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Preliminary Report on Prevalence of Intestinal Ciliate (*Buxtonella sulcata*) in Cattle of Assam

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ABSTRACT

Buxtonella sulcata is an intestinal ciliate protozoon which inhabits the caecum of cattle. In neonates and immunocompromised calves it multiplies fast, become virulent and cause clinical disease. A total of 2339 fecal samples of calves (535), heifer (641) and adult (1163) cattle were screened for 1 year present in and around Guwahati, Assam for detection of *B. sulcata* infection by direct, sedimentation and formalin ethyl ether concentration methods. Examination of fecal samples revealed an overall prevalence of 0.81%infection of *B. sulcata* in dairy cattle. Age-wise, 0.74%, 0.78% and 0.85% infections of *B. sulcata* were recorded in calves (<1 year), heifer (1-3 years) and adult (>3 years) cattle, respectively. Strongyle sp., *Eimeria* sp., Amphistome, *Strongyloides* sp., *Moniezia* sp., *Toxocara vitulorum*, *Trichuris* sp., *Fasciola gigantica* and *Bunostomum* sp. were also recorded. This report may be considered as the first report of *B. sulcata* infection in cattle of Assam.

1. Introduction

Livestock plays an important role in Indian economy and is an important subsector of Indian Agriculture. Among the livestock population, cattle (190.90 million) plays a major role in India's economy, accounting 37.28% of total livestock population (Livestock census, 2012). However, as per estimation record of State Animal Husbandry and Veterinary Department, Assam has 8,938,760 cattle population (Economic Survey, Assam 2012-2013). Gastrointestinal (GI) parasitism is a major constraint for livestock production causing heavy economic losses to the livestock producers. It plays a crucial role in reducing animal production by lowering the working capacity, growth, body weight and milk yield (Choubisa and Jaroli, 2013; Panigrahi *et al.*, 2014). *Buxtonella sulcata* (Jameson, 1926) is a ciliate protozoon inhabiting the large intestines of cattle and is Classified under the Kingdom: Protozoa, Phylum: Ciliophora, Class: Kinetofragminophora, Order: Trichostromatida, Family: Pyenotrichidae, Genus: Buxtonella (Bauer, 1983).

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B. sulcata is considered as an opportunistic ciliate protozoan inhabiting colon of bovines (Levine, 1985; Bhatia, 2000). In neonates and immunocompromised calves it multiplies fast, become virulent and cause clinical disease, characterised by debilitating diarrhoea that sometimes become severe and life threatening in untreated animals (Fox and Jacops, 1984; Goz *et al*., 2006; Al-Zubaidi and Al-Mayah, 2011). Although, controversy about the pathogencity of *B. sulcata* still present. Becker (1932) and Lapage (1956) assumed its commensal nature, but other reports (Tomczuk *et al.,* 2005; Al-Saffar *et al.,* 2010) claimed the association of high incidence and intensity of *B. sulcata* with diarrhea in cattle. It is often misdiagnosed as *Balantidium coli*, a ciliate protozoan found in caecum and colon of pigs, humans and nonhuman primates (Al-Saffar, 2010). The presence of *B. sulcata* in cattle has been reported from different countries such as Poland (Tomczuk *et al*., 2005), Iraq (Al-Saffar *et al.*, 2010), Egypt (Sultan *et al.*, 2013), Nepal (Adhikari *et al*., 2013), Serbia (Kocis *et al*., 2014), Uruguay (Correa and Castro, 2015) and Iran (Hasheminasab *et al*., 2015). Omeragic and Crnkic (2015) from Sarajevo, Bosnia and

Herzegovinia also reported *B.sulcata* (27.2%) infections in cattle with a significant difference between young and adults (33.3% vs 21.9%). Sporadic reports of *B. sulcata* infections in cattle have been reported from different states of India *viz*. Bangalore (Mamatha and Placid, 2006), Gujarat (Kumar *et al*., 2016; Maharana *et al*., 2016) and Jammu (Ganai *et al*., 2015). Since, from North East region of India there are no reports of *B. sulcata* infections in cattle, so the present study was designed to determine the prevalence of *B. sulcata* in cattle of Assam.

