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Endocrinopathies associated with colibacillosis in broiler and layer birds of Kashmir valley

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Abstract

The current study focuses on the histopathological and histochemical alterations in adrenal glands and Pancreas of poultry (broilers and layers) in outbreaks of Colibacillosis. The birds (broilers as well as layers) belonged to various poultry farms in Srinagar and Ganderbal districts of Kashmir valley (Jammu and Kashmir, India). A total of 82 disease outbreaks were recorded from June 2015- July 2016, out of which 19 outbreaks of Colibacillosis were observed in broilers while only 2 outbreaks of Colibacillosis were noted in layers. Diagnosis was confirmed after conducting thorough post mortem examination. The disease was diagnosed grossly as well as through histopathological examination. On post mortem examination the adrenal glands and pancreas were properly collected from the carcasses of the birds and preserved in 10% neutral buffered formalin for fixation. The tissue samples were processed for routine paraffin embedding technique and 5 micron thin tissue sections were stained with Haris Haematoxylin and Eosin. Parallel tissue sections, selected on the basis of histopathological examination, were stained for histochemical observations. From the present study it could be concluded that any morphological or functional aberrations in the endocrine glands will definitely, therefore, affect the functional capacities of the target organs as well as the glands itself. Endocrinopathies co-existed with Colibacillosis in both layers as well as broilers, and were mostly of hemodynamic derangements. Hence an investigation into endocrine gland disorders in poultry needs attention for increasing the productivity and profitability from this enterprise.

Keywords: adrenal gland, broilers, colibacillosis, histopathology, histochemistry

1. Introduction

Avian Colibacillosis caused by *Escherichia coli* (*E. coli*), is one of the principal causes of morbidity and mortality either as primary pathogen or as a secondary pathogen [1]. Infections occur in chickens of all age groups but broiler chicken within 4-6 weeks of age is more vulnerable and severely affected with considerable mortality [2]. Avian Colibacillosis is a complex syndrome characterized by multiple organ lesions like air sacculitis, pericarditis, peritonitis, salpingitis, synovitis, osteomyelitis or yolk sac infection [2]. In the past few years, both the incidence and severity of Colibacillosis have increased rapidly. The endocrine system of birds consists of the hypothalamic-hypophyseal complex, the gonads, pancreatic islet cells, Adrenal glands, Thyroid glands, Parathyroid glands, Ultimobranchial glands and the endocrine cells of the gut. These organs release special compounds called hormones into the blood stream, which in turn, target particular systems or organs. Endocrine glands are ductless glands. They secrete their secretions into the surrounding blood capillaries, unlike exocrine glands, which secrete their products into a duct. When these hormones get out of balance, the bird's body cannot function properly and hence performance will suffer and in some cases an imbalance can even lead to death [3]. Adrenal glands are important endocrine glands. They help to maintain homeostasis as well as play important roles in all types of stress response [4]. The microanatomy of the avian adrenal gland differs that of mammals, in that, a distinct cortex and medulla is absent in avian adrenal gland [5]. Changes in the structure of adrenal gland in poultry due to different stressors indicate that adrenal glands are involved in stress reaction [6a, 6b, 6c, 6d, 6e]. Pancreas in poultry consists of a pale, elongated gland, situated in the interduodenal area and formed by the ascending and descending duodenal loops. It is associated with the digestive system and is an exocrine as well as endocrine gland. The exocrine portion secretes basic electrolytes and digestive enzymes whereas the endocrine portion secretes hormones

such as insulin, glucagon, somatostatin, and pancreatic polypeptides [7]. The present paper describes the histopathological and histochemical alterations in adrenal glands and pancreas of poultry (broilers and layers) in outbreaks of Colibacillosis.

2. Material and methods

2.1. Sampling

The poultry birds (broilers and layers) died during the period from July 2015 to June 2016, were referred for postmortem examination, formed the material for the study. The clinical history of dead birds was recorded from the owners of the poultry farms. Dead birds were then subjected to thorough post mortem examination. External examination as well as internal examination of the birds was performed. Diagnosis of the disease was done.

2.2. Pathoanatomical Studies

2.2.1 Gross pathology

Gross pathological changes suggestive of Colibacillosis were recorded in the dead birds and the gross pathology of the endocrine glands under study i.e.adrenal glands and pancreas were recorded.

2.3 Histopathology

Representative samples of adrenal glands, pancreas were collected from dead birds that died of Colibacillosis, subsequently preserved and fixed in 10% buffered formalin for fixation. The tissue samples were processed for routine paraffin embedding technique employing alcohol and acetone as dehydrating agent, benzene as clearing agent and paraffin wax of melting point 60°C. The sections of 5µm thickness were cut and stained with Harris' Haematoxylin and Eosin for routine examination [8]

2.4 Histochemistry

Parallel tissue sections, selected on the basis of histopathological examination, were stained for Alcian Blue PAS technique for demonstration of neutral and acid mucopolysaccharides [9].

3. Results

A total of 82 disease outbreaks were recorded over a period of 1 year, out of which 19 outbreaks of Colibacillosis were observed in broilers while only 2 outbreaks of Colibacillosis were noted in layers.

