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Avian Colibacillosis - A Mini Review

M. Geetha* and K. M. Palanivel

Department of Veterinary Preventive Medicine, Veterinary College and Research Institute, Namakkal

*Corresponding Author E-mail: drmgeetha@gmail.com

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ABSTRACT

Avian colibacillosis is an economically important disease of poultry throughout the world. It causes great economic losses to the poultry farmers throughout the world in terms of mortality of affected birds, decreased productivity, increased costs towards treatment of affected birds etc. This article briefly review about epidemiology, host range, clinical signs, diagnosis of avian colibacillosis.

Key words: *Avian colibacillosis, poultry, E. coli*

INTRODUCTION

Avian colibacillosis refers to any localized or systemic infection caused entirely or partly by avian pathogenic *Escherichia coli* (APEC), including colisepticaemia, coligranuloma (Hjarre's disease), air sac disease, swollen-head syndrome, venereal colibacillosis and coliform cellulitis, peritonitis, salphingitis, orchitis, osteomyelitis/synovitis, panopthalmitis, omphalitis/yolk sac infection and enteritis[3].

Avian colibacillosis is an infectious disease of birds caused by *Escherichia coli* (*E. coli*) which is considered as one of the principal causes of morbidity and mortality, associated with heavy economic losses to the poultry industry by its association with various disease conditions, either as primary pathogen or as a secondary pathogen[11].

Occurrence

Global scenario

Colibacillosis in chicken was reported from various parts of the world including Bangladesh[18], Belgium[26], China[7], Denmark[13], Japan[22], Korea[12], and United States of America[29].

Indian scenario

Escherichia coli was isolated from tissues of chicken and antibiotic resistance pattern was studied by Sharada and Wilfred Ruban[20], at Karnataka. Detection and characterisation of shiga toxin producing *E. coli* (STEC) and enteropathogenic *E. coli* (EPEC) in poultry was carried out by Dutta *et al*[6].

Pathogenicity studies of twenty one *E. coli* isolates recovered from clinical cases of colibacillosis in chickens at Uttar Pradesh revealed that seventeen of them were found pathogenic[25]. Sarma *et al*.[19], reported that ninety nine strains of *E. coli* isolates from domestic fowl were serotyped into 56 different serotypes in Punjab.

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Escherichia coli associated egg peritonitis was responsible for 15.39 per cent of the reproductive tract abnormalities in commercial layers between 21 and 80 weeks of age in Namakkal area of Tamil Nadu for the period from 2005 to 2008. Drop in egg production and mortality in these layer flocks varied from 3 to 20 per cent and 0.5 to 7 per cent[23], respectively.

Epidemiology

Agent

Escherichia genus consists of gram negative, non-acid-fast, uniform staining, non-spore forming bacillus, usually of 2-3 X 0.6 µm in size belonging to the family Enterobacteriacea[3]. It is considered as a member of normal microflora of the poultry intestine, but certain strains such as avian pathogenic *E. coli* (APEC), spread to various internal organs and cause colibacillosis characterised by systemic fatal disease[10]. Serotypes of *E. coli* are classified according to the Kauffmann scheme. At present there are approximately 180 O, 60 H, and 80 K antigens were recognized[24]. In most serologic typing schemes only the O and H antigens are determined[3].

In domestic poultry, avian colibacillosis is frequently associated with *E. coli* strains of serotypes O78:K80, O1: K1 and O2: K1[11].

The occurrence of a specific serotype and its role in disease production depends upon the health status of the birds, climatic conditions, geographical situations and managemental strategies[23].

Host

Most, if not all, avian species are susceptible to colibacillosis. Clinical disease is reported most often in chickens, turkeys and ducks. Collectively, the various forms of colibacillosis are considered to be the most common infectious bacterial disease of broiler chickens and turkeys [3]. Avian pathogenic *E. coli* infection is most frequent in breeders followed by broilers and layers respectively and it is responsible for both embryo as well as early chick mortality in breeders[9]. Colisepticaemia is the commonest infectious disease of farmed poultry seen worldwide in chicken, turkeys etc[4].

Risk factors associated with occurrence of avian colibacillosis

Age

All ages are susceptible to colibacillosis, but young birds are more frequently affected and severity of the disease is greater in young birds including developing embryos[8].

Avian colibacillosis is prevalent in all age groups of chickens (9.52 to 36.73 %) with especially high prevalence rate in adult layer birds (36.73 %)[17]. Most outbreaks of colibacillosis occur around the period of peak production[26].

Avian pathogenic *E. coli* are responsible for a considerable number of various diseases at different ages including neonatal infection of chicks, oophoritis or salphingitis in laying hen, air sacculitis and septicaemia in all ages of chickens[11].

