

Popular Article

Coccidiosis in poultry: A major threat to poultry industry

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<https://doi.org/10.5281/zenodo.6976078>

Abstract

Coccidiosis is one of the most important protozoan diseases affecting the poultry sector all over the world. Coccidiosis is caused by the many species of Eimeria. They are typically intracellular parasites of the epithelial cells of the intestine of vertebrates. Coccidiosis can occur in all age groups of birds. Eimeria tenella is the most pathogenic than other species of Eimeria. Coccidiosis causes high mortality in chickens and this led to great economic loss to poultry sector. So, it is important to control the coccidiosis by better management in poultry houses, use of prophylactic coccidiostatic drugs and by vaccination of chickens.

Keywords: Poultry, coccidiosis, Treatment and control

Introduction

India presently holding the third rank in the world in egg production and poultry meat production has reached about 4.2 million tons per year. It is clear that the poultry sector is not only playing a great role for the nutritional safety of the country, but also providing working chance to the population of the world (Shirley et al., 2007). About three million people in India are directly linked to the poultry sector and contributing to the economy of the nation. Coccidiosis is caused by the different species of Eimeria. They are typically intracellular parasites of the epithelial cells of the intestine of vertebrates. Among all the Eimeria sp., Eimeria tenella is the most pathogenic strain that causes high mortality in chicken flocks. This high mortality due to coccidiosis causes great loss to the poultry industry. Intensive system of rearing gives more chances for transmission of the coccidian oocysts.



Different *Eimeria* species of poultry

Eimeria acervulina, *Eimeria brunetti*, *Eimeria hagani*, *Eimeria maxima*, *Eimeria mitis*, *Eimeria mivati*, *Eimeria necatrix*, *Eimeria tenella* and *Eimeria praecox*.

Eimerian reproduction

The lifecycle of the *Eimeria* sp. includes development in both inside and outside of the host. Within the host, parasite undergoes both asexual and sexual stages of development. In general, oocysts pass via faeces and get sporulated in the external environment. The excystation of the oocysts within the intestinal lumen is favoured by trypsin, bile and CO₂ and the released sporozoites penetrate the villous epithelial cells. Sporozoites of some species (*E. brunetti* and *E. praecox*) develop within cells at the site of penetration. Sporozoites of other species (*E. acervulina*, *E. maxima*, *E. necatrix*, and *E. tenella*) are transported to crypt epithelium (Trout and Lillehoj, 1993), where they develop as trophozoites. Within the host cells, trophozoites undergo asexual reproduction (schizogony or merogony) to produce merozoites which penetrate the healthy intestinal cells. A few cycles of merogony take place which is followed by sexual reproduction or gametogony. Merozoites enter the host cells and differentiate into either microgamonts (male) or macrogamonts (female). The microgamonts divide to form microgametes, which fertilize the macrogamonts and lead to the development of oocysts which are passed through the droppings.

Transmission of coccidiosis

It is a man-made disease due to overcrowding and unhygienic conditions in the poultry houses responsible for spreading and reinfection.

Pathogenesis of coccidiosis

Coccidiosis can occur in all age groups of birds. The presence of oocysts normally discharged by the carriers in their droppings. *E. tenella* is the most pathogenic than other species. *E. tenella* is most commonly found in 4 weeks old chicks, while 2 weeks old chicks are comparatively resistant. Chicks less than one week old are most susceptible to *E. brunetti*. *E. necatrix* infection commonly occurs in birds of six weeks age and above. *E. acervulina* is common in both young and old birds. Three types of coccidiosis are identified in poultry:

- (1) Intestinal coccidiosis caused by *E. necatrix*, *E. maxima*, *E. acervulina* and *E. mivati* affecting the small intestine.
- (2) Caecal coccidiosis caused by *E. tenella* affecting the caecum.
- (3) Rectal coccidiosis caused by *E. brunetti* affecting the lower small intestine, rectum and cloaca.



Clinical symptoms

Intestinal coccidiosis

- There is chronic watery diarrhoea without blood, Malabsorption of feed leads to stunted growth and decline in egg production
- In chronic form, the birds show watery mucoid dropping which soil the vent and feathers of the tail

Caecal coccidiosis

- Initially the bird droop, stop feeding but may continue to take water
- Pass large quantities of blood in dropping (red diarrhoea), become anaemic and die, Some of the recovered birds may show paralysis

Rectal coccidiosis

- Affected birds pass white fluidy droppings mixed with blood and mucus casts
- Loss of body weight due to severe dehydration or reduced food intake.

