

Morphological and epidemiological study of *Buxtonella sulcata* in cattle

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Abstract

This study was designed to diagnose the *Buxtonella sulcata*, which is closely related to *Balantidium coli*, is a ciliated protozoan that inhabits the digestive system of cattle (cows and buffaloes). Two hundred thirty-three feces' samples were collected randomly from cattle in Al-Diwaniya province/ Iraq. Using the formalin-ether precipitation and sheather's flotation techniques, then microscopically examination was done to detect the protozoan cysts or trophozoites. Prevalence rate and effect of certain risk factors were studied. The parasite's cystic phase had circular or semicircular shape with a diameter of 115-55 μm , were detected in 10.30% (24/233) of the examined cattle in the study area. The infection rate was unaffected statistically ($p > 0.05$) by any of studied risk factors including; cattle species (0.637%), age (0.893%), sex (0.734%) and climate changes (0.622%) during the study months. Through the current study, it appears that *Buxtonella silicata* is a protozoan endemic to cattle in the study area and has the possibility of coexistence with different biological and environmental conditions.

Keywords: *Buxtonella sulcata*, Cattle, Morphological and Prevalence.

Introduction

Parasitic infections are one of the main problems with livestock and are caused by environmental variables, poor management techniques, continual parasite exposure and animal owners who are unaware of the parasites' methods of transmission (1,2). Parasitic infections in ruminants are often caused by protozoan infection (2). In newborn and young bovine calves, a number of gut-dwelling protozoa (*Cryptosporidium*, *Eimeria*) may cause diarrhea and even death (3,4). *Buxtonella sulcata*, an exploitative ciliate protozoan, is one of the parasites (protozoa) that affects the colon of cattle (5). Many later studies asserted that *Buxtonella sulcata*, not *Balantidium coli*, was found in cattle (6,7). The intestinal trophozoite form and the cystic form of *Buxtonella sulcata* are the two forms that show resilience to environmental influences throughout their life cycle (8). The trophozoites that penetrate the colon walls of cows also cause diarrhea in calves (9). The most notable clinical symptom of *Buxtonella sulcata* infection is severe diarrhea, which may sometimes result in death in animals that have not been treated properly (6). The illness will become more prevalent in rural and semi-urban areas (10). When this parasite's cysts were examined under a microscope using direct and concentration procedures (sedimentation with tap water, 10% formalin, and ether-formalin), they were found in both animals with and without diarrhea. This parasite was identified using a variety of techniques, including the direct smear method, which was employed by Soulsby (3) and Markell (11), as well as concentration methods such

as floatation and sedimentation (12). This study aims to identify the *Buxtonella sulcatata* and study its prevalence in cattle in in Al-Diwaniya province / Iraq.

Materials and Methods

Two hundred and thirty-three samples of feces from cattle (165 cows and 68 buffaloes) were collected in the study area during the period from September 2022 to May 2023. Feces samples were taken from cattle of both sexes and different ages (less than one year to more than five years). These samples were collected in sterile disposable plastic containers and ranged in weight from 5 to 15 gm. A thorough history was obtained for each sample using a customized questionnaire form, which included information on age, sample type, sex, date of collection, and district. All samples were sent to the laboratory at the College of Veterinary Medicine/ University of Al-Qadisiyah in a cooled condition. Two laboratory methods were used to detect cyst and / or trophozoite of *Buxtonella sulcata* in fecal samples which are Formalin-ether sedimentation method (11) and Sugar flotation technique (13). Identification of *Buxtonella sulcata* cysts and trophozoites was based on morphological specific feature and on measurement of dimensions of these structures using ocular micrometer. The study included determining the prevalence of the parasite and observing the extent to which it was affected by the risk factors related to the species, age and sex of the animal and the change of environmental conditions according to the month of the year.

