

COMPARATIVE STUDY ON PATHOLOGY OF HEMIC SYSTEM OF THREE BROILER CHICKEN STRAINS SUFFERING FROM EXPERIMENTAL HYDROPERICARDIUM SYNDROME

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Summary

The experiment was conducted to study the comparative pathology of hemic system among three different broiler chicken strains i.e. Hubbard (H), Lohmann (L) and Indian River (IR) suffering from experimentally induced Hydropericardium Syndrome (HPS). For this 50 chicks of each strain were inoculated with HPS inoculum at the age of 21 days and other 50 chicks of each broiler strain were kept as uninoculated control. After slaughtering each bird of both groups was subjected to pathological examination of heart, spleen and aorta and also for determining routine haematological parameters. The maximum values of Total Erythrocyte Count (TEC), heterophils and thrombocytes and the minimum values of Total Leukocyte Count (TLC) and Hemoglobin (Hb) content were found in H broiler strain. Percentage of monocytes, basophils and eosinophils also showed maximum decrease in H broiler chicken strain. Gross pathological lesions in the inoculated birds revealed that the heart showed ballooning due to distention of pericardial sac with pericardial fluid. Haemorrhages on the epicardium and flabbiness of the myocardium. Under the microscope, degenerative changes in myocardial tissue were seen. Lesions in the spleen included splenomegaly and haemorrhagic spots. Aorta showed flabbiness of the wall and disruption of endothelium. It is concluded that there is a marked difference in susceptibility of HPS among three different commercial broiler strains. The Hubbard broiler strain is more susceptible which is followed by the Indian River and Lohmann respectively.

(Key Words : Hemic System, Hydropericardium Syndrome)

Introduction

Hydropericardium syndrome (HPS) or Angara disease is defined as the accumulation of fluid around the heart in the pericardial sac. This disease was first observed in an exclusively broiler growing area of Karachi (Pakistan) in August/September, 1987 (Qureshi, 1989). Hydropericardium syndrome on broiler farms inflicts heavy mortality upto 70% causing a loss of about thirty million rupees (Khan et al., 1988). Hydropericardium syndrome thus remains a constant threat to poultry industry in Pakistan (Sheikh, 1988).

Many aspects of this disease have been studied but comparative susceptibility of different broiler chicken strains is not still established. The present project has been designed for studying comparative alteration in hemic system (haematological parameters and pathological

lesions in heart, aorta and spleen) among three commercial broiler chicken strains.

Materials and Methods

Experimental inoculum

The HPS inoculum prepared from morbid livers of birds suffering from naturally HPS.

Experimental chicks

Day old commercial broiler chicks of three different strains (Hubbard, Lohmann and Indian River) were procured from different commercial hatcheries. The number of chicks of each strain was 100. These chicks were reared under standard managerial conditions.

Experimental design

One hundred chicks of each broiler strain were divided into two equal groups comprising of 50 chicks each. The following groups were made.

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Received July 4, 1994

Accepted March 6, 1995

Hubbard strain	Groups A and B
Lohmann Strain	Groups C and D
Indian River Strain	Groups E and F

All these groups were further subdivided into two equal subgroups comprising of 25 birds each. The subgroups so formed were as under.

Hubbard strain	Subgroup A1, A2, B1, B2
Lohmann Strain	Subgroup C1, C2, D1, D2
Indian River Strain	Subgroup E1, E2, F1, F2

Each chick from subgroup (B1, B2, D1, D2, F1, and F2) was inoculated with HPS inoculum at the age of 21 days through subcutaneous route at the dose rate of 1 ml (Arshad, 1991). Subgroups (A1, A2, C1, C2, E1, and E2) were kept as control. After inoculation the chicks were kept under observation until they started showing characteristic symptoms of hydropericardium syndrome. Diseased chicks and randomly selected normal chicks in equal number from analogous control subgroup were slaughtered. Necropsy examination of carcasses of dead chicks of experimental group was also conducted.

Collection of blood

From jugular vein of each slaughtered bird 3-4 ml of blood was collected in separate sterilized test tubes, already coated with anticoagulant (EDTA).

Preparation of blood smears

Blood smears were prepared from each sample of fresh blood (Benjamin, 1978). The smears were air dried, labeled and fixed in methanol and brought to the laboratory for further study.

