

## MORPHOLOGICAL DIFFERENTIATION BETWEEN PIG AND BUFFALO PARASITIC CILIATES TO IDENTIFY SPECIES

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### ABSTRACT

The incidence and prevalence of ciliates from cattle and buffaloes from various places have been ascribed to *Balantidium coli* as well as *Buxtonella sulcata* causing confusion about validity of the species in ruminants. The objective of the study was to identify the parasitic ciliates in faeces of buffaloes using parasitological techniques. A total of fifty samples of buffaloes and fifty samples of pigs were collected for comparison and to study the difference between pig and buffalo parasitic ciliates. Samples were analysed by direct smear, flotation and sedimentation techniques. Micrometry revealed significant difference between size of pig ciliates ( $73.93(\mu) \pm 2.18 \times 62.67(\mu) \pm 1.82$ ) and buffalo ciliates ( $131.20(\mu) \pm 4.51 \times 97.53(\mu) \pm 2.62$ ). Buffalo ciliate were having visible ridge on the cell surface which ran from anterior end posterior end. The cytostome (mouth) was located opposite to direction of motion. The pig ciliates did not show any ridge and the location of mouth was at tapering anterior end which was towards the direction of motion. These morphological differences suggested that the faecal ciliates recovered from buffaloes ciliates were *Buxtonella sulcata* while those from pigs were *Balantidium coli*. The movements of *B. coli* were fast as compared to *B. sulcata*.

**Keywords:** *Balantidium coli*, Buffaloes, *Buxtonella sulcata*, Parasitic ciliates, Pigs

There are conflicting reports of host range of *Balantidium coli* in literature. It has been reported as a common ciliate parasite of ruminants, pig and man (Samad, 1996; Randhawa *et al.*, 2010; Roy *et al.*, 2011; Sudan *et al.*, 2012; Gupta *et al.*, 2014). Other workers (Levine, 1985; Schuster and Ramirez-Avila, 2008; Bauri *et al.*, 2012) consider it as only a parasite of man, pig and primates. Schuster and Ramirez-Avila (2008) classified *Balantidium coli* under subkingdom: Protozoa, phylum: Ciliophora, class: Litostomatea, order: Vestibuliferida and family: Balantiidae, whereas, Jameson (1926) classified *Buxtonella sulcata* under subkingdom: Protozoa, phylum: Ciliophora, class: Kinetofragminophorea, order: Trichostomatida and family: Pyenotrichidae. The study was conducted to differentiate morphology and behaviour of *B. sulcata* from cattle and *B. coli* from pig.

### MATERIALS AND METHODS

Fifty faecal samples each from buffaloes and pigs were collected from Hisar, Haryana. The samples were analysed by direct smear, flotation and sedimentation techniques. Heat killing was performed by heating the slide gently over a flame, to immobilize *Balantidium coli* trophozoites for micrometry and photography. Digital micrometry, phase contrast microscopy and microphotography of the faecal ciliates was done with the help of advanced trinocular digital microscope (Karl Zeiss). The data generated was statistically analysed using t test for morphological comparison of micrometry data.

### RESULTS AND DISCUSSION

There was significant difference between size of faecal parasitic ciliates in buffaloes and pigs, as shown in

Table 1. It is quite evident that buffalo ciliates and pig ciliates are having different size range as trophozoites and cysts collected from buffaloes are much bigger than those collected from pigs. There is no difference in the size of macronucleus of the trophozoite of the ciliates collected from either pigs or buffaloes.

**Table 1. Size range of ciliates in buffaloes and pigs**

Parameter	Trophozoite/ Cyst/ Macronucleus	Pig ciliates (ME±S.E) (95% CI)	Buffalo ciliate (ME±S.E) (95%CI)	t-value	P value
Length (μ)	Trophozoite	73.93±2.18 (69.66 - 78.20)	131.20±4.51 (122.37 - 140.03)	11.43	.001
Width (μ)	Trophozoite	62.67±1.82 (59.09 - 66.25)	97.53±2.62 (92.39 - 102.67)	4.29	.001
Length (μ)	Cyst	55.93±2.87 (50.29 - 61.57)	81.13±5.11 (71.10 - 91.16)	10.91	.001
Width (μ)	Cyst	57.67±2.80 (52.17 - 63.17)	81.47±4.96 (71.74 - 91.20)	4.17	.001
Length (μ)	Macronucleus	30.40±1.60 (27.26 - 33.54)	30.87±0.91 (29.08 - 32.66)	0.25	.802

