



A Monthly e Magazine  
ISSN:2583-2212

July, 2023; 3(07), 1366-1369

Popular Article

## Poultry coccidiosis and its management

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<https://doi.org/10.5281/zenodo.8150773>

### Introduction

Poultry is one of the most rapidly escalating segments of the agricultural sector in India. During the last four decades poultry industry has changed itself from backyard to a scientific industry. In recent years, livestock sector has emerged as one of the leading sector among Indian agriculture and within it; poultry farming has contributed substantially to the nation's economy (Rath *et al.*, 2015).

Coccidiosis is recognized as the parasitic disease with the greatest economic impact on poultry industries worldwide (Allen and Fetterer 2002) due to production losses and costs for treatment or prevention (Shirley *et al.* 2005). It is caused by the protozoa of the phylum Apicomplexa, family Eimeriidae. There are nine different species of *Eimeria* which is mainly affecting the chicken and infecting various sites in the intestine and strictly host specific. Among nine *Eimeria* species affecting chicken, *Eimeria necatrix* and *Eimeria tenella* are the most pathogenic because schizogony stage occurs in lamina propria and crypts of Lieberkuhn of small intestine and caeca respectively. High mortality, weight loss and blood-stained droppings are frequent findings.

Both recovered and clinically infected birds shed oocyst in their droppings which contaminate feed, water, litter and soil. The clinical disease occurs after ingestion of large number of sporulated oocyst by bird. The process of infection is rapid (4-7 days) with parasite replication in host cells with extensive damage to intestinal mucosa (Sharma *et al.*, 2013). Sporulated oocyst survive long



depending on environmental factors. Oocysts are killed by freezing or high environmental temperatures. The control measure against this parasite has been through the use anticoccidial drugs, vaccines and strict management practice (Godwin and Morgan 2015).

### Etiology

The species of *Eimeria* which is highly host specific and its predilection site as follows:

Species	Predilection Site
<i>Eimeria tenella</i>	Caecum
<i>Eimeria acervulina</i>	Duodenum, Ileum
<i>Eimeria necatrix</i>	Jejunum, ileum, caecum
<i>Eimeria brunetti</i>	Caecum, rectum
<i>Eimeria maxima</i>	Jejunum, ileum
<i>Eimeria mivati</i>	Duodenum, rectum
<i>Eimeria mitis</i>	Ileum
<i>Eimeria praecox</i>	Duodenum, jejunum
<i>Eimeria hagani</i>	Duodenum, jejunum, ileum

(Source: Quiroz- Castañeda et al., 2015)

Majority of *Eimeria* have ovoid shape. *Eimeria maxima* (30.5 x 20.7µm) is the largest while *Eimeria mivati* (15.6 x13.4µm) and *Eimeria mitis* (15.6 x 14.2µm) are the smallest as compared to other species of *Eimeria*. Oocyst size, shape and color are helpful in identification of *Eimeria* species. *Eimeria tenella*, *Eimeria maxima*, *Eimeria acervulina*, *Eimeria hagani* and *Eimeria brunetti* are ovoid while *Eimeria necatrix* is oblong.

### Life cycle

#### Pathogenesis

Pathogenesis of the infection is influenced by species of the coccidia, concurrent diseases and nutritional factors. *E. necatrix* and *E. tenella* are the most pathogenic in chickens because schizogony occurs in the lamina propria and crypts of epithelium of the small intestine and ceca, respectively, and causes extensive hemorrhage.

The parasites invade the lining of the intestine and cause tissue damage, lowered feed intake, poor absorption of nutrients from the feed, dehydration, and blood loss (Fabiya, 2000). Most species develop in epithelial cells lining the villi (Kahn, 2008).

#### Clinical signs

Signs include droopiness, listlessness, loss of yellow colour in shanks, pale comb and wattles, ruffled feather, blood or mucus in faces, diarrhoea, dehydration and even death. (Habtamu et al., 2019).

#### Diagnosis

Diagnosis of coccidiosis is based on the faecal examination for oocyst, post mortem lesions.



