UREA METABOLISM IN SHEEP FED LOW QUALITY ROUGHAGE AND SUPPLEMENTS

M. HETTIARACHCHIA, R. M. DIXONA and J. B. NOW

[A]School of Agriculture and Forestry, The University of Melbourne, Parkville, Vic. 3052.
[B]Dept of Biochemistry, Microbiology and Nutrition, University of New England, Armidale, N.S.W. 235 1.

Transfer of endogenous urea from plasma to rumen digesta contributes nitrogen (N) for rumen microorganisms, and this transfer may be influenced by N intake and organic fermentation (OM) in the rumen (Kennedy and Milligan 1980). The effect of these factors on urea transfer to the rumen in sheep fed rice straw based diets was examined.

Twelve rumen cannulated Merino wethers (initially 16 months, 45 kg) were used in a factorial experiment (6 treatments, 2 sheep, 3 periods of 30 days). The dietary treatments consisted of 500 g/day rice straw (T1), 750 g/day 5% NaOH-treated rice straw (T2), 500 g/day rice straw plus 250 g/day barley grain (T3), or the same diets plus intra-ruminal infusions of 15, 30 or 15 g urea/day (T4, T5 and T6 respectively). Each diet also included 50 g/day of luceme hay and 20 g/day of mineral mixture. ^{14}Curea and $NaH^{14}CO_3$ tracers were used to measure urea transfer from the plasma to rumen digesta (Norton *et al.* 1978). The sheep were kept in metabolism cages throughout the experiment.

Table 1. Intake and N metabolism, including plasma urea nitrogen (PUN) concentration and plasma urea irreversible loss (PUN-IL), in sheep fed rice straw-based diets

Measurement	T1	T2	T3	T4	T5	T6	s.e.m.	Signif.
Number of sheep	6	4	6	6	5	6		
DM intake (g/day)	491	694	731	494	734	723	5.6	**
N intake (g/day)	3.4	4.3	6.3	10.7	18.7	13.5	0.31	**
OM digestibility (%)	53.1	57.0	59.6	54.0	61.3	60.4	1.22	**
DOM intake (g/day)	215	308	366	219	338	372	10.0	**
Rumen NH_3 (mg N/L)	37	3	31	223	277	225	20	**
Rumen pH	6.7	6.8	6.5	6.7	6.9	6.4	0.05	**
PUN (mg N/L)	78	24	72	201	202	180	12	**
PUN-IL (g N/day)	6.1	3.7	8.3	11.8	16.8	13.2	0.9	**
PUN transfer (g N/day)	2.0	1.4	2.4	1.1	1.4	1.3	0.3	**
Clearance (L/day)	31	59	35	6	8	9	4.7	**

$^{**}P<0.01$.

Some sheep did not consume all of the NaOH-treated straw, and their observations were excluded. Digestible organic matter (DOM) intake was increased by both barley grain supplement and feeding NaOH-treated straw. In the absence of intra-ruminal urea infusions, barley grain supplement (T3) had no significant effect on plasma urea N (PUN) concentration, rumen NH, concentration or PUN transfer to the rumen. Feeding NaOH-treated straw (T2) resulted in the lowest PUN and rumen NH, concentrations and, although PUN transfer to the rumen was reduced, clearance (calculated as the ratio of PUN transfer and PUN concentration) was increased. Intra-ruminal infusion of urea (T4, T5 and T6) increased PUN, rumen NH_3 concentration and plasma urea irreversible loss (PUN-IL), but PUN transfer to the rumen and clearance were reduced. Hence PUN transfer to the rumen was apparently reduced by high rumen NH_3 concentrations and was not affected by increased OM fermentation in the rumen, although clearance was negatively related to rumen NH, concentration.

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