

Effect of diet change on population of rumen protozoa in dromedary camel

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An increase in the amount of readily fermentable carbohydrates in the diet of camels can potentially disrupt the balance of the rumen microbial population and result in metabolic disorders. Rumen protozoa are part of the diverse microbial population that forms a symbiotic relationship with the host animal. Protozoa engulf bacteria and starch granules and ferment starch to produce organic acids, mainly volatile fatty acids (VFA). Fermentation of starch by protozoa occurs at a much lower rate than by amylolytic bacteria and therefore reduces the risk of acid accumulation. However, their activity, and hence their beneficiary role is compromised when rumen pH is lowered. Rumen protozoa are sensitive to low pH and may be killed when the rumen pH falls below 5. This study was carried out to investigate the effect of supplementary grain feeding of camels on protozoa types and population.

Four fistulated camels were fed rhodes grass (*Chloris gayana*) for 3 weeks (Period 1). Following period 1 they were gradually transitioned to a rhodes grass + steam flaked barley grain diet over a one week period, then were fed a 40%: 60% rhodes grass:barley ratio diet for a further 2 weeks (Period 2). Fresh water was available *ad libitum*. For the purposes of this experiment, rumen samples were collected on day 14 of both periods at 0, 8 and 16 hours after feeding. The pH was measured immediately after sampling. The rumen content was fixed and preserved in formaldehyde–saline solution. Enumeration of the ciliated protozoa was carried out using a Hawksley counting chamber and identification following the

scheme described by (Dehority, 1993). Data were analysed using one-way ANOVA and correlation analysis.

The total number of protozoa significantly decreased by 4.9 fold at 0 hours, 2.3 fold at 8 hours and 5.2 fold at 16 hours following the shift from the roughage to the roughage plus grain diet ($P < 0.05$; Table 1). *Entodinium* spp. were the predominant species when camels were consuming the roughage diet, comprising over 80% of the total protozoal population. The *Epidinium* spp. and *Eudiplodinium* spp. represented less than 10% of the population during this period. When camels were fed the roughage plus grain diet, the *Epidinium* spp. became the predominant species and represented greater than 65% of the total protozoal population. The number of *Entodinium* spp. declined by at least 6 fold when the camels were fed the roughage plus grain diet. This study also established the existence of *Dasytricha* (0.3% and 0.2% for roughage and roughage plus grain respectively), *Oligoisotricha* (0.5% for roughage diet), and *Buetschlia* spp. (less than 0.1% for roughage diet) in the camel's rumen. The total protozoa count and pH were significantly lower ($P < 0.05$) when camels were consuming the roughage plus grain diet. Our results show that supplementary feeding of grains to camels has a significant effect on the pH and the protozoal population within the rumen.

Dehority, B.A. (1993). Laboratory Manual for Classification and Morphology of Rumen Ciliate Protozoa, pp. 120. CRC Press, Inc.

Table 1 Protozoal population in the rumen of camels fed roughage (R) and roughage + concentrate (R+C) diets.

Diet	Time after feeding (h)	Total numbers \pm s.e. ($\times 10^4$ ml ⁻¹)*	<i>Entodinium</i> (%)	<i>Epidinium</i> (%)	<i>Eudiplodinium</i> (%)	<i>Diplodinium</i> (%)	pH
R	0	9.8 \pm 2.33	92.1	3.8	2.8	0.6	6.3
	8	6.8 \pm 1.56	82.3	5.2	9.2	1.4	6.5
	16	13.1 \pm 4.36	84.5	4.9	9.8	0.5	6.3
R+C	0	2.0 \pm 1.67	11.3	69.3	17.5	1.3	5.6
	8	3.0 \pm 2.55	12.4	68.5	17.1	2.0	5.2
	16	2.5 \pm 2.08	11.3	73.3	15.4	–	5.5

*Differences in protozoa numbers between diets are significant ($P < 0.05$) at all sampling times