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Poultry Coccidiosis - An Overview on Etiology, Diagnostic Practices and Preventive Measures

Dr. M. Fibi Rani[1]*, Dr. J. Shashank[2]

[1]PhD Scholar, Division of Parasitology, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India.

[2]Subject Matter Specialist (Veterinary Medicine), Krishi Vigyan Kendra, P.V. Narsimha Rao Telangana Veterinary University, Mamnoor, Warangal, Telangana.

Abstract

Coccidiosis is caused by the apicomplexan parasite of the genus *Eimeria* which has seven known species that affect the different parts of the intestinal tract of chickens. It is a deadlydisease that hampers poultry productivity and welfare. Thus, the disease is a major menace to the global poultry industry. The disease which occurs by ingestion of sporulated oocyst has been associated with poor poultry management systems. Mixed infection among this parasite species contributes to both pathogenicity and misdiagnosis of the disease. Progress in the identification and diagnosis approach which cuts across pathological, morphological and molecular has been reported for this parasite. Control measures include anti-coccidial drugs, vaccines and proper hygiene protocols in the farm.

Introduction

The poultry industry is one of the fastest growing sub-sector of agriculture that contributes to global nutrition and thus a major driving force of the economy. Chicken, a major poultry bird contributes greatly to agricultural production through the supply of meat and eggs (Mottet and Tempio, 2017; Hald, 2010). However, chickens are also host to many deadly diseases which hampers productivity and compromise welfare resulting in high mortality in some cases. Among many diseases that affect chickens globally, coccidiosis is a house-hold name associated with a high level of mortality in the poultry industry. Chicken coccidiosis is an enteric disease that impairs growth and suppresses the immune system resulting in high mortality, estimated to cost more than 3 billion annually in poultry industry (Blake and Tomley, 2014). The disease is caused by protozoan apicomplexan parasites of the genus *Eimeria* which consist of over 1000 species (Blake, 2015). In chicken, seven species of *Eimeria* have been identified among which *E. tenella*, *E. maxima* and *E. acervulina* have been regarded as the most economically significant species. Co-infection of *Eimeria* species is common in coccidiosis which contributes not only to pathogenicity but also leads to misleading diagnosis (Thenmozhi *et al*., 2014; Jenkins *et al*., 2008). Identifying *Eimeria* species is important as it provides the bedrock for effective control measures. A morphological approach based on examination of oocyst by microscope and some parasitological parameters were the first-generation approach used in the identification of *Eimeria* species. However, several limitations such as complexity, expertise and confusing characteristics among species have reduced the efficacy of this method (Kawahara *et al*., 2010). This has given room for a molecular approach. The control measure against this parasite has been through the use of anticoccidial drugs, vaccines and strict management practices (Godwin and Morgan 2015). However, the emergence of resistant strains has threatened the effectiveness of these anticoccidials necessitating a modification in the present control method.

Predisposing factors for the coccidial infestation in birds

- Poor managemental practice or poor hygiene on the farm.
- Wet litter.
- Deep litter system.
- Inadequate ventilation.
- High stocking density.
- Concurrent diseases.
- Poor nutritional status.

Transmission

Coccidiosis spreads fast in deep litter rearing system; transmission occurs through contaminated feed and water, faeco-oral route. Susceptibility of the fowl to different species of coccidia is related to age group. *E. tenella* is commonly encountered in chicks of 4 weeks old and *E. necatrix* in birds of 6 weeks old and above.

Pathogenesis

The pathogenicity of coccidiosis is influenced by host genetics, nutritional factors, concurrent diseases, age of the host, and species of coccidia. Of all the coccidian species, *E. tenella* is the most pathogenic followed by *E. necatrix*, because schizogony occurs in the lamina propria and crypts of Lieberkuhn of the small intestine and caeca, respectively, and causes extensive hemorrhages. *E. maxima* and *E. acervulina* are of moderate pathogenicity. *E. brunetti* is uncommon and *E. mivati* has a very low mortality rate.

