

Prevalence of Coccidial Infection in Cattle in Shaanxi Province, Northwestern China

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Abstract: In the present study, the prevalence of coccidial infection was investigated in dairy cattle and Qinchuan cattle in Shaanxi province, Northwestern China. A total of 228 cattle (83 and 145 for dairy cattle and Qinchuan cattle, respectively) feces samples were collected and examined by flotation technique using saturated saline. Coccidial oocysts were seen in 90 faecal samples with overall prevalence of 34.94% (29/83) and 42.07% (61/145) for dairy cattle and Qinchuan cattle. About 12 *Eimeria* (namely, *E. subspherica*, *E. ellipsoidal*, *E. zurnii*, *E. pellita*, *E. bovis*, *E. canadensis*, *E. bukidnonensis*, *E. cylindrica*, *E. auburnensis*, *E. brasiliensis*, *E. bombayensis*, *E. alabamensis*) and one *Isospora* (only found in Qinchuan cattle) species were identified according to the time of sporulation Coudert's key and morphological features of sporulated oocysts with the most common species of *E. bovis*, *E. ellipsoidal*, *E. zurnii*. Total >80 and 90% samples for two breeds were infected with ≥ 2 species. The coccidial Oocysts Per Gram (OPG) were ranged from 0-2150 with average of 276. These results suggested that integrated strategies should be implemented to prevent and control coccidial infection in cattle in this province.

Key words: Prevalence, coccidial infection, Shaanxi province, sporulation infection, Northwestern China, Flotation Technique

INTRODUCTION

Coccidiosis, one of the most important worldwide parasitic protozoa diseases can infect many of livestock and wild animals even including humans. Coccidial species inhabit in the intestinal epithelial cells and reproduce, leading to mucosa damage and the appearance of the clinical symptom, malnutrition, anemia, waste away, diarrhea and bloody stool (Sheng, 2006; Shi, 2011). Coccidial infections in cattle have been reported worldwide and in some provinces of China (Table 1). Coccidial infection in cattle mainly occurred in calves because of the incomplete immune system, intensive feeding and management systems (Rehman *et al.*, 2011; Lu *et al.*, 2009) with severe diarrhea and even death and recovered cattle would present to be low production of milk and meat (Chen *et al.*, 2006; Lu *et al.*, 2008).

Qinchuan cattle, one of the most important beef varieties in China is mainly raised in Shaanxi province and it also has been introduced to many other provinces of China. However, prior to the present study there has been no published study on coccidial infection of Qinchuan cattle. Therefore, the objectives of the present study were to investigate the coccidial species and its infection status in Qinchuan cattle in Shaanxi province and compare them to dairy cattle in this province.

Table 1: Prevalence of coccidial infection in cattle in the People's Republic of China (PRC)

Province/ Usage	cities	No. tested	Positive (%)	Time tested (years)	References
Meat	Yunnan	372	50.00	1981-1982	Zuo and Chen (1984)
Meat	Anhui	209	65.07	1997-1998	Li <i>et al.</i> (1999)
Milk	Henan	223	29.60	1999	Zhang <i>et al.</i> (2000)
Milk	Anhui	540	66.34	Unknown	Li <i>et al.</i> (2004)
Milk	Guangdong	223	36.32	2002-2003	Liu and Chen (2004)
Milk	Shaanxi	48	45.83	Unknown	Zhai <i>et al.</i> (2006)
Milk	Shanghai	718	37.46	2005	Zhao <i>et al.</i> (2007)
Milk	Inner Mongolia	3000	9.54	Unknown	Zhang <i>et al.</i> (2008)
Meat	Qinghai	70	72.86	Unknown	Chen and Zhang (1989)
Milk	Jiangsu	2100	33.52	2008-2009	Jin <i>et al.</i> (2010)

MATERIALS AND METHODS

Faecal samples: A total of 228 (145 and 83 from Qinchuan cattle and dairy cattle, respectively) fecal samples were collected from the small holder farms distributed in Shaanxi province, Northwestern China. The samples were stored at 4°C until examined.

