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DUODENAL AVAILABILITY OF AMINO ACIDS IN GROWING LAMBS SUPPLEMENTED WITH FERMENTABLE OR BYPASS PROTEINS

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The effect of supplying bypass protein in the diet of growing lambs consuming a low-protein, cellulosic diet is to increase feed intake and rate of liveweight gain (Kempton and Leng 1978). The reasons for this response are not clear but the effect has been generally attributed to an increased absorption of amino acids, probably arising from the dietary bypass protein, but perhaps also from increased microbial protein outflow from the rumen.

In this study sheep cannulated in the rumen, duodenum and ileum were allowed free access to a low-protein basal diet of 70% oat hulls and 30% Solka-Floc (Diet A), supplemented with urea (B), urea plus untreated casein (C), or urea plus formaldehyde-treated bypass casein (D). [^{15}N]-ammonium sulphate was infused intraruminally as a means of estimating ammonia kinetics and of separating the ^{15}N-labelled (microbial) NAN from dietary NAN in duodenal digesta (Nolan 1974). Flow rates of duodenal and ileal digesta were estimated using the recovery of intraruminally infused non-absorbable fluid phase and particulate matter markers. A summary of the results is given in Table 1.

TABLE 1. N metabolism in the rumen and microbial and dietary protein leaving the rumen of lambs on low protein diets supplemented with fermentable or bypass proteins

Diet	Metabolizable energy intake (MJ/d)	N intake (g N/d)	Rumen NH_3 production (g N/d)	Rumen NH_3 absorption (g N/d)	Flow of NAN to duodenum	
					Microbial (g N/d)	Dietary (g N/d)
A	4.7	1.7	6	2	5	0
B	8.3	13.6	17	8	9	1
C	9.7	30.7	33	18	12	2
D	10.7	40.0	18	10	10	24

Although microbial outflow from the rumen increased with increased intake, the availability of microbial protein to the animal (microbial NAN flow to the duodenum/MJ ME intake) was similar on all diets. Urea and untreated casein were completely degraded in the rumen and'produced the highest concentrations of ammonia; bypass casein was almost completely resistant to degradation and passed intact into the duodenum. Thus the total availability of amino acids to the animal was much greater on the diet containing bypass protein (34 g N/day) than on the other diets (5-14 g N/day).

The apparent digestibility of NAN in the small intestine was 63-66% on all diets irrespective of whether the NAN was predominantly as microbial N or as bypass protein. The ratio of protein absorbed: energy absorbed (g NAN/MJ ME) was 5.5 ± SE 0.70 for the basal, urea and untreated casein diets, and 11.6 ± 1.71 for the HCHO-casein diet.

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