In addition to the difference in size, the other morphological differences were also observed. Mouth was located at tapering anterior end towards the progression of trophozoite as seen during motion in ciliates of pigs, while ciliate of buffaloes showed that mouth was located at posterior end i.e. opposite to the direction of motion. Additionally, there was presence of a curved ridge which ran from the anterior end to the posterior end of the buffalo

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ciliate. The size range and morphological features indicate that the pig ciliate was *Balantidium coli* while buffalo ciliate was *Buxtonella sulcata*.

One interesting behavioural difference between trophozoite of *B. coli* and *B. sulcata* was the speed of movement. The movements of *B. coli* were very fast as compared to *B. sulcata*. The fast moving *B. coli* often disappeared from the microscopic observation view before a photograph was taken. Heat killing was used to facilitate photography and micrometry. Cysts of *Balantidium coli* in pigs and *Buxtonella sulcata* in buffaloes looks similar like having double wall around the cysts but have significant difference in size, as shown in Fig. 1.

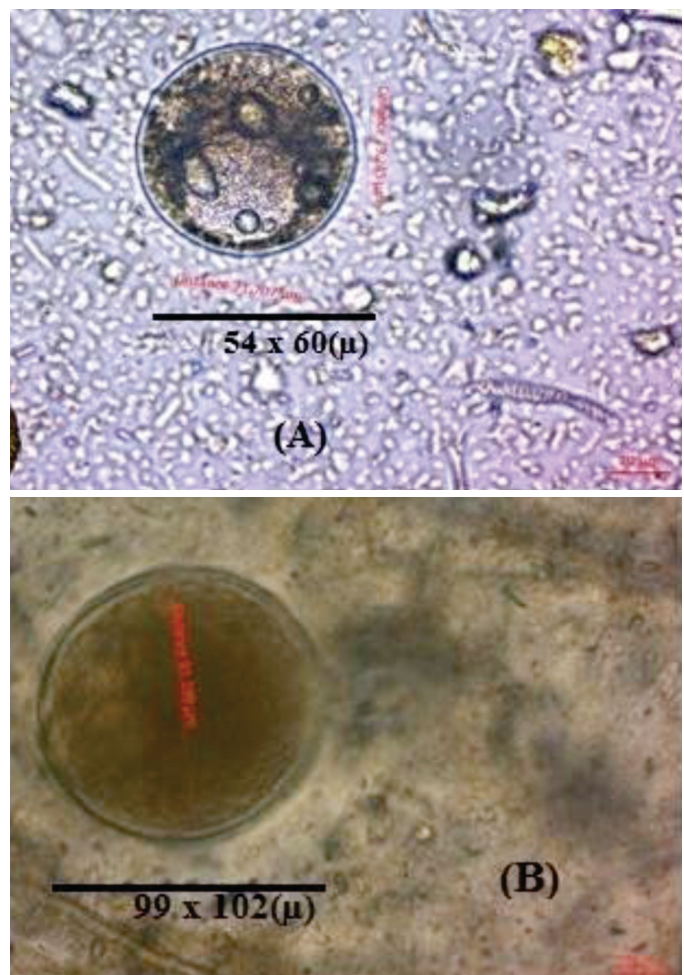


Fig. 1. Cyst of *Balantidium coli* (A) and *Buxtonella sulcata* (B) showing double wall and size (40x)

There was significant difference between size of *Buxtonella sulcata* in buffaloes and *Balantidium coli* in pigs, the later being smaller. The morphometric results of the trophozoites and cysts of *B. coli* in this study are in agreement with previous studies (Schuster and Ramirez-Avila, 2008).

