BUFFERING CAPACITIES OF RUMEN AND CAECAL DIGESTA FROM SHEEP

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Acidosis as a result of rapid fermentation of starch or sugars can occur in the rumen or hind gut (Godfrey *et al.* 1992). Saliva contains both bicarbonate and phosphate which provide important sources of buffer in the rumen. However, there is no similar supply of buffer in the caecum. The aim of these experiments was to investigate the buffering capacities of rumen and caecal digesta taken from Merino sheep weighing between 30 to 45 kg. Sheep on different diets were used in 3 experiments.

In experiment 1, six wethers were individually penned and fed oat chaff 900 g/day, hourly for 4 weeks before the experiment.

In experiment 2, three wethers were fed oat chaff 900 g/day for 2 weeks at hourly intervals before receiving intra-ruminal infusions of glucose, lactic acid or acetic acid in order to induce acidosis (pH < 5.2) in the rumen. The samples of rumen and caecal digesta were taken for the experiment 48 hours after acidosis was induced.

In experiment 3, five ewes grazing green pasture were used.

Following euthanasia, samples of rumen and caecal digesta were taken to determine buffering capacities. The buffering capacity of the digesta was determined by titration with 1 mol/L lactic acid, acetic acid or HCl, respectively, and all titrations were carried out in a hot room (37°C). The results are summarized in table 1. The buffering capacity is defined as the amount of acid required to change pH of digesta by 1 unit and calculated for change from pH 6.5 to 6.0.

Table 1. Buffering capacities (mean values SEM) of rumen and caecal digesta of sheep at 37°C and pH 6.5-6.0 (mol acid/ml digesta/1 unit pH change)

	Buffering capacity of rumen digesta			Buffering capacity of caecal digesta		
	lactic	acetic	HCl	lactic	acetic	HCl
Experiment 1 sheep fed chaff	51.1 ± 7.2	47.7 ± 8.9	33.7 ± 0.4	80.1 ± 3.3	72.3 ± 7.8	65.0 ± 14.0
Experiment 2 acidosis sheep	31.3 ± 0.1	31.6 ± 1.3	27.1 ± 1.5	75.5 ± 1.4	70.8 ± 0.6	57.2 ± 0.6
Experiment 3 pasture sheep	40.0 ± 2.8	38.6 ± 2.9	31.4 ± 2.5	78.6 ± 6.0	69.3 ± 4.0	54.4 ± 9.0

The results indicate that the buffering capacity of caecal digesta was nearly double that of rumen digesta in all sheep ($P < 0.05$). The buffering capacities of rumen and caecal digesta from the sheep fed chaff were a little higher than those from the sheep on grass ($P > 0.05$). The buffering capacities of rumen and caecal digesta from the sheep that had been made acidotic were slightly lower than those from normal sheep fed the same diet ($P > 0.05$). The buffering capacity determined using HCl was always less than that for lactic acid or acetic acid. It was suggested that this is due to the lower pKa for HCl. The conversion of lactic acid to acetate, propionate, and butyrate appears to have occurred.

It is very interesting that, despite there being no input of saliva into the caecum, the buffering capacity of caecal digesta was higher than that for the rumen digesta. This could be a result of the higher dry matter content of the caecal digesta and the greater concentration of buffering agents. The buffering capacities of rumen and caecal digesta may vary depending on feed and water intake before slaughter.

GODFREY, S.I., BOYCE, M.D., ROWE, J.B. and SPEIJERS, E.J. (1992). *Aust. J. Agric. Res.* 44:1093-101.