

Original papers

***Buxtonella* spp. like infection in cattle in Sanandaj province, Iran**

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ABSTRACT. Buxtonellosis is a disease caused by the ciliated protozoan *Buxtonella sulcata* (Jameson, 1926). *B. sulcata* is a common protozoan of ruminants and may result in subclinical infection or clinical disease including diarrhea. This study examined the prevalence of *B. sulcata* in cattle from Sanandaj province, Iran. Faecal samples were collected from cattle in the province from May 2013 to June 2014. A total of 217 cattle were selected randomly according to the age, sex, health, management system and season. In total, 99 cattle (45.63%) were found to be infected with *B. sulcata*. In adults, prevalence of *B. sulcata* infection (51.64%) was higher than calves (28.58%) and young cattle (40.55%). The prevalence of *B. sulcata* infection was also found to be higher in female (47.32%) than male (38.46) cattle. *B. sulcata* infection was significantly ($p < 0.05$) higher in poor health cattle (body condition and weight) (79.54%) than healthy cattle (24.47%). This study demonstrates that cattle are highly susceptible to *B. sulcata* infection under a variety of housing and environmental conditions in this region of Iran. The study also demonstrates a significant effect of infection on cattle health.

Key words: *Buxtonella sulcata*, prevalence, cattle, Iran

Introduction

Parasitic diseases are a major constraint on the development of the livestock industry in developing countries, including Iran. *Buxtonella sulcata* is a ciliated protist inhabiting the caecum and large intestines of cows and water buffaloes [1]. *B. sulcata* is one of the parasitic protozoa (Ciliophora) type which inhabited in the colon of the ruminants and the cause for diarrhea or for classification has not been fully explained [2,3]. *B. sulcata* is a flattened oval protozoan parasite covered with cilia which is morphologically similar to *Balantidium coli* in pigs and human [4]. The results of the present study showed a high prevalence of protozoan infection in dairy cattle [5]. *Buxtonella sulcata*

seems to be a nearly cosmopolitan ciliate recorded in England [6,7], Poland [8], Denmark [9], Pakistan [10], Japan [11], Turkey [12], Nepal [13], Iraq [14], Thailand [15], North-America [16], Korea [17], Costa Rica [18] and Egypt [19]. There have been few studies into the comparative clinical significance of *B. sulcata* in cattle and investigation of the prevalence of *B. sulcata* has not been conducted in Sanandaj before. Cattle are of major economic importance in this region with animals being grazed on open pasture and mixed with cattle belonging to different families. There is the potential for grazing to take place next to environmentally polluted water where faeces may enter rivers. In this study, we evaluate the prevalence of *B. sulcata* in different villages of

Table 1. Age wise prevalence of *B. sulcata* infection in cattle

Animals/Age	No. of samples examined N=217	No. of samples positive for <i>B. sulcata</i>	Prevalence (%)	Cyst per gram of faeces Mean±SE ²
Cattle calf (2 years)	21	6	28.58	251.00±15.39
Young (>2-5 years)	74	30	40.55	304.13±13.34
Adult (> 5 years)	122	63	51.64	313.41±19.51
Total	217	99	45.62	301.39±18.13

²Two means having common superscripts do not differ significantly

Table 2. Gender prevalence of *B. sulcata* infection in cattle

Sex	No. of samples examined N=217	No. of samples positive for <i>B. sulcata</i>	Prevalence (%)	Cyst per gram of faeces Mean±SE ²
Female	171	86	50.29	316.73±23.40
Male	46	13	28.26	247.21±17.15

²Two means having different superscripts differ significantly

Sanandaj. The rationale behind this was to establish if *B. sulcata* was present in significant numbers, therefore posing a disease and potential zoonotic risk. Although it has not been confirmed, the close relationship between *B. sulcata* and *B. coli* implies the possibility for zoonotic infection [8].

