

Prevalence of *Buxtonella sulcata* in neonatal and young lambs in three regions in Baghdad city (Abu Ghraib, Yusufiya and Mahmudiyah)

انتشار الإصابة بطفيلي *Buxtonella sulcata* في الحملان في ثلاث مناطق من محافظة بغداد (أبو غريب , اليوسفية , المحمودية)

H. H. O. Al-Seady, * M. H. kawan

*Asst. prof. Department of Parasitology,
College of Veterinary Medicine – Baghdad University

بحث مسجل

Abstract

Buxtonella sulcata (Jameson, 1926) is an intestinal protozoan of ruminants. *B. sulcata* may be a potential cause of diarrhea in lambs when there are suitable conditions in the intestinal lumen that promote the parasite multiplication. This work aimed to investigate the cyst and trophozoites of *B. sulcata* in lambs. 200 fecal samples of lambs (115 male – 85 female) were collected from three different areas in Baghdad province (Abu Ghraib, AL-Yusufiya and AL-Mahmudiyah), with age ranged from > 1month to 1year old. Two laboratory methods were used to detect *B. sulcata* cysts and trophozoites in fecal samples: direct wet film method and ether-formalin sedimentation method. The overall rate of infection was 24.5%, where the infection rate in male lambs 23.47% and in female 25.88%. Abo- Ghraib region showed the highest prevalence rate 34.28%.

الخلاصة

يعتبر طفيلي *Buxtonella sulcata* من الاوالي المعوية في المجترات ويعد هذا الطفيلي احد مسببات الإسهال في الحملان عند توفر الظروف الملائمة لتكاثره داخل تجويف الأمعاء. هدفت هذه الدراسة التحري عن أكياس وناشطات *B. sulcata* في الحملان. تم جمع 200 عينة براز من الحملان (115 ذكور و 85 اناث) من ثلاث مناطق مختلفة في محافظة بغداد (أبو غريب , اليوسفية , المحمودية) و التي تراوحت أعمارها (من اقل من 1 شهر إلى 1 سنة). فحصت العينات باستخدام طريقتان مختبريتان للكشف عن الطور المتكيس والطور الخضري للطفيلي وهما طريقة الفحص المباشر للمسحة الرطبة وطريقة الترسيب بمحلول الايثر - الفورمالين. بلغت نسبة الإصابة الكلية (24.5%). وكانت نسبة الإصابة في الذكور 23.47% و في الاناث 25.88%. سجلت اعلى نسبة اصابة في منطقة ابو غريب والتي بلغت 34.28%.

Introduction

Buxtonella sulcata is one of the parasitic protozoa (*Ciliophora*) types which inhabited the colon of the ruminants. *Buxtonella sulcata* is similar to *Balantidium coli* found in the swine and man, some authors included them into the same genus (1). They are most often considered to be commensals participating in digesting plant feed, which could be confirmed by their common incidence (2).

Some authors include them into the same genus, however, more often they are described as *Buxtonella sulcata* (Jameson 1926) (Kingdom: Protozoa, Phylum: Ciliophora, Class: Kinetofragminophorea, Order: Trichostromatidae, Family: Pyenotrichidae, Genus: *Buxtonella*) (2). Outside the organism they assume the form of a cyst. It is an endosporic form, but also invasive. Covered by a two-layer capsule, regular round or else slightly oval, it reaches 52–131 µm in diameter. Its size changes; 3 times after excreting it is only 2/3 of its initial size (1). Infection follows consuming cysts with fodder or drinking water. Trophozoites are released from cysts in the

end part of the small intestine or colon. In some publications, the mentioned above ciliates are described as parasites (3, 4, 5). It is supposed that the increased invasion of the protozoon may result in the acceleration of the passage of alimentary contents in the digestive tract of dairy cows, thus causing clinical disorders such as diarrhea or poor condition of animals (2).

Their vegetative forms living in ruminants' colon are asymmetric and oval, they reach the size of 60 – 138 x 46 – 100 µm. The surface of the ciliates' cells is evenly covered with short, thick cilia. In the centre there is a reniform nucleus with a nucleolus in its hilus. A characteristic deep syncystoma is situated at the anterior pole. Numerous alimentary vacuoles are visible in the cytoplasm. Ciliates reproduce by binary fission (2). The first reported infection from cattle with *B. sulcata* in Iraq (Al-Qadissiyah) was in (2005) (6). Al-Saffar *et al.* (7) found that 31.39% of cattle with diarrhea in mosul were infected with this parasite, Al-Zubaidi and Al-Mayah (2011) (8) reported infection with *B. sulcata* in neonatal and young calves in Baghdad province.

