THE EFFECTS OF *EPIDINIUM CAUDATUM* OR *DASYTRICHA RUMINANTIUM* ON THE RUMEN FERMENTATION AND NITROGEN METABOLISM IN GOATS

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Introduction

The role of rumen protozoa has become of considerable interest in relation to animal production (Veira, 1986). Many in vivo studies have been carried out by comparing conventional animals (mixed protozoa) with defaunated animals. Recently, Jouany et al (1981) showed that each protozoa genus had a specific action on the rumen fermentation using wethers established *Polyplastron multivesiculatum(P)*, *Isotricha prostoma(I)* or *Entodinium* sp. *(En)* as monogeneric ciliate protozoa.

In the present paper, we studied the effect of *Epidinium caudatum (E)* or *Dasytricha ruminantium (D)* on rumen fermentation and nitrogen (N) metabolism in vivo.

Materials and Methods

Nine castrated Japanese Saanen goats of 6 months of age weighing about 18 kg were housed in a room under controlled temperature (22°C), and maintained in individual metabolism cage to prevent contact with each other. They were fed 500 g of basal diet consisting of 300 g Italian ryegrass hay wafer (19.4 mgN/g), 175 g corn (13.4 mgN/g) and 25 g molasses (4.6 mgN/g). The diet was given once daily at 09:30 h. Water and a mineral block were given freely. They were defaunated by feeding of the basal diet supplemented with 25 g Ca-caprylate for 8 consecutive days. After the defaunation, three of them were refaunated by the inoculation of ciliate population mainly made up of *D*. The goats established with *D* as single rumen protozoa (*D*-goats) were prepared by feeding of the basal diet supplemented with Ca-caprate to the refaunated goats. Other three goats were inoculated with mixed protozoa containing *E*. The goats established with *E* (*E*-goats) were prepared using lauric acid. Remained three goats were maintained protozoa-free (PF-goats).

In trial 1, they were given the basal diet for 4 weeks. On days 22 to 26, total urine and feces were collected daily. On days 27, samples of rumen fluid were taken by a stomach tube just before feeding (time 0) and 2, 4 and 6 hrs after feeding. At the same time, samples of venous blood were taken. In trial 2, the basal diet supplemented with urea (10 g/day) were given for 4 weeks. Samples were taken by the same manner as trial 1.

Results and Discussion

In the present paper, rumen fermentation and N metabolism were examined in *E*-goats and *D*-goats. Though *En*, *I* or *P* had been studied in vivo (Williams and Dinusson 1973, Jouany et al. 1981), *E* and *D* have not been studied alone in vivo. In addition, this paper first showed defaunation and establishment of *D* or *E* using medium-chain fatty acids. Details of the method will be reported in the near future (in preparation).

The numbers of protozoa were maintained in the order of 10^5/ml throughout the experiment in both *E*- and *D*-goats. The numbers of both species decreased by feeding and gradually recovered within 24 hr.

In trial 1, fecal N excretion of *E*-goats (2.85 g/day) decreased significantly ($p < 0.05$) compared to that of PF-goat (3.06 g/day). In both trials, fecal N excretion tended to be higher in PF-goats, which is in agreement with results shown by mixed protozoa (Itabashi et al., 1984).

In trial 1, excretions of allantoin (mg/day) in PF-goats, *E*-goats and *D*-goats were 1120, 1040 and 980, respectively. In trial 2, those were 1130, 1100 and 910, respectively. As microbial N entering abomasum is correlated with allantoin excretion (e.g. Matsumoto and Itabashi, 1988), these data indicate that microbial synthesis in the rumen decreased in *D*-goats.

Figure 1 shows time cource of some constituents in the rumen fluid and plasma. In trial 1, rumen ammonia N of PF-goats was significantly ($p < 0.05$) lower than that of *D*- or *E*-goats at 4 hr after feeding. In trial 2, ingestion of diet increased ammonia N of *E*-goats significantly (p

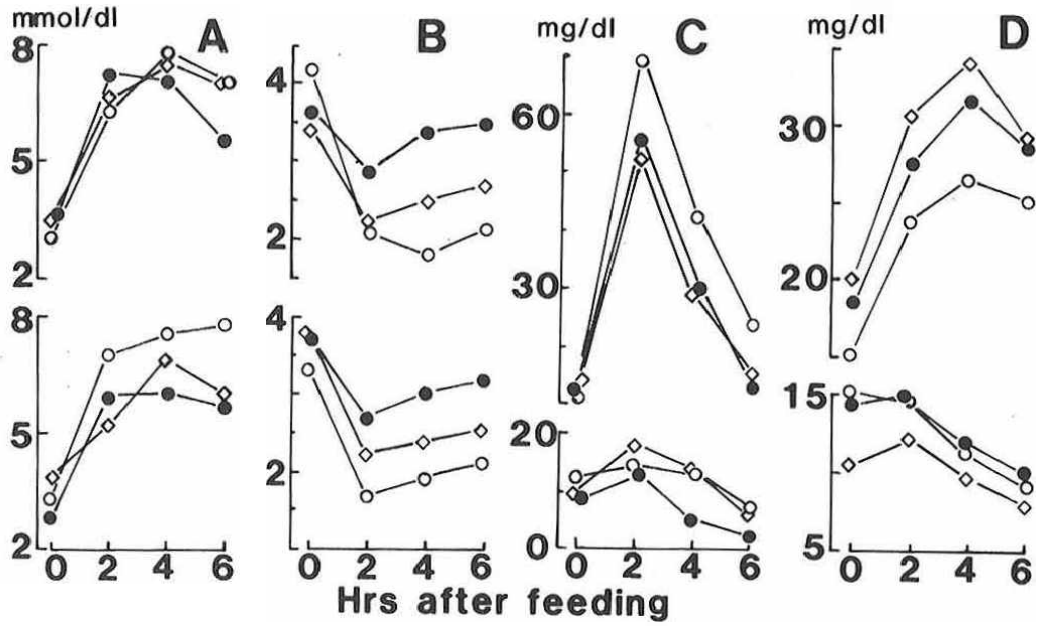

Figure 1. Time cource of rumen total VFA (A), C_2/C_3 ratio (B) and ammonia-N (C) and plasma urea-N (D) in PF goats (●), E-goats (○) and D-goats (◇). They were fed the diet supplemented with (upper) or without (lower) urea.

< 0.05) compared to PF- or *D*-goats. But plasma urea N was the lowest in *E*-goats.

Both *D* and *E* increased the molar proportion of propionate (C3) and decreased that of acetate (C2), resulting the decrease of C2/C3 ratio in faunated goats. The results are in accordance with Williams and Dinusson (1973) and Jouany et al. (1981) who used animals inoculated with *En*. Though they showed decreased butyrate proportion concomitant with increased propionate in *P*-, *E*- or *En*- animals, *E* or *D* increased butyrate in our present work. On the other hand, it has been shown that mixed protozoa increased C2/C3 ratio and butyrate and decreased propionate (Williams and Dinusson, 1973; Jouany et al, 1981; Itabashi et al, 1984). These results suggest that the mode of action of single species or genus of protozoa on rumen fermentation differ from that of mixed protozoa. These discrepancies are not explained clearly, but bacterial composition might be changed by the establishment of *E* or *D* toward propionate production. Informations on concurrent changes of bacterial population are needed to explain changes mentioned above.

The present study suggests that *E* and *D* also have a specific action on the rumen fermentation and N metabolism as suggested by Jouany et al. (1981).

(Key Words: *Epidinium*, *Dasytricha*, Allanatoin)

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