It is possible to diagnose based on zone of intestine parasitized, gross appearance of lesion, oocyst morphology. Various criteria used to differentiate *Eimeria* species include clinical signs, characteristic lesions at particular sites of infection in intestine, pre-patent period, size of oocysts, sporulation time and morphology of intracellular stages (Conway et al., 2007).

### **Examination of oocyst in faecal droppings**

Floation method with saturated salt or sugar solution is important for detection oocysts in feces of infected birds. It can be a useful indicator of subclinical infection. Concentration floatation technique is also used for the collection of *Eimeria* oocysts from intestinal content of chickens. *Eimeria* oocysts isolation depends on the measurements of oocysts by using a calibrated ocular micrometer at 400x magnification (Conway & Mckenzie, 2007). Oocyst size, shape, and minimum sporulation time are helpful in identification of *Eimeria* species (Arabkhazaeli et al., 2011).

### **Molecular diagnosis**

Molecular method uses PCR assay by amplification of specific gene in the DNA sequences of *Eimeria* parasite. ITS-1 and ITS-2 are sequences which are excised from rDNA precursor through post transcription. They have been widely used in the identification of all the seven species of *Eimeria* in chickens using specific primers (Haug et al. 2007, 2008; Hamidinejat et al. 2010; Jenkins et al. 2006).

### **Post Mortem lesions**

Clinically the infection can be recognized by the accumulation of blood in the caeca and blood mixed diarrhoea (*E. tenella*), small white spots usually intermingled with rounded, bright or dull red spots of various size (*E. necatrix*), numerous array of whitish transverse patches in the upper half of the small intestine (*E. acervulina* and *E. mivati*) and there is a catarrhal enteritis and thickening of the intestinal wall and extensive coagulative necrosis and sloughing of the mucosa throughout the entire intestine (*E. brunetti*) (McDougald and Fitz-coy, 2008).

### **Treatment**

Anticoccidial drugs available for use finely or various combination are amprolium, clopidol, diclazuril, ethopabate halofuginanone and ionophores (monensin, lasalocid, narasin, maduramicin, nicarbasin, robenidine), and sulphaquinoxaline. Amprolium is structurally similar to and is a competitive antagonist of thiamine (vitamin B) because rapidly dividing coccidian has relatively high requirements for thiamine; nitrobenzamides exerts their greatest coccidiostatic activity against the asexual stages (Kahn, 2008). While ionophores are anticoccidials commonly used in the large-scale industry and they alter the function of the cell membrane and rupture the parasite. Ionophores also have antibacterial action and help to prevent secondary gut diseases (Fanatico, 2006).



## Management

Prevention of avian coccidiosis is based on a combination of good management and the use of anticoccidial compounds in the feed or water. Litter should always be kept dry and special attention should be given to litter near water fonts or feeding troughs (Taylor et al., 2007). Special care is needed in rainy season when moisture is prevalent along with suitable temperature for sporulation of oocysts. In case of clinical outbreaks, it is essential to remove and isolate the clinically affected birds because they excrete of oocysts every day, thus endangering the health of other birds (Roy, 2007).

## Immunoprophylaxis

*Eimeria* spp are highly immunogenic and primary infections can stimulate solid immunity to homologous challenges. So, immunological control has been recognized as the major practical alternative to chemotherapy for coccidiosis control.

Different types of vaccines available for chicken coccidiosis:

Vaccine	Description	Meant for
Coccivac D	Wild type, 7 Spp, oral	Breeders/Layers
Coccivac B	Wild type, 4 Spp, oral	Broilers.
Immucox C1	Wild type, 4 Spp, oral	Broilers/Breeders
Livacox D	Attenuated, 2 Spp, oral	Caged chicken
Livacox T	Attenuated, 2 Spp, oral	Breeders/Broilers
Paracox	Attenuated, 7 Spp, oral	Breeders/Layers
Cox Abic	Subunit vaccine from <i>E. maxima</i>	Breeders/ Broilers

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