The incidence of the egg peritonitis caused by *E. coli* was noticed throughout the laying period, however more common during the peak production *i-e.*, 21-60 weeks of age[23].

Host susceptibility factors

When hens are beak trimmed at a younger age, their beaks may regrow, and pecking can lead to cannibalism results in *E. coli* infection[2].

High egg production is associated with an imbalance between the oestrogen and the progesterone levels, which causes reduced resistance to ascending infections on the oviduct[26].

Various intrinsic and extrinsic factors like damage to mucosal and skin barriers, impaired mononuclear phagocytic system, immuno-suppression, extreme environmental temperature, stress and even the effects of vaccine viruses like Newcastle disease virus (NDV), infectious bronchitis virus (IBV) and infectious bursal disease (IBD) have been correlated with pathogenicity of *E. coli* in chickens[25]. Infectious laryngotracheitis virus, Marek's disease virus, influenza virus, chicken infectious anaemia virus, *Ascardia galli*, *Eimeria* species predisposes birds to colibacillosis[3]. Several pathogens like NDV,

IBV and *Mycoplasma gallisepticum* may play a part in the occurrence of colibacillosis[11].

Clinical signs

Pathogenic *E. coli* infection in birds may cause colisepticaemia, air sac disease, pericarditis and perihepatitis, mushy chick disease, acute septicaemia etc[21]. Clinical signs seen in birds affected with colisepticaemia are diarrhea, pasty vent, loss of appetite, depression, dyspnea and sneezing[27]. In air sac disease affected birds have cloudy, thickened, odematours air sacs with caseous deposition[1]. Clinical signs vary from inapparent to total unresponsiveness just prior to death depending on the specific type of disease produced by *E. coli*. Localized infections generally result in fewer and milder clinical signs than systemic diseases. Affected birds are typically undersized for the flock and found at the ends of the house along the side walls, or under feeder or waterers. Young birds with omphalitis and infected yolk sacs also may have difficulty in walking. Birds with colisepticaemia are often terminally moribund and the flock may be inactive and anorectic. They sit with their eyes closed in a hunched position with drooping of the head, neck and wings. Although, technically, death is not a clinical sign, this may be the main indication of an outbreak of colibacillosis in a flock. Clinical signs of predisposing or compounding factors often are seen concurrently with signs of *E. coli* infections[3].

Gross lesions

Gross lesions characteristic of colisepticaemia in birds inclusive of fibrinous perihepatitis, pericarditis, congestion and regression of ovarian follicles, mild to moderate flaccid and wrinkled ovarian follicles with rupture of theca wall resulting in egg peritonitis, salpingitis[12]. Rupture of ovarian follicles, presence of amorphous yolk material in the peritoneal cavity, more commonly attached to the surface of the ova and the serous surface of the intestines and oviduct through strands were the gross lesions observed in egg peritonitis associated with *E. coli* infection[23].

Diagnosis

Collection of samples

The diagnosis of colibacillosis is by isolation of *E. coli* from cardiac blood and affected tissues like liver, spleen, pericardium or bone marrow[11]. Bone marrow cultures are easy to obtain and are generally free of contaminating bacteria[3]. Swabs collected from liver, oviduct and body cavity were also used for isolation of *E. coli* from colibacillosis affected birds[12].

Isolation and identification

Selective media like MacConkey, eosin-methylene blue (EMB) or drigalki agar are used for isolation of *E. coli*[11]. A presumptive diagnosis of *E. coli* infection can be made if most of the colonies are characteristically dark with metallic sheen on EMB agar, bright pink with precipitate surrounding colonies on MacConkey agar, or yellow on tergitol-6 agar[3]. Further identification of the isolated colonies is based on biochemical reactions (indole production, fermentation of glucose with gas production, presence of beta-galactosidase, absence of hydrogen sulphide production and urease, and the inability to utilize citrate as carbon source[5]. *Escherichia coli* was identified as gram negative rods by Gram staining technique[12].

Economic losses

Colibacillosis is one of the main causes of economic loss in the poultry industry worldwide[2]. Despite being known for over a century, avian colibacillosis remains one of the major endemic diseases of poultry resulting in decrease in productivity, mortality and economic losses[15]. About 5.5 per cent mortality and 10-20 per cent drop in eggs was observed with *E. coli* infections in egg type layers reared in cages[16]. Heavy economic loss occurs in colibacillosis affected broilers and layers due to morbidity and mortality, reduced production and poor chick quality[17]. Omer *et al.*[14], reported that colibacillosis in layers caused 1.9 per cent mortality, results in 824.6 US $ economic loss in layers.

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