

Associative behaviour and antagonism of bovine rumen ciliate (Protista, Ciliophora) from Zona da Mata, Minas Gerais State, Brazil ¹

Marta D'Agosto ²

Paulo Marcos da Matta Guedes ³

ABSTRACT. Aiming at obtaining the community profile and verifying the occurrence of antagonism and association among ciliates, samples of rumen content were analysed in 10 bovinos soon after their death. The animals were killed at the Juiz de Fora Municipal slaughter house (Juiz de Fora, Minas Gerais State, Brazil) between August 1996 and May 1997. Ciliates occurred, respectively, in the following percents and samples number: *Entodinium* Stein, 1859 (50,48; 100), *Diplodinium* Schuberg, 1888 (5,59; 98), *Eudiplodinium* Dogiel, 1927 (6,91; 97), *Ostracodinium* Dogiel, 1927 (9,68; 95), *Isotricha* Stein, 1859 (4,15; 93), *Dasytricha* Schuberg, 1888 (3,31; 93), *Metadinium* Awerinzew & Mutafova, 1914 (3,06; 90), *Eremoplastron* Kofoid & MacLennan, 1932 (7,39; 87), *Epidinium* Crawley, 1923 (5,31; 73), *Charonina* Strand, 1928 (1,33; 65), *Eodinium* Kofoid & MacLennan, 1932 (1,49; 59), *Diploplastron* Kofoid & MacLennan, 1932 (0,88; 24), *Elytroplastron* Kofoid & MacLennan, 1932 (0,36; 16), *Polyplastron* Dogiel, 1927 (0,04; 03) and *Buetschlia* Schuberg, 1888 (0,02; 01). When the antagonistic behaviour and the association were analyzed, it was observed that *Eudiplodinium* was detected in the absence of *Polyplastron* and in the presence of *Epidinium* in 94% and 73% of the samples, respectively. These data confirm the antagonism and the coexistence among particular populations of rumen ciliates and allowed the identification of 94% of the samples examined as being of profile type B, none of type A and 3% of mixed A-B community and of type O. It is suggested the use of the term community profile instead of population profile, as the respective types involve associations of various ciliate populations.

KEY WORDS. Rumen ciliate, behaviour, bovine, community profile, antagonism

Several factors act upon the behaviour of rumen ciliate populations. Among these factors, the competition between the members of the ruminal microbiota influences the population profile of the ciliates present in the rumen. CZERKAWSKI (1986) has pointed out the competition for nitrogen between ciliates and bacteria which digest starch and cellulose; there is also competition among species of ciliates which is recorded as antagonism and results in the elimination of one population by another.

EADIE (1962a,b) has showed that *Polyplastron multivesiculatum* (Dogiel & Fedorowa, 1925), *Eudiplodinium maggii* (Fiorentini, 1889) and species of *Epidinium* Crawley, 1923 do not establish stable mixed populations. Considering these observations, the following designations have been proposed by this author: type A population with *P. multivesiculatum* in association with other ciliates such as

1) Apoio: FAPEMIG.

2) Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Juiz de Fora. 36036-330 Juiz de Fora, Minas Gerais, Brasil. E-mail: dagosto@icb.ufjf.br

3) Bolsista PIBIC-CNPq/UFJF.

Diploastron affine (Dogiel & Fedorowa, 1925), and type B population in which *E. maggii* and *Epidinium* spp., together or isolated, are the large predominant ophryoscolecids. Common ciliates to types A and B are species of *Entodinium* Stein, 1859 and isotrichids ciliates.

The antagonism among some species of rumen ciliates has been studied by EADIE (1967) by means of inoculating known populations in ciliate-free hosts. He concluded that by predation a dominant population of *P. multivesiculatum* can eliminate *Epidinium*, *E. maggii*, *Eremoplastron* Kofoid & McLennan, 1932 and *Ostracodinium* Dogiel, 1927. He also stated that there is antagonism between *Epidinium* spp. and species of *Ophryoscolex* Stein, 1859.

TOWNE *et al.* (1988) examined the rumen content of bisons, observing ciliate populations characterized as type B in 30 hosts; mixed A-B populations with *P. multivesiculatum* coexisting with *E. maggii* and/or *Epidinium* sp. in 38 hosts; 12 hosts with type A population and one bison with type O population, characterized by the presence of *Entodinium* spp. and/or Isotrichidae ciliates, without the occurrence of the large ophryoscolecids which characterize the other types of populations.

The present work was aimed at presenting an evaluation of the community profile of bovine rumen ciliates soon after their death and analysing the behaviour of association and antagonism among the large ophryoscolecids and other ciliates that determine these profiles.

MATERIAL AND METHODS

The work has been developed at the Juiz de Fora Municipal slaughter house (Juiz de Fora, 21°45'35"S and 43°20'50"W, Minas Gerais State, Brazil) and in the Laboratory of Parasitological Zoology – Protozoology (Department of Zoology, Federal University of Juiz de Fora – UFJF).