Lesions found in intestine of different coccidian infection

- In *E. acervulina* infection, upper part of small intestine especially duodenum shows white pin point foci or streaks running transversely in the intestinal mucosa.
- In *E. maxima* infection, middle portion of small intestine becomes flaccid and dilated. Inflamed mucosa covered with pinkish mucoid exudates with blood.
- In *E. mivati* infection, intestinal mucosa reveals oedematous petechiae. Greyish white mucosal lesions, representing colonies of gamonts and oocysts, are circular and petechial haemorrhages may also be seen.
- In *E. necatrix* infection the main lesions occur in the middle small intestine. Serosal surface of the small intestine show pin point to pin head sized greyish white foci.
- In *E. tenella* infection, petechial haemorrhage seen in caecum. The caecal pouch becomes greatly enlarged and there is dark brown to blackish caseous mass in caecum.
- In *E. brunetti* infection, lesions are confined to posterior part of small intestine between the yolk stalk and caecum. The gut wall is covered with haemorrhagic catarrhal exudate.

Diagnosis of coccidiosis

(1) History of the flocks (2) Clinical signs of various coccidiosis (3) Examination of faeces to detect the oocysts (4) Postmortem findings: dead as well as affected birds may be sacrificed to get the pathogenic lesions. The location and type of lesion will provide the clue.

Treatment of coccidiosis

A lot of drugs are available against poultry coccidiosis. Some of them are coccidiostatics while others are coccidiocides.



- (1) **Sulphonamides**- It includes: (a) Sulfaquinoxaline @ 120-250 ppm along with feed or water (b) Sulfadimidine @ 120-250 ppm along with feed or water
 - (2) **Thiamine analogues**: Amprolium @ 62.5-125 ppm
 - (3) **Nitrofurans**: They are coccidiostatic drugs (a) Nitrofurazone @ 120 ppm for curative purpose and 50 ppm for prophylactic use (b) Furazolidone @ 120 ppm for curative purpose and 50 ppm for prophylactic use
 - (4) **Carbanilide derivatives**: Nicarbazin @ 100-125 ppm
 - (5) **Nitrobenzamide**: Zoalene @ 62.5-125 ppm
 - (6) **Pyridinoles**: Clopidol @ 125 ppm
 - (7) **Polyether ionophorus antibiotics**: (a) Monensin @ 100-125 ppm (b) Lasalocid @ 100-125 ppm (c) Salinomycin @ 50-70 ppm
 - (8) **Triazine derivatives**: (a) Toltazuril @ 25 ppm in water (b) Diclazuril @ 1-5 ppm in water
- Control of coccidiosis**: Control of coccidiosis is based on combination of good managerial practices in poultry houses and chemotherapy.

(1) Chemotherapy

Anti-coccidial drugs are available for curative and prophylactic purpose. But the emergence of drug resistance has created a great problem mainly due to the frequent use of same drug and it can be avoided by following 'Shuttle programme'.

(2) Hygienic measures

(a) The litter should always be kept dry (b) Feeding and water troughs should be kept to such a height that they cannot be contaminated by droppings (c) Good ventilation should be provided to reduce humidity and sporulation of coccidian oocysts (d) Overcrowding of flocks should be avoided (e) The faeces should be cleared regularly (f) High protein feed along with vitamins (especially fat soluble vitamins, i.e. A, D, E and K)

(3) Vaccination

Live vaccines (Coccivac[®], Immunocox[®]) are available to induce immunity against coccidiosis. It is a suspension of live oocysts of 8 species of *Eimeria* of chicken except *E. hagani*. It is given in the drinking water at 3-5 days of age. Live attenuated vaccine (Paracox[®]) is also available in which precocious lines of different species have been used and is given orally. Recently a subunit vaccine (Cox A bic[®]) has been launched in market where purified proteins of gametocytes have been used.

Conclusion

Poultry industry plays important role in the economy of the nation. Coccidiosis causes great loss to the poultry sector due to high mortality of poultry take place in the coccidiosis. So control of



coccidiosis is important, the current methods of control of coccidiosis are by anticoccidial drugs, vaccines and managerial practices. But due to use of same drugs it causes resistance against coccidiosis. To plan an effective vaccine, it is important to understand the dynamism in the evolution of diversity among genes that encodes effective vaccine antigens at the genome level along with the related factors that drive this diversity.

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