

THE EFFECT OF MONENSIN ON RUMEN CILIATE PROTOZOA
AND FERMENTATION IN SHEEP

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Monensin (c. 30 mg/kg feed) increases the efficiency of utilization of feeds by ruminants (Chalupa 1980). It increases the molar proportion of propionate in total VFA in the rumen, but workers such as Raun et al. (1976) argue that this effect does not account fully for the improvement in feed conversion. Protozoa numbers have been decreased by monensin in some but not all in vivo studies (Oddy et al. 1978; Chalupa 1980). Hino (1981) found that monensin was toxic to protozoa in vitro and suggested this might explain some of the effects on rumen efficiency.

This experiment was designed to study effects of monensin on populations of rumen ciliates and other rumen processes. Six mature cross-bred wethers with rumen cannulas were fed (g/d) 700 oats chaff, 100 lucerne chaff and 100 dried molasses in equal amounts each hour. During an introductory period (days 0-21) three of the animals received 20 mg/day active monensin mixed into the feed allowance. During the experiment (days 21-32) 30 mg monensin/d, i.e. 33 mg/kg feed/d, was given to the same sheep, and samples were collected at 1200 h each day for subsequent analysis. Results are given in Table 1.

TABLE 1 Effects of monensin on ruminal measurements in sheep

	Control	Monensin	SEM	Significance
Large ciliates, > 75 μ ($\times 10^{-5}$ /ml)	0.09	0.01	0.02	p<0.10
Small ciliates, < 75 μ ($\times 10^{-5}$ /ml)	5.93	7.06	1.53	NS
Propionate proportion (mol/mol VFA)	0.21	0.29	0.01	p<0.01
Acetate proportion (mol/mol VFA)	0.67	0.61	0.01	p<0.01
Volume (l)	3.45	4.54	0.25	p<0.05
Fluid t $\frac{1}{2}$ (d)	0.26	0.34	0.004	p<0.001

There were no significant differences in total VFA (110 mmol/l), pH (6.64), fluid outflow rate (9.1 l/d) nor NH₃ concentrations (4 mmol/l), although decreases in NH₃ concentration in response to monensin have been reported (Chalupa 1980). Numbers of ciliates/ml fluctuated greatly in all animals. In contrast to Oddy et al. (1978) we did not detect effects on total numbers of ciliates, but there was a tendency for numbers of large ciliates to be lower (and for small ciliates to be higher) in sheep receiving monensin. This suggests selective toxicity but the results contradict Hino (1981) who found 4 mg monensin/l was toxic for *Entodinium* spp. (small ciliates) but not for larger ciliates which were affected only at 8 mg/l; the effective concentration in rumen fluid in our sheep was calculated, from knowledge of rumen kinetics, to be < 3 mg/l, which is probably closer to that occurring in commercial practice.

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