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Protecting Young Calves from Coccidiosis: Challenges and Control Strategies

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Abstract:

Bovine coccidiosis is a widespread enteric disease caused by *Eimeria* spp. that predominantly affects young calves, resulting in diarrhoea, reduced growth, impaired feed efficiency, and substantial economic losses to the cattle industry. Among the recognized species, *Eimeria bovis* and *Eimeria zuernii* are the principal pathogens responsible for severe intestinal lesions and clinical disease. This paper summarizes the current understanding of the epidemiology, life cycle, pathogenesis, clinical manifestations, diagnostic approaches, and control strategies of bovine coccidiosis. The paper also discusses the limitations of conventional control measures, emerging concerns regarding anticoccidial resistance, and the importance of integrated management practices for effective disease prevention.

Keywords: Bovine coccidiosis; Eimeria bovis; Eimeria zuernii; epidemiology; pathogenesis; molecular diagnosis; integrated control; cattle.

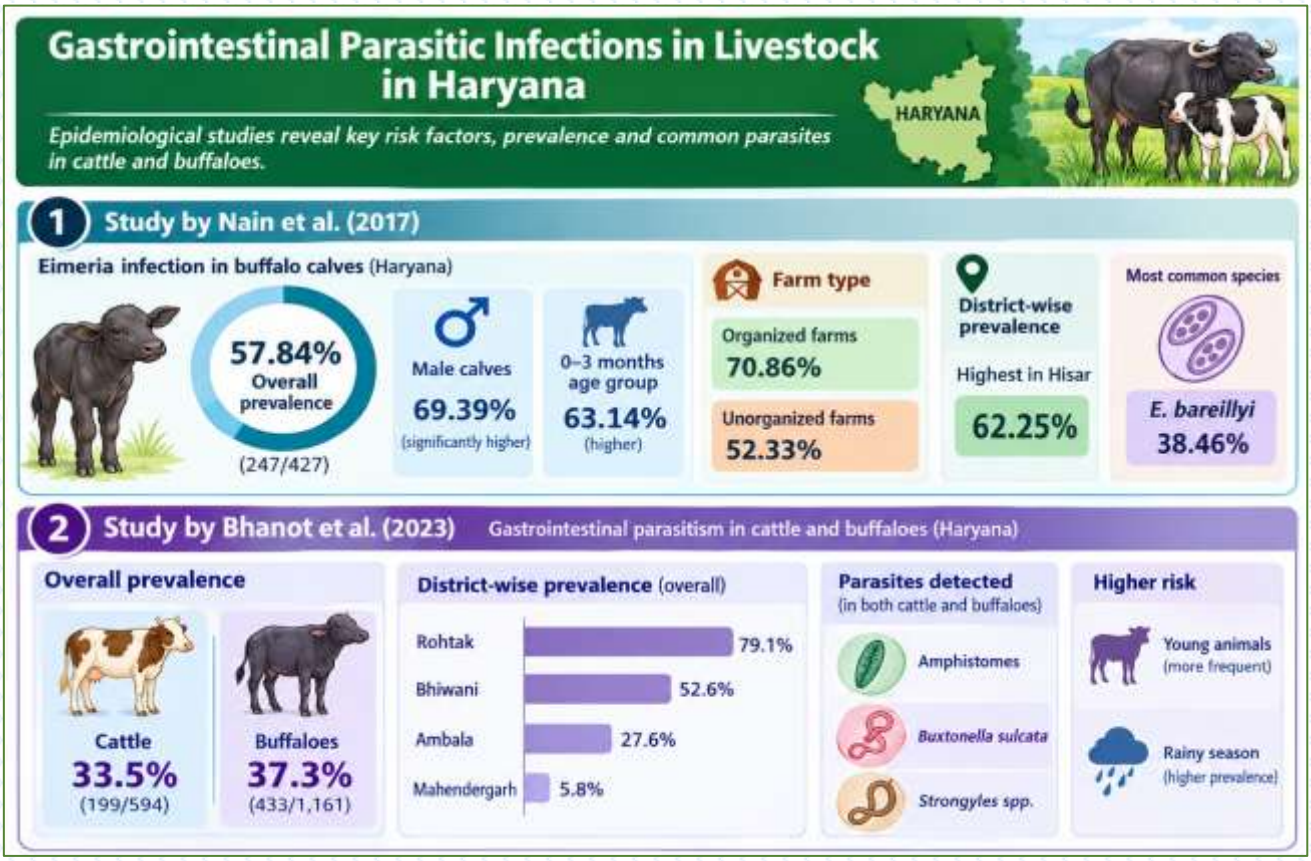
Introduction:

Coccidiosis is one of the most economically important parasitic diseases affecting a wide range of domestic animals, including poultry and cattle. In cattle, the disease is caused by intracellular protozoan parasites belonging to the genus *Eimeria* and is distributed worldwide, posing a significant challenge to the livestock industry. Bovine coccidiosis is associated with considerable economic losses resulting from reduced weight gain, impaired feed conversion efficiency, poor growth performance, decreased productivity, increased morbidity and mortality, and the substantial costs incurred for treatment and preventive control measures.

