

Colibacillosis: An Inapparent Scourge of Poultry Production

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Colibacillosis is an infectious disease caused by the bacterium *Escherichia coli* (also known simply as *E. coli*), and is seen in poultry flocks throughout the world including India. Colibacillosis is a broad term used to describe a spectrum of diseases in poultry caused by various pathogenic strains of *E. coli*. These infections manifest as a complex interplay of factors, including the pathogen itself, the host's immune response and environmental conditions. The disease's manifestations range from mild respiratory or intestinal infections to severe systemic infections, leading to significant morbidity and mortality rates. The economic impact of colibacillosis on the poultry industry is substantial, with losses arising from decreased production, increased medication costs, and the culling of affected birds.

Clinical Symptoms

E. coli is gram negative facultatively anaerobic (can be both aerobic and anaerobic depending on environmental conditions) bacilli that are part of the normal intestinal microflora of poultry. Although most *E. coli* is non-pathogenic, some strains are able to establish themselves outside of the intestines and cause disease. These strains are known as Avian Pathogenic *E. coli* (APEC). High numbers of *E. coli* are maintained in the poultry house environment through faecal contamination and the common route of infection is inhalation of the faecally contaminated dust that contains large numbers of pathogenic *E. coli*.

Table 1- Symptoms affecting various organ systems of Poultry

S. No.	Organ system affected	Symptoms
1	Respiratory System	Respiratory colibacillosis often presents with clinical signs resembling those of respiratory infections. Affected birds may exhibit coughing and sneezing, which can be more prevalent in broiler chickens, pullets, and young layers. Nasal discharge, ranging from clear to mucopurulent, can be observed in birds with respiratory colibacillosis. This discharge may contribute to a wet environment within the housing, predisposing other birds to infection.
2	Heart and Air sacs	In cases of pericarditis and airsacculitis, affected birds may appear lethargic and weak. They may spend more time resting and exhibit reluctance to move. Birds with pericarditis or airsacculitis may experience labored breathing, manifested as an increased respiratory rate, gasping, and open-mouth breathing. The accumulation of exudate and inflammation within the air sacs and pericardial sac can restrict respiratory function.
3	Systemic spread	Colisepticemia, characterized by the systemic spread of <i>E. coli</i> , can result in a range of non-specific clinical signs. Affected birds may huddle together, appear lethargic, and show reduced activity. Diarrhea, often watery and greenish in color, can be observed in birds with colisepticemia. This condition can lead to dehydration and electrolyte imbalances.
4	Enteric manifestations	Colibacillosis can manifest as enteric infections, leading to diarrhea, dehydration, and electrolyte imbalances. Affected birds may pass watery feces with varying degrees of blood or mucus. Sick birds may display ruffled feathers and a hunched posture, indicating discomfort and illness. Layers affected by colibacillosis may experience a significant drop in egg production. The disease can negatively impact egg quality and shell integrity, resulting in economic losses.
5	Joints and osteomyelitis	In cases of colibacillosis affecting the joints, birds may exhibit lameness and swollen, painful joints. This condition is commonly referred to as septic arthritis. Due to joint pain and swelling, affected birds may have reduced mobility and difficulty in walking.
6	Reproductive System	Colibacillosis can lead to reduced fertility and poor hatchability in breeder flocks. The infection may affect the reproductive organs, particularly the oviduct, causing inflammation and damage. In severe cases, infected hens may develop egg yolk peritonitis, characterized by the accumulation of egg yolk within the abdominal cavity. This condition can lead to severe peritonitis and a drop in egg production.

The identification of the clinical signs and symptoms is crucial for the timely diagnosis and effective management of this disease, which has economic implications for the poultry industry. This disease shows a range of clinical symptoms and their impact on poultry health and production are summarized (Table 1). This bacterial disease is associated with a diverse range of clinical manifestations that can affect poultry health and productivity. As the poultry industry has evolved with changing management practices, breeding, and environmental factors, it is essential to understand the clinical signs of colibacillosis to facilitate early diagnosis and effective disease management.

Predisposing factors

Respiratory disease attributed to infection with *E. coli* is most commonly seen after respiratory stress caused by infections with *Mycoplasma gallisepticum* or viral agents such as Infectious bronchitis virus (IBV) and Newcastle disease virus (NDV). Environmental influences, such as temperature, humidity, and high concentrations of ammonia and dust in poultry houses, also contribute to the respiratory stress of birds. The intensification of poultry production, characterized by high stocking densities and rapid production cycles, can contribute to stress among birds. Stress weakens the immune response, making poultry more susceptible to *E. coli* infections. The implementation of effective biosecurity measures is crucial in preventing and controlling the spread of colibacillosis. Farms with strict biosecurity protocols, including controlled access, proper sanitation, and disease surveillance, are better equipped to minimize disease transmission. The indiscriminate use of antibiotics in poultry production, while aimed at preventing bacterial infections, can contribute to the emergence of antimicrobial-resistant in various *E. coli* strains.

Diagnosis of Colibacillosis

Colibacillosis causes typical pathology, which can be seen during post mortems of affected birds. Isolation of a pure culture of *E. coli* from the heart, liver or other lesions confirms the diagnosis.

Treatment of Colibacillosis

Treatment of colibacillosis in poultry, caused by avian pathogenic *E. coli* (APEC), relies on prompt antimicrobial therapy, usually administered via drinking water, with common choices including amoxicillin, enrofloxacin, and aminoglycosides. Effective management requires addressing underlying stressors, such as poor

ventilation, high ammonia levels, and concurrent infections. If there is high mortality due to *E. coli* infection, the live *E. coli* vaccine can be used as a treatment and is efficacious in 50 per cent of cases.

Prevention and control of Colibacillosis

Control measures taken to prevent *E. coli* infection in chickens primarily involve elimination of predisposing factors, which includes vaccinating birds against mycoplasmas, IBV and NDV. *E. coli* is susceptible to disinfectants and temperatures greater than 80° C, so thorough cleaning of poultry houses, thereby reducing exposure to pathogenic strains of *E. coli*, can help. Ensuring proper ventilation and chlorination of drinking water also reduces the levels of environmental contamination. Implementing stringent biosecurity measures is crucial in preventing the introduction and spread of *E. coli* on poultry farms. This includes controlling access, maintaining cleanliness, and monitoring the health status of incoming birds. Responsible use of antimicrobials is essential in mitigating the development of antimicrobial resistance. Veterinarians should prescribe antibiotics judiciously, and alternative strategies such as probiotics may be considered for disease prevention. Maintaining optimal environmental conditions, including proper ventilation, litter management, and sanitation, helps reduce the risk of *E. coli* contamination and transmission within the flock.

Colibacillosis remains a significant challenge in poultry production, with economic implications for the industry. The etiology of the disease is intricately linked to pathogenic strains of *E. coli*, possessing various virulence factors that enable them to colonize and invade the host's tissues. The pathogenesis involves the initial infection, attachment and colonization, tissue invasion, toxin production, and potential systemic spread. Modern production factors such as intensive farming practices, antimicrobial usage, biosecurity measures, vaccination, and nutritional management all play a role in control of colibacillosis in poultry. Efforts to control and manage colibacillosis in poultry production should take into consideration these multifaceted factors and focus on prevention, early detection, and responsible antimicrobial use. As the poultry industry continues to evolve, a holistic approach to disease management is essential to reduce the economic burden of colibacillosis and ensure the health and welfare of poultry in current production systems.