Recovery and species identification of coccidian oocysts: The presence of coccidial oocysts in the samples was examined by the flotation method using saturated saline as the flotation medium. Faecal sedimentation procedure was carried out according to Li *et al.* (1999). The modified McMaster technique was used to quantify the coccidian

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Oocysts Per Gram (OPG) of faeces. Oocysts in the both counting chambers of the slide were counted and the mean number of oocysts was multiplied by the dilution factor (100) to get an estimation of OPG. Each sample was examined 3 times to get a precise number. The result was the mean value of the three independent examinations done by the same individual. Coccidian oocysts were purified and transferred into 2.5% of (w/v) potassium dichromate solution at 26-28°C to be sporulated. During the period, the sample solution was shaken to mix up every 6 h. After sporulation, the coccidian oocysts were placed on slides for microscopic examination with 400 x magnification (one 10 x ocular glass and one 40 x objective glass). The sizes of oocysts and sporocysts measured and morphological characteristics (shape, colour, micropyle and cap, polar granule and stieda bodies) observed were recorded as the basis of identification according to Courtney *et al.* (1976), Levine (1985) and Zhang *et al.* (2000). At least 50 sporulated oocysts of different species were measured.

Statistical analysis: The SPSS software was used to analyze data to evaluate the differences in prevalence of coccidial infection between different groups of cattle and a value of $p < 0.05$ was considered to be significant difference.

RESULTS AND DISCUSSION

In the present study, 90 of 228 faecal samples were positive for coccidial oocysts with an average infection rate of 39.47%. Prevalence of coccidial infection for Qinchuan cattle was 42.07% (61/145) which was a little higher than that of dairy cattle (34.94%, 29/83) but with no statistically significant ($p > 0.05$).

For the Qinchuan cattle, the highest prevalence was found in weaned calves (3-12 months) and the lowest was found in group of >2 years old but prevalence of coccidial infection in dairy cattle were increased with age (Table 2). A total of 12 *Eimeria* species (namely, *E. subspherica*, *E. ellipsoidalis*, *E. zurnii*, *E. pellita*, *E. bovis*, *E. canadensis*, *E. cylindrica*, *E. auburnensis*, *E. brasiliensis*, *E. bukidnonensis*, *E. bombayensis* and *E. alabamensis*) and one *Isospora* species were identified from the 229 faecal samples of cattle collected from Shaanxi (Table 3). All the *Eimeria* species were found in both two breeds but *Isospora* species was only found in 16.39% (10/61) of Qinchuan cattle. *E. bovis* was the most prevalent species for both Qinchuan cattle (70.49%) and dairy cattle (68.97%) followed by *E. zurnii* (55.74 and 37.93%) and *E. ellipsoidalis* (50.82 and 48.28%). The lowest prevalent one was *E. brasiliensis* (3.28 and 3.45%)

Table 2: Prevalence and intensity of coccidial infection in dairy cattle and Qinchuan cattle in Shaanxi province

Animal groups	Examined no.	Positive no.	Prevalence (%)	Oocysts per gram of faeces average (range)
Dairy cattle	83	29	34.94	174 (0-1800)
<3 months	7	5	71.43	60 (0-100)
3-12 months	11	8	72.73	388 (0-1800)
1-2 years	11	3	27.27	150 (0-300)
>2 years	54	13	24.07	92 (0-250)
Qinchuan cattle	145	61	42.07	325 (0-2150)
<3 months	14	3	21.43	67 (0-100)
3-12 months	37	29	78.38	388 (0-2150)
1-2 years	68	25	37.67	316 (0-1000)
>2 years	26	4	15.38	93 (0-250)
Total	228	90	39.47	276 (0-2150)