Epidemiogical Findings in India and Haryana:

The infection rates of gastrointestinal parasitic infections differed across agro-climatic zones in India, highlighting the possible influence of local climate and management practices on parasite

occurrence. In Punjab, gastrointestinal parasitic infections were quite common in buffalo calves, affecting 73.58% of the 1,582 calves examined. *Eimeria* spp. was the most frequently detected parasite (54.55%), followed by *S. papillosus* and strongyles (Jyoti *et al*. 2014). *Eimeria* infection was present in 11.97% of the 2,339 dairy cattle examined in Guwahati, Assam. The infection was more common in heifers (45.4%) and calves (33.2%) than in adult cattle (21.4%). Cases were more frequent during the post-monsoon (16.29%) and monsoon (15%) seasons, suggesting that humid and wet conditions may favor transmission. Among the seven species identified, *E. bovis* (6.80%) was the most common, followed by *E. zuernii* (2.35%), with oocyst counts ranging from 50 to1,500 OPG. (Das *et al.,* 2015)



Epidemiological studies in Haryana revealed that Eimeria infection was common among buffalo calves, with an overall prevalence of 57.84% (247/427). Infection was significantly found higher in male calves (69.39%) and in younger calves aged 0-3 months (63.14%), while organized farms recorded greater prevalence (70.86%) than unorganized farms (52.33%). Hisar showed the highest district-level prevalence (62.25%), and *E. bareillyi* was the most frequently (38.46%) detected species (Nain *et al.* 2017). According to study of Bhanot *et al.* (2023) conducted in Haryana, gastrointestinal parasitism shows an prevalence of 33.5% in cattle (199/594) and 37.3% in buffaloes (433/1,161). The highest overall prevalence was recorded in Rohtak district (79.1%), followed by Bhiwani (52.6%), Ambala (27.6%) and Mahendergarh (5.8%). *Amphistomes*, *Buxtonella sulcata* and Strongyles spp. were detected in both cattle and buffaloes. Infection was more frequent in young animals and tended to be higher during the rainy season.

Etiology:

Bovine coccidiosis is an intestinal parasitic disease caused by host-specific, unicellular protozoan parasites belonging to the genus *Eimeria*. To date, at least 13 *Eimeria* species have been identified in cattle; however, *Eimeria bovis* and *Eimeria zuernii* are recognized as the most frequently implicated in clinical disease and are responsible for substantial production losses. These parasites are responsible for the majority of clinical cases of bovine coccidiosis and are frequently associated with severe intestinal pathology, including extensive epithelial damage, haemorrhagic enteritis, and diarrhoea, particularly in young calves. Despite the marked host specificity of *Eimeria* species, cattle are commonly infected with multiple species simultaneously, making mixed-species infections considerably more prevalent than infections caused by a single species. Such mixed infections may increase disease severity and complicate diagnosis, epidemiological investigations, and control strategies. The comparative characteristics of the two species is given in Table no. 1.

Table no. 1: The comparative characteristics of Eimeria species affecting cattle.

Eimeria bovis	***Eimeria zuernii***
Large oocyst measuring approximately 25–34 × 17–23 µm.	Smaller oocyst measuring approximately 15–23 × 13–19 µm.
Causes severe lesions primarily in the ileum and large intestine	Mainly affects the cecum and colon.
Associated with hemorrhagic enteritis and poor growth	Responsible for acute and severe outbreaks of diarrhoea in calves.

Transmission:

Bovine coccidiosis is primarily transmitted through the fecal-oral route following the ingestion of sporulated Eimeria oocysts present in contaminated feed, drinking water, bedding, or the environment. Contaminated housing facilities, feedlots, pastures, and water sources serve as major reservoirs of infection, facilitating the spread of the parasite among susceptible animals. Environmental persistence of oocysts, particularly under favourable conditions of temperature and humidity, further enhances disease transmission within cattle populations.

Risk Factors:

Several host, environmental, and management-related factors contribute to the occurrence and severity of bovine coccidiosis. Clinical infection most commonly is seen in about calves of 1–2 months of age but can occur up to 1 year of age. Infection generally spread from the contaminated environments, particularly when conditions are moist and humid conditions. In winter season cases are less in number.

- Young calves and recently weaned animals are particularly susceptible because of their immature or insufficiently developed immunity.

- Stress associated with weaning, transportation, overcrowding, abrupt dietary changes, and adverse weather conditions predisposes animals to clinical disease.
- Additional risk factors include high stocking density, confinement in poorly drained or restricted areas, feeding directly on contaminated ground or inadequately cleaned troughs.
- Poor hygiene and sanitation, and the accumulation of fecal material, all of which increase environmental contamination with infective oocysts and promote disease outbreaks.