2. Materials and Methods

2.1 Study area

The present study was conducted in Guwahati, the capital city of the state of Assam that lies within the latitude of 26°11′0″N and longitude 91°44′0″ E. The city is situated on an undulating plain with varying altitudes of 49.5 - 55.5 m above mean sea level. The southern and eastern sides of the city are surrounded by hillocks.

2.2 Study design

A total of 2339 fecal samples of calves (535), heifer (641) and adult (1163) cattle were collected from both Government and Private farms and screened for detection of *B. sulcata* infection in Guwahati, Kamrup district, Assam. The selected animals were categorized according to age *viz.* calves (<1 year), heifer (1-3 years) and adult (>3 years). Fecal samples were collected directly from the rectum of the individual animal and kept in marked plastic pouch/vials. Three grams of fecal samples were examined by direct and sedimentation techniques (Soulsby, 1982) as well as formalin ethyl ether concentration method (Garcia, 1999). Wet mounts from sediments were stained with Lugol's iodine 5% and examined under an Olympus BX51 light microscope at ×200 and ×400 magnifications. Samples not being examined on the same day were stored at refrigerated temperature (4°C) for next day examination. Morphological identification of *B. sulcata* cysts was done according to Rees (1930), Lapage (1956) and Lynn (2008). Microphotographs of the cysts were taken by using a digital camera (Sony DSC: WX80/B).

3. Results and Discussion

B. sulcata cyst is the resting stage of large ciliated protozoon of the caecum of cattle and is commonly found in the feces. Examination of the fecal samples in the present study revealed an overall prevalence of 0.81% infection of *B. sulcata* in cattle.

Age-wise, 0.74%, 0.78% and 0.85% infections of *B. sulcata* were recorded in calves (<1 year), heifer (1-3 years) and adult (>3 years) cattle, respectively. The cysts of *B. sulcata* are round or oval in shape, slight yellowish in color, have macronucleus, contractile vacuoles and surrounded by a two layered capsule (Fig.1, 2).

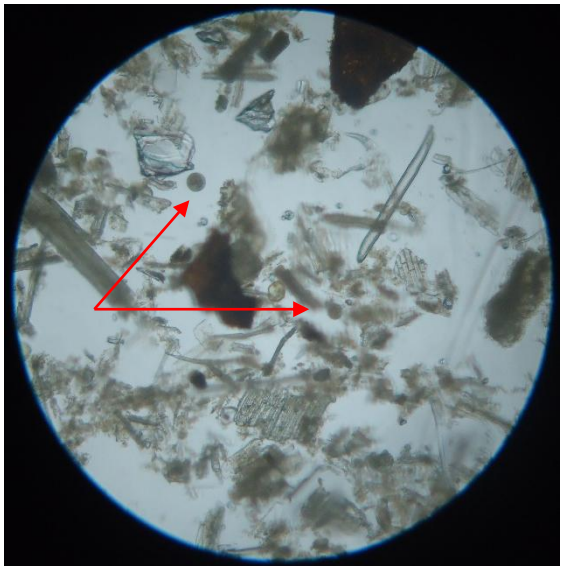

Figure 1. *Buxtonella sulcata* cyst of cattle (100X)

Other gastrointestinal parasites which were observed along with *B. sulcata* in cattle are Strongyle, *Eimeria* sp., Amphistome, *Strongyloides* sp., *Moniezia* sp., *Toxocara vitulorum*, *Trichuris* sp., *Fasciola gigantica* and *Bunostomum* sp. Although *Buxtonella sulcata* is frequently found during the fecal examination of animals (Jimenez *et al.*, 2010) but it is usually misdiagnosed with *Balantidium coli* (Malmsten, 1857) another intestinal ciliate which is a pathogenic ciliate for animals and man. *B. coli* main host is swine (Wenyon, 1926; Levine, 1985), but it could infect other animal species (Headley *et al.*, 2008).