Haematological studies

The following blood parameters from blood sample of each bird were recorded.

- Total Erythrocyte Count (TEC) (Natt and Herrick, 1952)
- Total Leukocyte Count (TLC) (Natt and Herrick, 1952)
- Differential Leukocyte Count (DLC) (Benjamin, 1978)
- Total Thrombocyte Count (TTC) (Shaker and Simba, 1985)

Pathological examination

Heart, aorta and spleen were eviscerated from carcasses of slaughtered and dead broiler chicks. The gross lesions of each organ were recorded and the affected tissues were also undergone histopathological examination (Drury and

Wallington, 1980).

Statistical analysis

The data were statistically analysed by using "t" test and one way analysis of variance (Steel and Torrie, 1960).

Results

Haematological parameters

The values of haematological parameters are presented in table 1 and 2.

Pathological examination

Gross lesions

Heart

The most conspicuous lesion of HPS observed after lifting the rib cage was ballooning of pericardial sac with pericardial fluid (figure 1). The pericardial sac was distended with watery fluid and in some cases enlarged to double to size of heart, the pericardial fluid varied in quantity and was maximum upto 15 ml. The pericardial fluid was thin, turbid and when kept at room temperature changed its consistency into jelly like mass. The pericardial sacs were thin, transparent and glistening but in some cases adhered to the inner side of keel bone. Petechial haemorrhages were seen on the epicardium at the base of the heart. When incised, the myocardium appeared congested.

Aorta

No significant gross pathological lesion was noted but only increased flexibility of the mural substance had been felt.

Spleen

Spleen showed splenomegaly but in some birds there was no change in the size. In few birds there was white spots on the surface of the spleen and showed resemblance with the marble spleen. The enlarged spleens also exhibited tension of the capsules and dark with haemorrhagic spots.

Histopathology

Heart

The cardiac muscles showed degenerative changes, mild congestion and leukocytic infiltration with heterophils, lymphocytes and plasma cells were seen in between myocardial muscle fibers. In some areas massive interstitial oedema, intercellular haemorrhages, and necrosis of myocardial cells encountered.

TABLE 1. HAEMATOLOGICAL PARAMETERS AMONG DIFFERENT BROILER CHICKEN STRAINS

Broiler strain	Group	TEC ($\times 10^6/\text{MM}^3$) Mean \pm SE	TLC ($\times 10^6/\text{MM}^3$) Mean \pm SE	TTC ($\times 10^6/\text{MM}^3$) Mean \pm SE	HB conten GM/100 ML Mean \pm SE	PCV % Mean \pm SE	E.S.R mm in an hour Mean \pm SE
Hubbard	Experimental	2.02 \pm 0.06 ^a	12.57 \pm 0.51 ^{ade}	28.60 \pm 0.40	6.57 \pm 0.16 ^{ade}	26.05 \pm 0.58 ^a	3.63 \pm 0.21 ^a
	Control	2.89 \pm 0.04 ^a	26.47 \pm 0.54 ^a	26.61 \pm 0.30	10.44 \pm 0.13 ^a	30.58 \pm 0.45 ^a	2.47 \pm 0.21 ^a
Lohmann	Experimental	2.14 \pm 0.11 ^b	18.85 \pm 0.24 ^{bd}	28.42 \pm 0.53	7.51 \pm 0.21 ^{bd}	27.14 \pm 0.68 ^b	3.28 \pm 0.28 ^b
	Control	3.01 \pm 0.04 ^b	26.00 \pm 0.82 ^b	27.50 \pm 0.17	10.86 \pm 0.25 ^b	31.14 \pm 0.55 ^b	2.43 \pm 0.34 ^b
Indian River	Experimental	2.08 \pm 0.07 ^c	16.10 \pm 0.78 ^{ce}	28.58 \pm 0.53	7.38 \pm 0.15 ^{ce}	26.80 \pm 0.58 ^c	3.20 \pm 0.24 ^c
	Control	2.94 \pm 0.09 ^c	25.7 \pm 0.57 ^c	27.10 \pm 0.40	10.64 \pm 0.22 ^c	30.30 \pm 0.49 ^c	2.30 \pm 0.28 ^c

Values with similar superscript (single alphabet) on means shows significant difference