Samples of the rumen content of 100 friesian-zebu bovines were examined just after the death of the animals at the Juiz de Fora Municipal slaughter house. The animals were obtained between August 1996 and May 1997.

The samples consisted of 20 milliliters of rumen content fixed and preserved in an equal volume of 18,5% formalin according to DEHORITY (1984). For the identification and quantification of the ciliates was adopted the method proposed by DEHORITY (1984) and modified by D'AGOSTO & CARNEIRO (1999), which proposed the replacement the brilliant green dye by the lugol solution. The identification of the ciliates was based on OGIMOTO & IMAI (1981).

The analyses of the communities profiles were made basing on the results obtained for the identification and quantification of samples per animal on each experimental phase, according to EADIE (1962a,b), TOWNE *et al.* (1988) and WILLIAMS & COLEMAN (1991). The association behaviour or antagonism among some ciliate genera/species were analysed according to EADIE (1967).

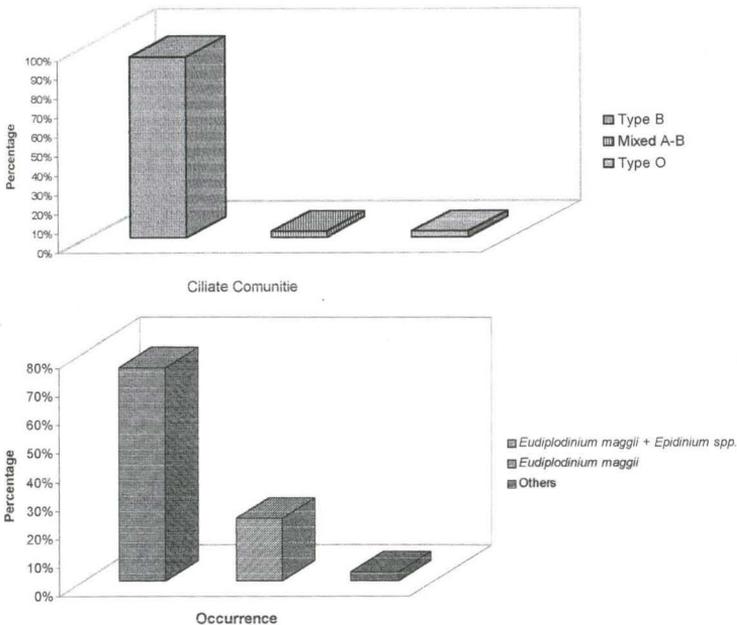
RESULTS AND DISCUSSION

Considering all the samples analysed, ciliates occurred, respectively, in the following percents and samples number: *Entodinium* Stein, 1859 (50,48; 100), *Diplodinium* Schuberg, 1888 (5,59; 98), *Eudiplodinium* Dogiel, 1927 (6,91; 97),

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In order to better adequate the ecological definitions, it is suggested the use the term community profile instead of population profile, as this characterization involves populations of various ciliate species.

The analysis of the community profile of each sample showed that 94% were characterized as of profile B (Fig. 1). With the analysis of signs of antagonistic behavior and association among ciliate populations, it has been observed that *E. maggii* occurred in the absence of *P. multivesiculatum* in 94% of these samples and in 73% it was associated with *Epidinium* sp. (Fig. 2).



Figs 1-2. (1) Type composition (percentage of B, mixed A-B and O) of rumen ciliate comunitie in cattle; (2) association percentage of the rumen ciliate *Eudiplodinium maggii* and *Epidinium* spp.

The large ophryoscolecid that characterizes the type A community, *P. multivesiculatum*, was observed in only 3% of the samples, characterized as mixed type (A-B) due to the simultaneous occurrence of *E. maggii* and/or *Epidinium*. The occurrence of *Diploplastron* sp., usually associated with *P. multivesiculatum*, was found in 20,22% of the profile B samples.

Only three samples were regarded as type O, characterized for presenting organisms of the genus *Entodinium* and/or isotrichids, without the occurrence of large ophryoscolecids that predominate in A and B communities.

The results have demonstrated a clear tendency for a natural establishment of one of the community types with the predominance of some large ophryoscolecid. When TOWNE *et al.* (1988) observed 47% of A-B mixed community in bisons, they pointed out that the large predominant ophryoscolecids coexisted with low populations of antagonic ciliates. Basing on these results and considering that this is a momentary record carried out in recently killed animals, it is suggested that the elimination of one of the antagonic populations would occur in the records of the A-B mixed type. This supposition is based on several authors who followed the ciliate populations in fistulate animals for some time (EADIE 1967; ABOU AKKADA *et al.* 1969; JOUANY *et al.* 1988; D'AGOSTO *et al.* 1998) or in isolated hosts (ITO *et al.* 1995) and who also found the stabilization of the occurrence of large entodiniomorphs in a certain type of community.

The communities regarded as mixed presented a clear predominance of *E. maggii* and/or *Epidinium sp.* in relation to *P. multivesiculatum*. These data indicate a tendency of these mixed communities to be established as B-type community.

These results confirm the tendency for an antagonic behaviour and the association among certain ciliate populations of the rumen.

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