17.36%, 9.40%, 8.0% and 5.51% mortality of chickens, respectively due to coccidiosis. In the present study, this occurrence was recorded as 0.21% in cockerels. The incidence of coccidiosis reported in this study and previous reports indicates that coccidiosis is decreasing in Bangladesh. It is concluded that the reason of decreasing the incidence of coccidiosis might be due to the awareness of the farmers and routine use of coccidiostats in their farms.

Acknowledgements : The authors

acknowledge the help of farmers and attendants of poultry farms in Bangladesh during this investigation. This study was supported by the Brain Korea 21 Project in 2004, Republic of Korea and a research grant from Bio-Safety Research Institute, Chonbuk National University, Korea in 2004.

## References

1. Kutubuddin M. 1973. Pathological investigation on the cause of mortality of poultry birds in Bangladesh Agricultural University poultry farm. M. Sc. Thesis, Dept. of Pathology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.
2. Sarker AJ. 1976. The prevalence of avian diseases in Bangladesh Agricultural University poultry farm, Mymensingh. *Bangladesh Vet J* 10 : 61~66.
3. Kamal AHM. 1989. Pathologic investigation on the mortality of chicken in Bangladesh Agricultural University poultry farm. M. Sc. Thesis, Dept. of Pathology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.
4. Bhattacharjee PS, Kundu RL, Biswas RK, et al. 1996. A retrospective analysis of chicken diseases diagnosed at the Central Disease Investigation Laboratory, Dhaka. *Bangladesh Vet J* 30(3-4) : 105~113.
5. Islam MR, Khan MAHNA, Das PM, et al. 1998. Poultry diseases diagnosed at necropsy in 1997 and 1998 in the Department of Pathology of Bangladesh Agricultural University, Myme

- nsingh. Proceedings of 5th BSVER Annual Scientific Conference, 3-4th December 1998, Bangladesh Agricultural University, Mymensingh, Bangladesh.
6. Talha ASM. 1999. Pathology of poultry diseases occurring in Mymensingh. MS Thesis, Department of Pathology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.
  7. Sil GC, Das PM, Islam MR, et al. 2002. Management and disease problems of cockerels in some farms of Mymensingh, Bangladesh. *Int J Poult Sci* 1 : 102~105.
  8. Shil GC, Ehsan MA, Rahman MS, et al. 2003. Diseases associated with mortality and pathological changes in cockerel birds. *Bangladesh J Vet Med* 1(1) : 33~38.
  9. Islam MT, Samad MA. 2003. Outbreaks of infectious bursal disease in vaccinated and unvaccinated commercial cockerel farms in Bangladesh. *Bangladesh J Vet Med* 1(1) : 21~24.
  10. Rahman MA, Samad MA. 2003. Pattern of occurrence of single and concurrent diseases associated with mortality in commercial chickens in Bangladesh. *Bangladesh J Vet Med* (1) : 15~20.
  11. Hofstad MS, Barnes HJ, Calnek BW, et al. 1988. *Diseases of poultry*. 8th ed. Iowa State University Press, Iowa, USA : 141~159.
  12. Rajeswar JJ, Mohan CPC. 1992. A report on the first incidence of infectious bursal disease among broiler chickens in Kanyakumari district of Tamil Nadu. *Indian Vet J* 69 : 867~868.
  13. Saha AK, Majumder AK. 1993. Report of infectious bursal disease among grower chickens in Tripura. *Indian Vet J* 74 : 515~516.
  14. Helmboldt CF, Garner E. 1964. Experimentally induced Gumboro disease. *Avian Dis* 8 : 561~574.
  15. Lukert PD, Hitchner SB. 1984. *Infectious bursal disease*. In: Diseases of poultry. 8th ed. Hofstad MS. (ed). Iowa State University Press, Iowa, USA : 153-174.
  16. Mayes FJ. 1987. A survey of early poultry mortality in turkey flocks. *Irish Vet J* 41(11) : 367~370.
  17. Byrne PS, Lowndes KM. 1976. Avian diseases diagnosed in Ireland. *Poultry Abstracts* 2(8) : 247.
  18. Calnek WB, Barnes HJ, Beard CW, et al. 1997. *Diseases of poultry*. 10th ed. Iowa State University Press, Iowa, USA : 53~134.