Figure 2.*Buxtonella sulcata* cyst of cattle (400X)

According to Hong and Youn (1995) and Al-Zubaidi and Al-Mayah (2011), *B. sulcata* is considered as a commensal of intestinal tract of ruminants and helps in the digestion of plant materials and therefore, it is common to find higher rate of infection with *B. sulcata* in bovines. Concerning the pathogencity of *B. sulcata*, it is controversial either it is a commensal or pathogeneic as it was noticed that high intensity of *B. sulcata* was associated with diarrhoea in ruminants (Goz *et al.*, 2006; Al-Saffar *et al.*, 2010), but it is not clear if it is a real cause of dirrhoea or not. Urman and Kelly (1964) 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, but they did not accuse *B. sulcata* as a cause of death or colitis. Urman and Kellky (1964) and Skotarczak (1997) also suggested that *B. sulcata* can lead to pH changes of large intestinal content of cattle and multiplication of the parasite causes a cytotoxic effect in the large intestine which is manifested as lesions of the intestinal mucosa followed by secondary bacterial infections. Later, Tomczuk *et al.* (2005) claimed that *B. sulcata* has similar behavior to *B .coli* as a cause of diarrhoea in cattle. This report on the prevalence of *B. sulcata* in cattle may be considered as the first report from Assam as well as North East region of India and impact of this protozoan in cattle requires further study as a pathogen or commensal which remained understudied so far.

Conclusion

This preliminary investigation revealed presence of *Buxtonella sulcata* in cattle of Assam. Further extensive research on intestinal ciliates in different ruminants of this region as well as its pathogenecity, treatment and control are required.

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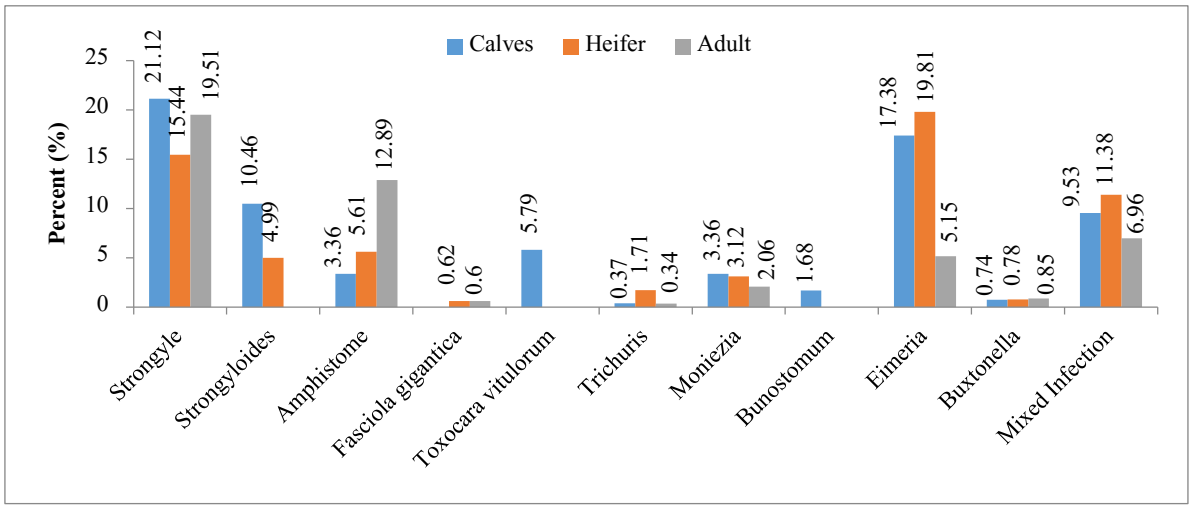

Figure 3. Prevalence of Gastrointestinal (GI) parasites in different age groups of Cattle

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