Materials and methods

A total of 200 fecal samples (115 male and 85 female) were collected from lambs with age ranging from (<1month -1year), from three regions in Baghdad province:(Abu Ghraib: 70 fecal samples, AL-Yusufiya: 70 fecal samples and AL-Mahmudiyah: 60 fecal samples), during the period from November 2013 to April 2014. Approximately five grams of fecal sample was taken directly from rectum of each animal, put in clean plastic containers with information age, sex and sampling data. Two laboratory methods were used to detect cyst and / or trophozoite of *B. sulcata* in fecal samples which are direct wet film method and ether-formalin sedimentation method (9). The intensity of infection was estimated in positive cases with direct wet film method by counting cysts in 20 microscopical fields using high power magnification (10). Identification of *B. sulcata* cysts and trophozoites was based on morphological specific feature and on measurement of dimensions of these structures using ocular micrometer (8). Statistical probability of $p < 0.05$ was considered significant (8).

Results and discussion

During coproscopical examination of 200 fecal samples of lambs, total rate of infection among all examined samples was 24.5% (Table 1), lower than recorded before from calves in Turkey (11); cattle from Iraq (7) and cattle in Korea (12). Other studies which performed in different part of world such as England, Poland, Costa Rica, Bangalore and Thailand (2, 13, 14, 15, 16) showed a wide differences in the rate of infection ranged between 2-87%.The differences in the rate of infection could be due to many different factors, such as environmental conditions, number of animal examined, farm management practices and stress factors. Fox and Jacobs (13) itself showed that seasonal fluctuations in the prevalence of the infection and cyst excretion rates were related to changes in the diet and opportunities for transmission, furthermore, the delivery rate may be lead to an increase in prevalence of infection.

Table1: Total rate of infection with *B.sulcata* in lambs.

Total	No. of Samples examined	No. Positive	Infection Rate %
	200	49	24.5

B. sulcata trophozoites were oval in shape, sized 76-114 μ m in length x 50-80 μ m in width (with an average of 110 x 70 μ m). The whole body covered by clear long cilia. Kidney shape macronucleus and a smaller micronucleus were also observed. The characteristic grooves, cytopyge and cytostome located at the posteroventral position (Fig.1) were also noticed. The morphometrical results of the trphozoites and cysts of *B.sulcata* in this study are in agreement with other previous studies (7, 19). The most obvious morphological character of the trophozoites is the presence of a curved groove (Fig.1) which runs from the anterior end to the posterior end (19, 20).



Figure 1: Trophozoite of *B. Sulcata*: in direct smear x400.

While, *B. sulcata* observed cysts were round in shape with diameter ranging between 60 - 110 μ m (with a mean of 80 μ m), clear cyst wall of encysted trophozoites could be seen even without staining (Fig.2). The shape and size of the cysts and trophozoites which observed in this study are in agreement with those described by (6, 17, 18).

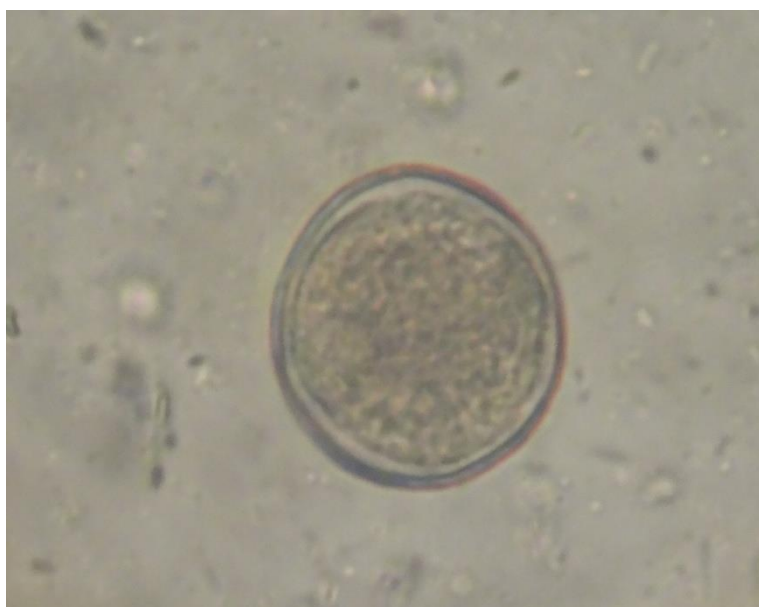


Figure 2: Cyst of *B. Sulcata* in direct smear x400.