3.1. Gross pathology

The disease was characterized by fibrinopurulent perihepatitis, pericarditis, peritonitis and presence of foamy exudate in the air sacs (air sacculitis) (Plate 1). The carcass was emaciated. Adrenal glands were severely congested but no significant alterations were observed in the pancreas.

3.2. Histopathology

Adrenal Glands

There was Sinusoidal congestion, sinusoidal dilatations and hypoplasia of the interrenal tissue (Plate 2).

Pancreas

Islet of Langerhans of Pancreas revealed a few pyknotic cells (Plate 3).

3.3. Histochemistry

Ductular epithelium of Pancreatic ducts revealed positivity for acid mucopolysaccharides (Plate 4).



Plate 1: A Case of Colibacillosis of a broiler chicken showing deposition of fibrin layer on the surface of heart and Liver.

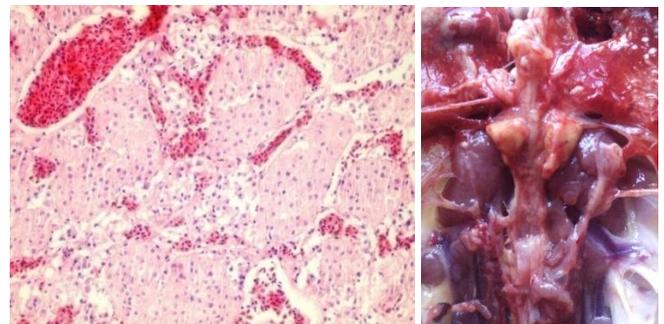


Plate 2: Section of adrenal gland of a broiler chicken affected with Colibacillosis revealing sinusoidal congestion, sinusoidal dilatation and hypoplasia of interrenal tissue.H&E. Original magnification-400 X.

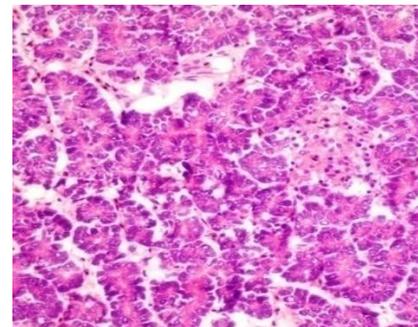


Plate 3: Section of pancreas of a broiler chicken affected with Colibacillosis revealing a few pyknotic cells in islets. H&E. Original magnification-400X.

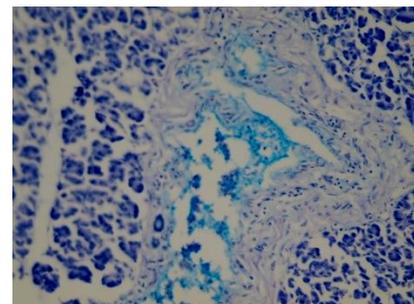


Plate 4: Section of pancreas of a layer chicken affected with Colibacillosis showing acid mucopolysaccharides in pancreatic ducts. PAS-AB. Original magnification- 400X.

4. Discussion

Avian pathogenic *Escherichia coli* (APEC) are the major cause of Colibacillosis in poultry production ^[10]. It is a common disease in poultry flocks worldwide especially in the intensive farming system ^[11]. Colibacillosis affects birds of all ages. This disease has an important economic impact on poultry production worldwide ^[12]. *E. coli* is considered a member of the normal micro flora of the poultry intestine, but certain strains, such as those designated as APEC, spread into various internal organs and cause Colibacillosis characterized by systemic fatal disease ^[13]. Avian Colibacillosis caused by *E. coli* is a major health problem in poultry industry ^[13]. The endocrine system includes all of the organs that function exclusively as endocrine glands, such as the thyroid gland, pituitary gland, adrenal glands, and so on. Endocrinology has gained importance both in humans as well as in animals as their derangement is directly going to affect the productive capacities of animal. Poultry is not an exception. Endocrinopathies in birds do occur though however avian practitioners seem to remain mostly unaware to endocrinology. Knowledge about the endocrinopathies in birds is going to gain momentum as working know how of avian endocrinology is explored more and more, and appropriate clinical diagnostic tests can be used to document endocrine abnormalities ^[14]. In this study, an attempt was undertaken for determining the histopathological and histochemical alterations in the adrenal glands and pancreas of poultry (broiler and layers) in Kashmir Valley in outbreaks of Colibacillosis. Histopathologically congestion was the predominant feature in the adrenal glands which is attributed to the stress factor induced by the concerned diseases. ^[15] reported marked hyperemia in adrenal glands of broilers exposed to the long term sound. No significant changes could be observed on histochemical examination. In Case of Pancreas degenerating and necrotic β cells were observed in the islet of Langerhans that indicate progression of the diseases and the metabolic stress might be warranting hyper secretion from the functional islets and exhaustion of β cells. Histochemical study revealed that ductular epithelium of the pancreas was positive for acid mucopolysaccharides which are in accordance with the findings of ^[16] in Quail.

5. Conclusion

The study revealed that the endocrinopathies co-existed with Colibacillosis in both layers as well as broilers. Knowledge about the endocrinopathies in birds is going to gain momentum as working know how of avian endocrinology is explored more and more, and appropriate clinical diagnostic tests can be used to document endocrine abnormalities. Hence investigations into endocrine gland disorders in poultry need attention for increasing productivity and profitability from this enterprise.

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