The morphology of the trophozoites and cysts of *B. sulcata* in this study are in agreement with previous

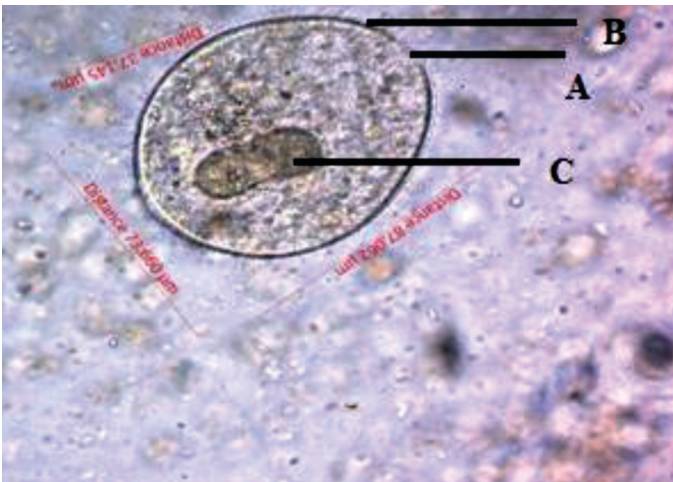


Fig. 2. Trophozoite of *Balantidium coli* with prominent cytostome (A), cilia (B) and kidney-shaped macronucleus (C) (40x)

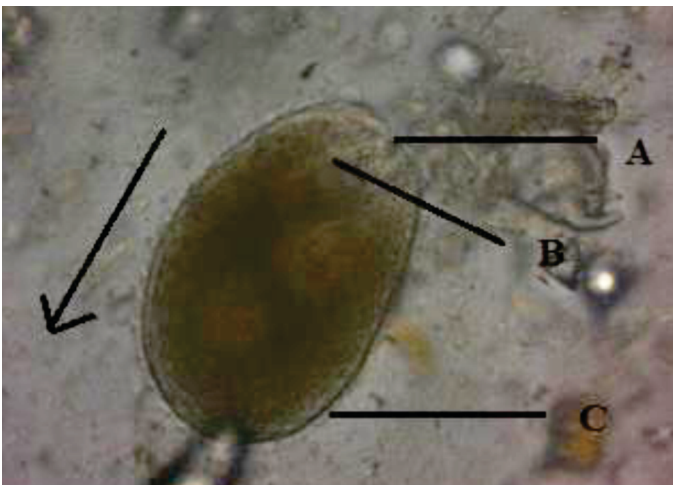


Fig. 3. Trophozoites of *Buxtonella sulcata* showing cytostome (A) opposite to the direction of movement (Arrow), ridge (B) and cilia (C) (40x)

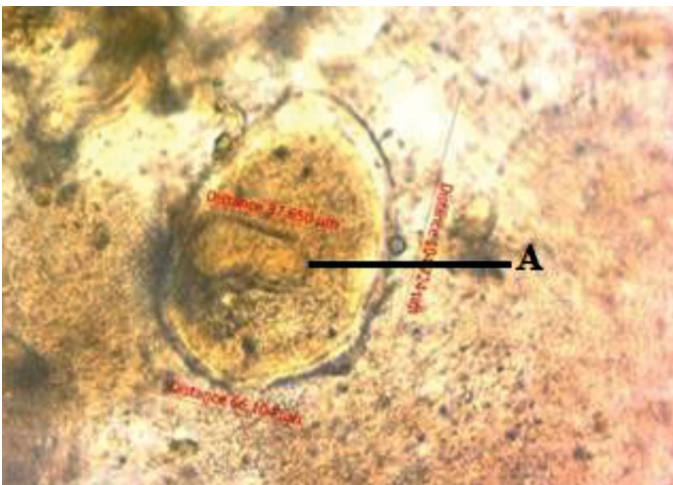


Fig. 4. Trophozoites of *Buxtonella sulcata* showing kidney-shaped macronucleus (A) (40x)

studies (Rees, 1930; Al-Saffar *et al.*, 2010; Sultan *et al.*, 2013). The most obvious morphological character of the trophozoites is the presence of a curved ridge which runs from the anterior end to the posterior end (Jameson, 1926; Rees, 1930). On the basis of the above characteristics we



concluded that pig ciliates are *Balantidium coli* and buffalo ciliates are *Buxtonella sulcata*. Levine (1985) suggested that the species present in ruminants (i.e. cattle, buffaloes, camels) is actually *B. sulcata*. This view is supported by our results and other works done on cattle and buffaloes (Tomczuk *et al.*, 2005; Goz *et al.*, 2006; Al-Saffar *et al.*, 2010). Ponce-Gordo *et al.* (2008) also stated that “it is a common mistake on identifying any ciliates in faces of animals as *B. coli*”.

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