Prevalence of infection with *B. sulcata* among studied area showed that there is significant differences ($p < 0.05$) between Abu Ghraib rate of infection 34.28% and Al- Mahmudiyah rate of infection 15% (Table 2).

Table2: Infection rate with *B. sulcata* in the three studied area.

Region	No. of Samples examined	No. Positive	Infection Rate %
Abu Ghraib	70	24	34.28
AL-Yusufiya	70	16	22.85
AL-Mahmudiyah	60	9	15
Total	200	49	24.5

$$X^2 = 5.4$$

The study also showed no significant difference ($p < 0.05$) in infection rate between male and female as these ratios were 23.47% and 25.88% respectively (Table 3).

Table3: Infection rate with *B. sulcata* in male and female lambs.

Sex	No. of Samples examined	No. Positive	Infection Rate %
Male	115	27	23.47
Female	85	22	25.88
Total	200	49	24.5

$$X^2 = 0.3$$

The infection rate among lambs between 4-6 months old are higher than that of <1-3 months old with no significant difference ($p < 0.05$). The highest rate of infection was recorded of the age group 4-6 months 33.33% followed by age group 10-12 months 29.03%. While the age group of 7-9 months had the lowest rate of infection 16.98% (Table 4).

Table4: Prevalence of *B. sulcata* according to the age groups.

Age group (Months)	No. of Samples examined	No. Positive	Infection Rate %
<1- 3	74	17	22.97
4 – 6	42	14	33.33
7– 9	53	9	16.98
10 - 12	31	9	29.03
Total	200	49	24.5

$$X^2 = 2.8$$

Buxtonella sulcata is frequently found during the fecal examination of animals to reveal infection with gastrointestinal parasites (21). The intestinal ciliates found in ruminant commonly identified as *Balantidium coli* (21, 22); or *Buxtonella sulcata* (2, 7, 11). Levine (26) suggested that the species present in ruminants (i.e. cattle, buffaloes and camels) is actually *Buxtonella sulcata*; this view is supported by our results and other works done on cattle and buffaloes (2, 7, 11), and the view of (27) who stated that "it is a common mistake on identifying any ciliates in feces of animals as *Balantidium coli*".

Concerning the pathogenicity of *B. sulcata*, it is controversial either it is a commensal or pathogenic as it was noticed that high intensity of *B. sulcata* was associated with diarrhea in ruminants (7, 11). Urman and Kelly (1964),(4) reported a case of dead cow with ulcerative colitis, histological examination showed presence of blood cells and debris within the food vacuole of *B. sulcata* invaded the epithelium and sub-epithelial layers of colon, it may be helpful agent of death

(2). Goz *et al.* (2006) claimed that *B. sulcata* has similar behavior to *Balantidium coli* as a cause of diarrhea in cattle.