Results**Morphological and total prevalence of *Buxtonella sulcata***

The cystic phase of *Buxtonella sulcata* was examined under a microscope and had a circular to semicircular form. Its diameter varied from 55 to 115.5



µm, however most cysts had a diameter of 65 to 75 µm. Similar to the geography of the earth, the embryonic mass filled most of the inner cystic area within the cyst, with the exception of one side, where the distance from the

cyst wall was significantly larger. Within the cyst, the macro and micro nuclei can be seen (Fig.1). During this investigation, the trophozoite phase was not seen.

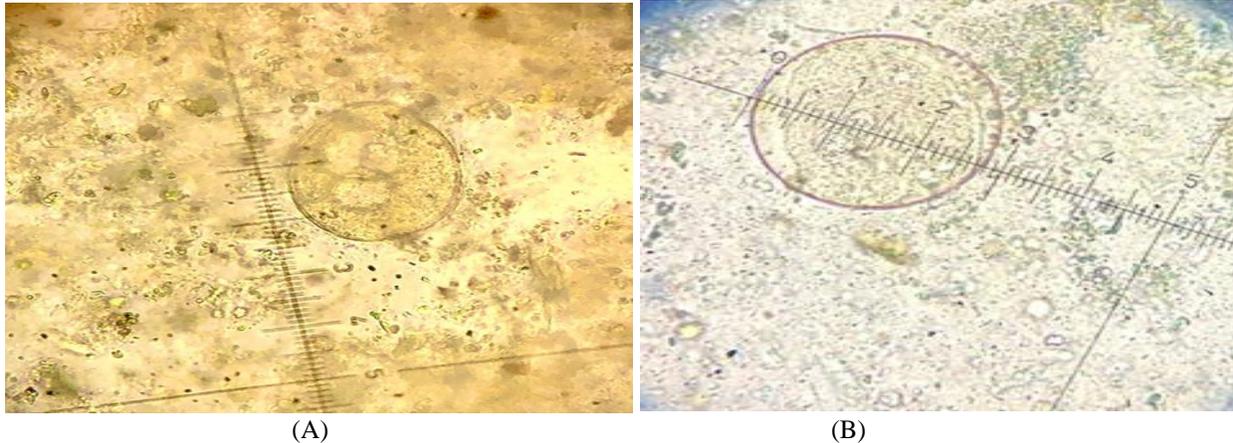


Figure 1: *Buxtonella sulcata* cyst (A) in cows (B) in buffaloes (X 40).

The results of the microscopic examination of feces samples showed that out of 233, 24 (10.30%) samples were positive and showed the cystic phase of the

parasite. Cows recorded an infection rate of 9.69% and buffaloes 11.76%, with no statistically significant difference ($p>0.05$), table 1.

Table 1: Prevalence of *Buxtonella sulcata* in cattle in Al-Diwaniyah province

Cattle species	Examination No.	Positive No.	Percentage %
Cows	165	16	9.69
Buffaloes	68	8	11.76
Total	233	24	10.30
Chi-square (x^2)	0.223*		
P value	0.637		

* No significant difference ($P>0.05$)

Prevalence of *Buxtonella sulcata* according to sex

The results showed that there was no effect of the studied risk factors on the rate of infection with the *Buxtonella sulcata* parasite, although there was a variance

in the recorded rates according to the studied groups. Females showed a higher infection rate (11.19%) than males (9.09%), table (2).

Table 2: Infection rate of *Buxtonella sulcata* in cattle according to the sex.

Sex	Examined cases	Positive cases	Percentage %
Female	134	15	11.19
Male	99	9	9.09
Total	233	24	10.30
Chi-square (x^2)	0.116*		
P value	0.734		

* No significant difference ($P>0.05$)

Prevalence of *Buxtonella sulcata* according to age

The age group between 3-<5 years recorded a relatively higher infection rate (11.53%) than others, table (3)

**Table 3:** Infection rate of *Buxtonella sulcata* in cattle according to the age.

Age (Year)	Examination No	Positive No	Percentage %
< 1	31	2	6.45
1 - < 3	92	10	10.86
3 - < 5	52	6	11.53
> 5	58	6	10.34
Total	233	24	10.30
Chi-square (x²)	0.616*		
P value	0.893		

* No significant difference (P>0.05)

Prevalence of *Buxtonella sulcata* according to months

differences were not statistically significant (P>0.05), table (4).

