

TRANSFERS OF NITROGEN BETWEEN BLOOD AND THE RUMEN IN SHEEP  
GIVEN A LOW PROTEIN ROUGHAGE

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Nolan and co-workers found low rates of transfer of blood urea-N (BU-N) into the rumen (1-2 g N/d) in sheep given lucerne chaff and poorer quality roughages (Nolan and Leng 1972; Nolan and Stachiw 1979). By contrast, Kennedy and Milligan (1978) reported values of up to 9.6 g N/d in sheep given bromegrass pellets. This paper reports measurements of the extent of N transfer across the rumen wall of sheep given a poor quality diet supplemented with different levels of urea-N.

Six Merino or Merino-cross wethers (35-45 kg live weight) fitted with rumen and abomasal cannulas were offered ad libitum every 3 h, alkali-treated wheat straw (45 g NaOH/kg dry matter (DM)) supplemented with minerals including S to provide a N:S ratio of 10:1. The treated straw contained 878 g organic matter (OM) and 5.3 g N/kg DM. A urea solution was sprayed on the straw to provide a total of 8.8, 11.2 and 16.8 g N/kg DM. The exchange of N between rumen  $\text{NH}_3$  and blood urea was determined from their enrichment with  $^{15}\text{N}$  during sequential intravenous  $^{15}\text{N}$ -urea and intraruminal  $^{15}\text{NH}_4\text{Cl}$  infusions.

Treatment effects on DM and digestible OM intake, organic matter apparently digested in rumen (OMADR) and N transfer across the rumen wall

	Treatment			SEM
	A	B	C	
	Urea-N added (g/kg DM)			
	3.5	5.9	11.5	
DM intake (g/d)	808 <sup>a</sup>	1034 <sup>b</sup>	1102 <sup>b</sup>	80.2
Digestible OM intake (g/d)	434 <sup>a</sup>	534 <sup>b</sup>	592 <sup>b</sup>	41.7
OMADR (g/d)	312 <sup>a</sup>	406 <sup>ab</sup>	454 <sup>b</sup>	46.8
Rumen $\text{NH}_3$ -N (mg/l)	37 <sup>a</sup>	107 <sup>b</sup>	184 <sup>c</sup>	12.6
Blood urea-N (mg/l)	41 <sup>a</sup>	92 <sup>b</sup>	152 <sup>c</sup>	6.7
N transfers:				
Rumen $\text{NH}_3$ to blood urea (g/d)	3.5 <sup>a</sup>	6.7 <sup>b</sup>	8.9 <sup>c</sup>	0.94
Blood urea to rumen $\text{NH}_3$ (g/d)	3.8 <sup>a</sup>	4.7 <sup>a</sup>	2.6 <sup>b</sup>	0.52
Microbial N from blood urea (%)	31 <sup>a</sup>	21 <sup>b</sup>	12 <sup>c</sup>	1.8

Means with unlike superscripts differ significantly ( $P < 0.05$ ).

The transfer of N from rumen  $\text{NH}_3$  to BU increased with increasing rumen  $\text{NH}_3$  levels. The transfer of BU-N to rumen  $\text{NH}_3$  was similar for treatments A and B but decreased at the highest rumen  $\text{NH}_3$  level (C); the rates of transfer were intermediate between those cited above. On the low-N diet, there was a small positive net transfer of N into the rumen  $\text{NH}_3$  pool but there was substantial net transfer from rumen  $\text{NH}_3$  to BU-N with diets B and C.

The proportion of microbial N derived from BU decreased progressively as rumen  $\text{NH}_3$  increased. The increase in DM intake and OMADR from treatment A to treatments B and C suggests that microbial activity under the conditions of this experiment was limited when  $\text{NH}_3$  levels were less than about 110 mg N/l.

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