References

1. Rommel, M.; Eckert, J.; Kutzer, E.; Korting, W. and Schneider, T. (2000). Veterinarmedizinische Parasitologie. Parey Buchverlag, Berlin.
2. Tomczuk, K.; Kurek, L.; Stec, A.; Studzinska, M. and Mochal, J. (2005). Incidence and clinical aspects of colon ciliate *Buxtonella sulcata* infection in cattle. Bull. Vet. Inst. Pulawy. 49:29-33.
3. Hong, K.O. and Youn, H.J. (1995). Incidence of *Buxtonella sulcata* from cattle in Kyonggi-do. Korean J Parasitol, 33, 135–138.
4. Urman, H.D. and Kellky, G.W. (1964). *Buxtonella sulcata*. A ciliate associated with ulcerative colitis in a cow and prevalence of infection in Nebraska cattle. Iowa State Univ Vet, 27, 118–122.
5. Wacker, K.; Roffeis, M. and Conraths, F.J. (1999). Cow-calf herds in Eastern Germany: *status quo* of some parasite species and comparison of chemoprophylaxis and pasture management in control of gastrointestinal nematodes. J. Vet. Med. B., 46, 475–483.
6. Aayiz, NN. (2005). Diagnostic study for cow infection with *Buxtonella sulcata* in Iraq. Al-Qadissiyha J. Vet. Sci. 4(2):53-56.
7. Al-Saffar, T. M.; Suliman, E. G. and Al-Bakri, H. S. (2010). Prevalence of intestinal ciliate *Buxtonella sulcata* in cattle in Mosul. Iraqi J. of Vet. Med., Vol. 24, No. 1: 27-30.
8. Al-Zubaidi, M.T. and Al-Mayah, K.S. (2011). Prevalence *Buxtonella sulcata* in neonatal and young calves in AL-Nasir station and some regions in Baghdad (AL-Shuala and Gazaliya). Iraqi J. of Sci., Vol.52, No.4, P.420-424.
9. Markell, E. K.; Voge, M. and John, D. T. (1999). Medical Parasitology. 6th ed. W.B. Saunders Company, Philadelphia. pp.331- 337.
10. Cox, F. E. (1999). Modern Parasitology: A Text Book of Parasitology. 2nd ed. Black Well Science. pp 76-77.
11. Goz, Y.; Altug, N.; Yuksek, N. and Zkan, C. (2006). Parasites detected in neonatal and young calves with diarrhoea. Bull. Vet Inst Pulway, 50: 345-348.
12. Hong, Ki-Ok and Youn, Hee-Jeong (1995). Incidence of *Buxtonella sulcata* from cattle in Kyonggi-do. Kor J Parasitol., 33(2): 135-138.
13. Fox, M.T. and Jacobs, D.E. (1986). Pattern of infection with *Buxtonella sulcata* in British cattle. Res Vet Sci. 41:90-92.
14. Jimenez, A.E.; Montenegro, V.M.; Hernandez, J.; Dolz, G.; Maranda, L.; Galindo, J.; EPe, C. and Schineder, T. (2007). Dynamics of infections with gastrointestinal parasites and *Dictyocaulus viviparus* in dairy and beef cattle from Costa Rica. Vet Parasitol. 148:262-271.
15. Mamatha, G.S. and Pacid, E.D.S. (2006). Gastrointestinal parasitism of cattle and buffaloes in and around Bangalore. J. Vet. Parasitol. 20(2):846-874.
16. Kaewthamasorn, M. and Wongsamee, S. (2006). A preliminary survey of gastrointestinal and haemoparasites of beef cattle in the tropical livestock forming system in Nan Province, Northern Thailand Parasitology Research. (Online), short communication.
17. Rommel, M.; Eckert, J.; Kutzer, E.; Korting, W. and Schneider, T. (2000). Veterinar Medizinische Parasitologie. Parey Buchverlag. Berlin [cited Tomczuk *et al.*, 2005].
18. Hong, K.O. and Youn, H.J. (1995). Incidence of *Buxtonella sulcata* from cattle in Kyonggi-do. Korean J Parasitol. 33(2):135-138.
19. Rees, C. W. (1930). Studies on the morphology and behavior of *Buxtonella sulcata* from cattle and of *Balantidium coli* from the pig. Parasitol, 22: 314-325.
20. Kudo, R. R. (1931). Handbook of Protozoology. Charles Thomas publisher, pp369.

21. Jiménez, A. E.; Fernández, A.; Alfaro, R.; Dolz, G.; Vargas, B.; Epe, C. and Schnieder, T. (2010). A crosssectional survey of gastrointestinal parasites with dispersal stages in feces from Costa Rican dairy calves. *Vet Parasitol*, 173 (3-4): 236-246.
22. Cooper, H. and Gulati, A. (1926). On the occurrence of Isospora and Balantidium in cattle. *Me. Dept Agric India, Calcutta, Vet Ser 3*: 191-193.
23. Bilal, C. Q.; Kahn, M. S.; Aviaz, M.; Ijaz, M. and Khan, J. A. (2009). Prevalence and chemotherapy of Balantidium coli in cattle in the River Ravi reigon, Lahore (Pakistan). *Vet Parasitol*, 163: 15-17.
24. Becker, E. R. (1932). The present status of problems relating to the ciliates of ruminants and Equidae. *The Quarterly Rev of Biol*; 7 (3): 282-297.
25. Lapage, G. (1956). *Veterinary Parasitology*. Oliver and Boyd Ltd., London, pp. 908.
26. Levine, N. D. (1985). *Veterinary Protozoology*. Iowa State University Press, Ames, pp. 334–364.
27. Ponce-Gordo, F.; Jimenez-Ruiz, E. and Martínez-Díaz, R.A. (2008). Tentative identification of the species of *Balantidium* from ostriches (*Struthio camelus*) as *Balantidium coli*-like by analysis of polymorphic DNA. *Vet Parasitol*, 157: 41-49.