The highest infection rate (19.04%) was recorded in the month of May, but all these

Table 4: Infection rate of *Buxtonella sulcata* in cattle according to the months of year.

Month	Examined cases	Positive cases	Percentage %
September	24	4	16.66
October	29	3	10.34
November	39	3	7.69
December	34	4	11.76
January	21	0	0
February	19	2	10.52
March	20	1	5
April	26	3	11.53
May	21	4	19.04
Total	233	24	10.30
Chi-square (x²)	6.22*		
P value	0.622		

* No significant difference (P>0.05)

Discussion

Microscopic inspection was used to investigate the parasite *Buxtonella sulcata*. The cystic phase was shown as a circular to semicircular form, which is consistent with findings by (14) and (15). The embryonic mass manifested within the cyst in a way resembling the topography of the earth, covering the majority of the interior cystic area and occupying a space of one distance from the cyst wall, with the exception of one side where the distance is slightly larger (14). The infection rate (10.30%) of *B. sulcata* which recorded in this study is relatively low if compared with previous local studies, where study (14) in Al-Qadisiyah and other study (16) in Mosul, confirmed that 47% and 24.1%, of cattle had infection with this protozoan respectively. The difference in infection rates between the current study and previous studies in Iraq may be attributed to the different conditions surrounding the research, such as the number

of samples, the nature of breeding, and the general health status of the studied animals (16). Globally, the rates of parasite prevalence in cattle were studied, the results varied, some of them had higher rates than what was stated in this study, in Germany recorded a rate of 73% (17), and in India recorded 54.5% (18). Studies (19) and (20) observed no statistically significant difference in the infection rates of males and females. In another research conducted in Hisar, India, it was discovered that there was no statistically significant difference in the prevalence rates of *B. sulcata* in males and females, which were 61.22% and 52.31%, respectively (18). While in Iran, showed that female cattle exhibited a higher frequency of *B. sulcata* (47.32%) than male cattle (38.46) (21). Additionally, female cattle showed a significantly ($p \leq 0.05$) higher mean cyst load per gram of feces (316.73 ± 23.40) than male cattle (247.21 ± 17.15). In India



noted that there was no statistically significant difference between the two studied age groups (18). There were notable variations in the incidence of *B. sulcata* infection between neonates and young animals, which was conducted in Baghdad city (20). The prevalence of adult cattle (51.64%) was greater than that of heifers (28.58%) in research that was conducted in Iran, which also found a significant difference between various ages (21). The present study research also contrasted with a study conducted in India, which revealed that juvenile animals had a much higher infection rate (33.1%) than adults (13.9%) ($p < 0.0001$) (6). The elder buffalo in another research in South-Western Gujarat, India, showed a higher prevalence of *B. sulcata* infection (33.3%) than the juvenile (18.2%) (7). The incidence of *B. sulcata* infection in cattle increased significantly ($p < 0.05$) during the rainy season (63.38%), with summer infections being more common (44.15%) than winter infections (28.99%). According to (7), the rate of *B. sulcata* parasite infection was highest in the winter (43.8%), followed by the monsoon (31.0%) and summer (31.0%), with no discernible difference (21). The different environmental conditions, the number of animals studied, the method of

raising animals, as well as the examination methods used in the different studies may be to blame for the differences in the results of the current study relating to the studied risk factors with some other studies. This study concluded that *Buxtonella sulcata* parasite is one of the parasitic protozoans' endemics in AL-Diwaniyah province in Iraq, and the rate of its infection to cattle is not affected by internal factors of the animal such as age, sex, or external factors represented by environmental conditions.

Acknowledgment

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Ethical approval

The committee for Research Ethics approved the current study protocol.

Conflict of interest

There is no conflict of interest in the current study as proved by the authors.

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