Materials and Methods

Faecal samples were collected between May 2013 and June 2014 in Sanandaj province. A total of 217 cattle were selected randomly according to the age, sex, health status, management system and season from different villages of Sanandaj province. The age of the cattle was determined by examination of teeth and also asking the farmer [20]. Cattle were categorized into three groups, namely, cattle calf (≤ 2 years), young ($>2-\leq 5$ years) and adult (>5 years). The health status of cattle was categorized into two groups, namely, poor health and healthy cattle (based on body situation score and eye inspection) [20]. The management system (floor type) was also divided into concrete floor and muddy floor. The 217 faecal samples were collected directly from the rectum of these animals by wearing an apron, hand gloves and gumboot to avoid contamination. Samples were immediately placed in sterile bottles and were sent to the laboratory. Stoll's ova counting techniques was

performed for determining the number of cysts or trophozoites per gram of faeces by their morphological features as described by Soulsby [21]. Morphological tests were conducted in Dmyaran laboratory. Of 99 cattle from 217 that were positive for *B. sulcata*. The fecal sample was mixed with water to make a 45 ml solution in a 100 ml graduated beaker with a magnetic stirrer. The mixture was strained with a coffee strainer. The strained mixture was shaken and 0.15 ml of mixture was taken on to a glass slide and covered with a cover slip. Then the cysts were identified and counted under a microscope. The total number of cysts of parasites found in the slide was multiplied by 100 to get the cysts per grams of feces (CPG). This multiplication is required as 1g faeces is present per 15 ml of diluent. Statistical analysis was performed by using the Statistical Package for Social Sciences (SPSS-16 version) technique.

Results

Overall prevalence of *B. sulcata* was 45.62% from 99 positive samples and the mean numbers of cysts per gram of faeces were 301.39±18.13 (Table 1). The results concerning the prevalence, age, gender, health status, management and seasonality are shown in Tables 1–5. The statistical analysis of infection with *B. sulcata* in our study showed

Table 3. Health status related prevalence of *B. sulcata* in cattle

Health status	No. of samples examined N=217	No. of samples positive for <i>B. sulcata</i>	Prevalence (%)	Cyst per gram of faeces Mean±SE ²
Poor health	88	70	79.54	301.77±23.65
Healthy	129	29	22.48	281.57±18.41

²Two means having different superscripts differ significantly ($p<0.05$)

Table 4. Prevalence of *B. sulcata* infection in cattle in relation to management

Management system (Floor type)	No. of samples examined N=217	No. of samples positive for <i>B. sulcata</i>	Prevalence (%)	Cyst per gram of faeces Mean ±SE ²
Concrete floor	37	9	24.32	292.11±27.12
Muddy floor	180	90	50.00	311.01±19.73

²Two means having common superscripts do not differ significantly

Table 5. Seasonality of *B. sulcata* infection in cattle

Season	No. of samples examined N=217	No. of samples positive for <i>B. sulcata</i>	Prevalence (%)	Cyst per gram of faeces Mean±SE ²
Summer	77	34	44.15	316.17±17.11
Rainy	71	45	63.38	293.29±11.24 ^a
Winter	69	20	28.99	267.45±18.11

²Two means having common superscripts do not differ significantly ($p<0.05$)

prevalence of *B. sulcata* infection (51.64%) in adults was significantly higher than calves (28.58%) and young cattle (40.55%). The prevalence of *B. sulcata* was statistically higher in female (47.32%) than male (38.46) cattle. The mean burden of cysts per gram of feces was also significantly ($p<0.05$) higher in female (316.73±23.40) than male cattle (247.21±17.15). The health status had a significant effect on the prevalence of *B. sulcata* infection in cattle. Prevalence of *B. sulcata* infection was significantly ($p<0.01$) higher in poor health cattle (79.54%) than healthy cattle (24.47%). In poor health cattle (301.77±23.65) the mean burden of cysts per gram of feces was considerably ($p<0.05$) higher than healthy cattle (281.57±18.41) (Table 3). Prevalence of *B. sulcata* infection in cattle on Muddy floor (50%) was higher than cattle on concrete floor (24.32%). The mean burden of cysts per gram of faeces was significantly ($p<0.05$) higher

in Muddy floor cattle (311.01±19.73) than Concrete floor (292.11±27.12) cattle (Table 4). The significant difference in these results suggests concrete flooring reduces exposure to infection. The prevalence of *B. sulcata* infection of cattle was significantly ($p<0.05$) higher during rainy season (63.38%) than summer (44.15%) and winter (28.99%). There was no significant difference in cyst burdens between the three seasons (Table 5). Fig. 1 and 2 show cysts and trophozoite of *B. sulcata* in direct smear.