Clinical Signs:

The clinical presentation of bovine coccidiosis ranges from asymptomatic or subclinical infections to severe enteric disease. Affected animals commonly exhibit diarrhoea, which may become haemorrhagic in severe cases. Along with dehydration, anorexia, reduced feed intake, poor weight gain, anaemia, and generalized weakness is observed. Severe infections are most frequently observed in young calves, in which heavy parasite burdens can result in marked intestinal damage, reduced productivity, high morbidity, and, in some cases, mortality.

Pathological Findings:

Grossly, coccidial infection is associated with intestinal congestion, haemorrhage, oedema, thickening of the mucosa, necrotic debris, and intestinal ballooning (Fig 1), with lesions being most pronounced in the ileum and caecum. Histologically, there is hemorrhagic enteritis characterized by marked mucosal and submucosal congestion, inflammatory cell infiltration, villous destruction and stunting, necrosis, crypt dilation, and goblet-cell hyperplasia. Different stages of coccidia gametogony are observed within the intestinal mucosa, with occasional extension into the submucosa (Fig 2) and formation of coccidial nests in Peyer's patches.



Fig 1: Coccidia affected intestine showing congestion, haemorrhage, oedema, thickening of the mucosa.

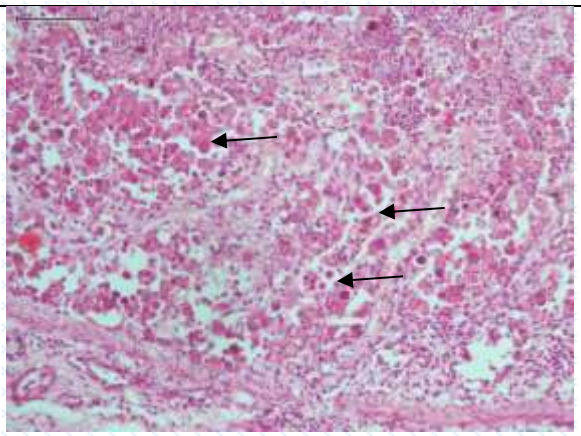


Fig 2: Coccidia affected intestine: Different stages of *Eimeria* gametogony (arrow) within the intestinal mucosa, along with villous necrosis and stunting. H&E stain 200X.

Diagnosis:

The diagnosis of bovine coccidiosis is primarily based on the microscopic detection and identification of *Eimeria*oocysts in fecal samples using fecal flotation techniques. Histopathological examination of intestinal tissues can confirm infection by demonstrating characteristic developmental stages of the parasite and associated intestinal lesions. In recent years, molecular diagnostic techniques, particularly polymerase chain reaction (PCR)-based assays, have emerged as highly sensitive and specific tools for species identification, epidemiological investigations, and the detection of mixed *Eimeria* infections.

Treatment:

Coccidiosis is a self-limiting disease, and spontaneous recovery without specific treatment occurs commonly when the multiplication stage has passed. Commonly used drugs for treatment include anticoccidial drugs such as sulpha drugs and others, like amprolium as given in Table no. 2.

Table no. 2: Anticoccidial drug used for treatment and prevention in cattle

	Drug	Dosage
Disease reduction methods	Amprolium*	10 mg/kg daily for 5 days
	Sulfaquinoxaline	2.7 mg/kg daily for 3-5 days
	Sulfamethazine	110 mg/kg daily for 5 days
Prevention	Bovatec	1 mg/kg) per day, max. 360 mg/day
	Deccox	22.7 mg/100 lb. daily for 28 days
	Rumensin	100 to 360 mg/head per day

*Provision of thiamine after treatment should be considered. Treatment should be given in consultation with a veterinarian.

Prolonged use of chemical medications often results in drug resistance, significantly diminishing their efficacy.

Prevention and Control:

Effective prevention and control of bovine coccidiosis rely primarily on the implementation of sound husbandry and biosecurity practices aimed at minimizing environmental contamination and reducing exposure to infective *Eimeria* oocysts.

- Maintaining high standards of hygiene through the routine removal of fecal material and regular cleaning and disinfection of housing facilities is fundamental to limiting parasite transmission.
- The provision of clean drinking water and balanced, high-quality feed supports optimal immune function, thereby improving resistance to infection and reducing the severity of clinical disease.

- Avoiding overcrowding and maintaining appropriate stocking densities help minimize environmental contamination and decrease the risk of cross-transmission among susceptible animals.
- Water troughs should be elevated above ground level to reduce contamination, while grazing should be restricted in areas adjacent to ponds, streams, or other wet environments where infective oocysts may accumulate.
- An integrated approach combining good management practices with strategic anticoccidial interventions and continuous monitoring remains the most effective strategy for the long-term control of bovine coccidiosis.

Conclusion:

Bovine coccidiosis remains a major constraint to sustainable cattle production, causing significant economic losses through both clinical disease and often-overlooked subclinical infections. Although advances in molecular diagnostics have greatly improved species-specific detection and epidemiological surveillance, effective control continues to be challenged by the environmental persistence of *Eimeria* oocysts, mixed-species infections, and the emergence of anticoccidial drug resistance.

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