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

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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 Ghaib, 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%. Abu Ghaib region showed the highest prevalence rate 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.

<table>
<thead>
<tr>
<th>Total</th>
<th>No. of Samples examined</th>
<th>No. Positive</th>
<th>Infection Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>49</td>
<td>24.5</td>
<td></td>
</tr>
</tbody>
</table>
B. sulcata trophozoites were oval in shape, sized 76-114μm in length x 50-80μm in width (with an average of 110 x 70 μm). 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 posterioventral 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.](image1)

While, B. sulcata observed cysts were round in shape with diameter ranging between 60 - 110 μm (with a mean of 80 μm), 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.](image2)
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).

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of Samples examined</th>
<th>No. Positive</th>
<th>Infection Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abu Ghraib</td>
<td>70</td>
<td>24</td>
<td>34.28</td>
</tr>
<tr>
<td>AL-Yusufiya</td>
<td>70</td>
<td>16</td>
<td>22.85</td>
</tr>
<tr>
<td>AL-Mahmudiyah</td>
<td>60</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>49</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Χ² = 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).

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. of Samples examined</th>
<th>No. Positive</th>
<th>Infection Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>115</td>
<td>27</td>
<td>23.47</td>
</tr>
<tr>
<td>Female</td>
<td>85</td>
<td>22</td>
<td>25.88</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>49</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Χ² = 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).

<table>
<thead>
<tr>
<th>Age group (Months)</th>
<th>No. of Samples examined</th>
<th>No. Positive</th>
<th>Infection Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1-3</td>
<td>74</td>
<td>17</td>
<td>22.97</td>
</tr>
<tr>
<td>4 – 6</td>
<td>42</td>
<td>14</td>
<td>33.33</td>
</tr>
<tr>
<td>7–9</td>
<td>53</td>
<td>9</td>
<td>16.98</td>
</tr>
<tr>
<td>10 - 12</td>
<td>31</td>
<td>9</td>
<td>29.03</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>49</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Χ² = 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