Discussion

In present study the prevalence of *B. sulcata* was 45.63%. Studies conducted in England, Thailand, Costa Rica, Poland and Bangalore [6,8,15,22,23] indicated a wide differences in percentage between 2–87%. The differences in the prevalence could be because of a lot of different factors, such as

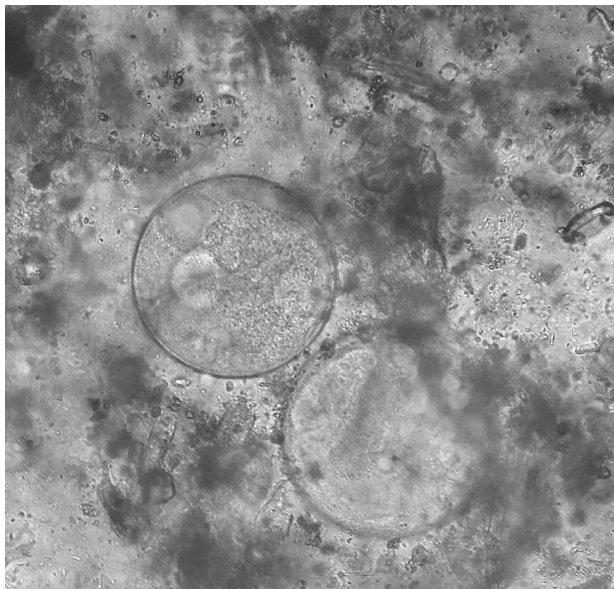


Fig. 1. Cysts of *B. sulcata* in cattle; in direct smear, 400× (scale bar: 1 cm=100 μm)

environmental situations, animal, farm management practices and stress factors. Fox and Jacobs [6] showed that seasonal fluctuations in related to changes in the diet and opportunities for transmission, in addition, the delivery rate may be result in an increase in prevalence of infection. The high prevalence in Iran would suggest that local environmental factors support transmission and persistence of the parasite but the ubiquitous nature of *B. sulcata* demonstrated in other studies would suggest that transmission and persistence are supported across a wide range of environmental and farming conditions. The data and statistical findings in this study would suggest that female cattle, calves and cattle in poor health are at greatest risk of infection with higher subsequent shedding of cysts. Concrete flooring as a factor to reduce prevalence and shedding is worth further investigation as this study suggests it is a statistically significant factor in reducing infection.

Conclusions

This study demonstrates that cattle are highly susceptible to *B. sulcata* infection under a variety of housing and environmental conditions in this region of Iran. Infection is demonstrated in the study to have a significant effect on cattle health, and so is likely to have economic and welfare implications for farmers and cattle in the region. Further studies would be beneficial to assess the impact of improved housing conditions, hygiene and

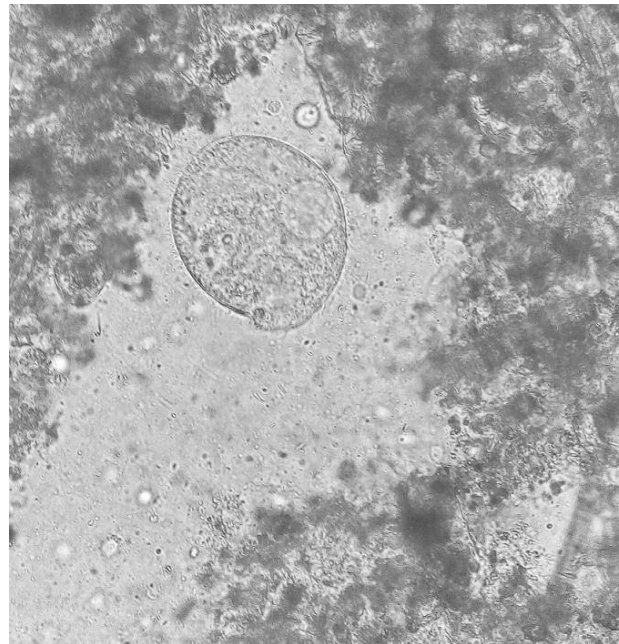


Fig. 2. Trophozoite of *B. sulcata* in cattle; in direct smear, 400× (scale bar: 1 cm=100 μm)

therapeutic agents in the control of *B. sulcata*.

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