Types of coccidiosis in poultry:

1) Intestinal coccidiosis due to *E. necatrix. E. maxima, E. acervulina* and *E. mivati* affecting small intestine.
2) Caecal coccidiosis due to *Eimeria tenella*.
3) Rectal coccidiosis due to *E. brunetti* in the lower small intestine, rectum and cloaca.

Clinical signs

Intestinal coccidiosis: In *E. necatrix*, acute form is characterized by blood-stained droppings and death occurs within 5-7 days after the infection. In chronic form, bird show watery mucoid dropping which soils the vent and feathers of the tail. *E. acervulina* infection is characterized by watery diarrhoea, malabsorption of food, stunted growth, decline in egg production.

Caecal coccidiosis: Dull and depressed birds, roughened feathers, drooping, stops feeding but may continue to drink, passing of blood mixed droppings, dehydration, anaemia and death.

Rectal coccidiosis: White fluidy droppings mixed with blood and mucosal shreds, inappetence, severe dehydration, reduction in body weight.

- Most of the time birds will recover but sometimes, secondary bacterial infection of clostridium causes necrotic enteritis and death occurs due to dehydration.

PM lesions: In *Eimeria tenella*, haemorrhagic typhlitis, enlarged caeca and presence of caecal core are evident, *Eimeria necatrix* causes salt and pepper appearance of intestine, ballooning of intestine, intestinal bleeding lesions and mucous accumulation in intestine. *Eimeria brunetti* causes lesions in lower part of intestine, rectum, caeca and cloaca. Haemorrhagic ladder like streaks are present on the mucosa of lower intestine and rectum.

Diagnosis

- Faecal smear examination under microscope (10 x and 40 x) will reveal *Eimeria* oocyst.
- History of flock, low feed conversion rate, passing watery droppings mixed with mucosal shreds and blood.
- Clinical signs of sudden onset of diarrhea and dysentery.
- By post-mortem examination - presence of enteritis lesions in intestine with mucus accumulation, haemorrhagic enteritis, salt and pepper like lesions in various part of intestine as per the location and species of *Eimeria* infested the intestine, thickening of the wall of intestine, petechial haemorrhages and dehydrated pale carcass.

Differential diagnosis

- Colibacillosis
- Salmonellosis
- Necrotic enteritis

Treatment

- Once the disease is diagnosed, treatment should be given immediately and removal of stress factor should be done early. Drugs including Sulpha group, Amprolium compounds, Monensin, and Tetracycline compounds should be given. Prophylaxis dosage should be given in endemic areas in drinking water. Feed additive coccidiostats should be used in suspected farms.
- The emergence of drug-resistant strains of coccidia is a major problem, so a plan to avoid the development of drug resistance which includes the switching around thirteen classes of drugs and the “Shuttle programme” has been suggested.

Control

- Immunoprophylaxis: acquired immunity is built against each species by repeated successive exposures to small number of oocysts of all species.
- Control through selective breeding.
- Nutritional supplementation.
- Sanitation and management practices.
- Prevent chicken from coming in contact with faeces containing oocysts.
- Avoid any type of stress on birds.
- Provide clean feed and water to birds.
- Avoid rearing of mixed age group birds in the same unit.
- Following good bio-security measures in the farm.
- Quarantine should be followed strictly in the farm.
- Isolate and treat the affected birds.
- Regular vaccination and deworming should be followed.
- Wet litter should be cleaned out and replaced with dry liter regularly.
- Prophylactic medication.
- Proper disposal of litter material.

Conclusion

- Despite the key role the poultry industry plays in the economy of each nation, the menace of coccidiosis has been a limiting factor. Though the fight against chicken coccidiosis has been on for several decades, the resurgence of this disease coupled with new variants among *Eimeria* parasite in different geographical areas demands fresh attention on their control measures. The current methods of anticoccidial drugs, vaccines and strict management practices have proven effective but the emergence of genetic and antigenic diversity is a major threat on the effectiveness of the present anticoccidial vaccines and drugs.

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