TABLE 2. DIFFERENTIAL LEUKOCYTE COUNT AMONG DIFFERENT BROILER CHICKEN STRAINS

Broiler strain	Group	Lymphocyte % Mean \pm SE	Monocyte % Mean \pm SE	Hetrophil % Mean \pm SE	Eosinophil % Mean \pm SE	Basophil % Mean \pm SE
Hubbard	Experimental	55.16 \pm 0.54 ^a	3.00 \pm 0.32 ^a	40.26 \pm 0.39 ^{ad}	0.89 \pm 0.18	0.68 \pm 0.15
	Control	69.63 \pm 0.58 ^a	5.42 \pm 0.27 ^a	22.68 \pm 0.34 ^a	1.42 \pm 0.23	0.79 \pm 0.17
Lohmann	Experimental	58.28 \pm 0.82 ^b	3.80 \pm 0.31 ^b	36.00 \pm 0.90 ^{bd}	1.14 \pm 0.24	0.71 \pm 0.26
	Control	69.28 \pm 0.78 ^b	5.14 \pm 0.37 ^b	22.85 \pm 0.31 ^b	1.86 \pm 0.42	0.86 \pm 0.31
Indian River	Experimental	55.60 \pm 0.47 ^c	3.30 \pm 0.28 ^c	39.30 \pm 0.49 ^c	0.90 \pm 0.17	0.80 \pm 0.27
	Control	69.30 \pm 0.47 ^c	4.90 \pm 0.26 ^c	23.40 \pm 0.48 ^c	1.40 \pm 0.39	0.90 \pm 0.83

Spleen

The splenic parenchyma showed focal areas of coagulated necrosis. Haemorrhages and infiltration of the inflammatory cells.

Aorta

Necrosis was observed in the tunica media of the vessel wall. The endothelial layer of aorta was disrupted.

The above mentioned pathological lesions were prominent and pronounced in H chicken strain as compared with the remaining two strains.

Discussion

In present project the chicks of three different broiler strains were inoculated with HPS antigen at age of 21 day, and the disease was produced. This confirms the findings of Khan et al. (1988), Anjum et al. (1988) and Bhatti et al. (1988). However reports are available that noted by Bhatti et al. (1988) and Niazi (1989). Non inflammatory increase in heterophils may be due to systemic stress associated with endogenous release of

HPS also appears in broiler of one week and older than five weeks of age (Khan et al., 1988; Anjum, 1988). It is tempting to speculate that HPS has a wide range of age susceptibility in broiler chicks. The pathological lesions appeared more pronounced in H broiler chicks as compared with IR and L broiler chickens. This confirms the findings of Khan et al. (1988), Niazi (1989), Akhtar and Cheema (1990) and Khan et al. (1994) regarding the difference in the occurrence of disease among different broiler strains. The significant decrease in the mean of total erythrocytic count, haemoglobin content and PCV indicated severe anemia of macrocytic hypochromic type. Niazi (1989) also reported this type of anemia. The significant decrease in the mean of TLC in the broilers affected with HPS suggested the presence of viral infection (Benjamin, 1978). It is possible that broilers affected with HPS suffered from stress due to viral infection or stress (Sturkie, 1965) and shock (Benjamin, 1978). The increase in the heterophils was identical those corticosteroid. Decrease in production of thrombocyte was associated with leukopenia and anemia as described by Benjamin (1978). This however is contrary to the findings

of this study. The increased thrombocyte count may be due to the fact that thrombocytopenia is followed by a rebound thrombocytosis (Jain, 1981). Decrease in haemoglobin content among experimental birds may be due to the disease process, which damaged vascular wall allowing blood to escape, and was confirmed by the disruption of aortic endothelium and haemorrhages found in necropsed tissues. The increased ESR can be attributed to the acute localized infection of serosal membranes e.g., pericarditis (Benjamin, 1978). In the spleen there were focal areas of degeneration and necrosis which may be due to the effect of the adenovirus. Winterfield (1991) reported that spleen showed histiocytic hyperplasia, fibrinoid necrosis and lymphocytes were depleted in quails affected with adenovirus infection.

Keeping in view all the above findings, it is concluded that there is a marked difference in susceptibility of HPS among three different commercial broiler strains and HPS also affects a lot on the hemic system of the broiler. The Hubbard broiler strain is more susceptible which is followed by the Indian River and Lohmann respectively.

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