Table 3: Coccidial species identified and their prevalence in dairy cattle and Qinchuan cattle in Shaanxi province

Species	Dairy cattle (n = 29) positive no./prevalence (%)	Qinchuan cattle (n = 61) positive no./prevalence (%)
<i>E. subspherica</i>	7/24.21	17/27.87
<i>E. ellipsoidalis</i>	14/48.28	31/50.82
<i>E. zurnii</i>	11/37.93	34/55.74
<i>E. pellita</i>	8/27.59	14/22.95
<i>E. bovis</i>	20/68.97	43/70.49
<i>E. canadensis</i>	6/20.69	24/39.34
<i>E. cylindrica</i>	6/20.69	23/37.70
<i>E. auburnensis</i>	8/27.59	24/39.34
<i>E. brasiliensis</i>	1/3.45	2/3.28
<i>E. bombayensis</i>	4/13.79	21/34.43
<i>E. alabamensis</i>	3/10.34	8/13.11
<i>E. bukidnonensis</i>	5/17.24	12/19.67
<i>Isospora</i> sp.	-/-	10/16.39

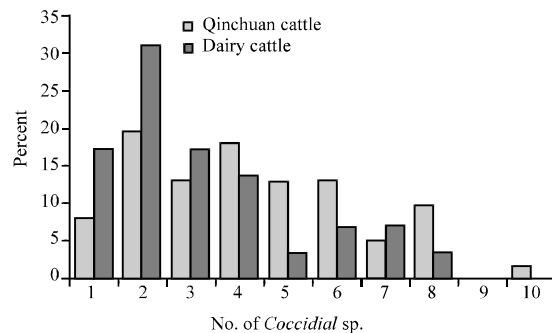


Fig. 1: Percentage with single or mixed infection of different *Eimeria* and *Isospora* species in Qinchuan cattle and dairy cattle

for both two breeds of cattle. About ≥ 2 coccidial species were seen in Qinchuan cattle and dairy cattle. About 92 and 83% of Qinchuan cattle and dairy cattle carried >2 species with >40 and 20% of them even were infected with >5 coccidial species (Fig. 1).

The prevalences of coccidial infection in two cattle breeds were examined in the present study. The prevalence of Qinchuan cattle was 42.07% which was lower than that in Yunnan, Qinghai and Anhui provinces (Chen and Zhang, 1989; Zuo and Chen, 1984; Li *et al.*, 1999). The prevalence of dairy cattle in this study was 34.94% which was higher than that in Jiangsu, Henan

provinces (Zhang *et al.*, 2000; Jin *et al.*, 2010) and Inner Mongolia (Zhang *et al.*, 2008) but lower than that in Guangdong (Liu and Chen, 2004) and Anhui (Li *et al.*, 2004) provinces, Shanghai city (Zhao *et al.*, 2007) and Shaanxi province reported in 2006 (Zhai *et al.*, 2006).

The differences could be explained with differences in breeds, ecological conditions, climates and husbandry practice. Previous studies showed that *E. bovis* and *E. zuernii* were the two most pathogenic species with strongest virulence to cattle (Li *et al.*, 1999; Liu *et al.*, 2005; Cornelissen *et al.*, 1995; Kennedy and Kralka, 1987) which alone or together caused clinical coccidiosis but Cicek *et al.* (2007) reported that dominant species inhabiting in animals were not always lead to the incidence of the disease.

In the current investigation, the prevalence of *E. bovis* was 68.97 and 70.49% for dairy cattle and Qinchuan cattle, respectively and the prevalence of *E. zuernii* was also 37.93 and 55.74% for two breeds. But there were no cases of clinical coccidiosis happened in the animals.

CONCLUSION

Present survey showed that coccidial infections were found in both of Qinchuan cattle and dairy cattle with high prevalence and potential threat to cattle production in this province. Therefore, integrated strategies should be carried out to prevent and control coccidial infection in cattle in Shaanxi province.

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