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UREA METABOLISM AND RUMEN FUNCTION IN SHEEP GIVEN CONCENTRATE DIETS TREATED-WITH FORMALDEHYDE

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Two sheep were given, from a continuously moving belt, pelleted diets containing barley 70, straw 10, soybean meal 10 and either starch 10 (B) or starch 9, urea 1 (BU) at the rate of 1000 g/d. The diets were untreated *or* treated with formaldehyde (F) (Faichney and Davies 1973). The sheep were kept in metabolism cages indoors; mean max. and min. temperatures were 24 and 20°C. Urea synthesis was calculated by dividing the dose by the integral of the specific activity/time curve in jugular plasma following a single injection of ^{14}C-urea. Clearances of urea and endogenous creatinine were determined in a 72 hr urine collection period spanning the estimate of urea synthesis. The mean results for the two sheep are shown in the table:

Diet	N intake (g/d)	Urea N synthesis (g/d)	Urea N excretion (g/d)	Urea N recycled (%)	Plasma urea N (mg/l)	Urea clearance (ml/min)	Creatinine clearance (ml/min)	Clearance ratio
B	18.4	12.8	3.6	73	80	30	91	0.34
BF	18.4	12.7	2.6	80	71	25	75	0.34
BU	21.5	14.9	7.5	50	126	42	86	0.48
BUF	23.0	22.6	8.0	65	137	41	92	0.46
Standard Error		1.37	0.75	3.6	10.8	4.2	7.4	0.035

Formaldehyde treatment increased and urea inclusion decreased the proportion of synthesized urea N recycled ($P<0.05$ and $P<0.01$). The urea supplement increased the clearance ratio (an estimate of the fraction of filtered urea excreted) from about one third to about one half but treatment had no effect. These results suggest that the kidney is not actively involved in the enhanced recycling of urea to the gastro-intestinal tract which is consequent upon formaldehyde treatment of the diet.

Rumen pH, volatile fatty acid (VFA, mmole/l), acetic:propionic acid ratio (A:P) and ammonia nitrogen (mg/l) values for sheep l/sheep 2 were: B 5.60/5.50, 101/108, 1.31/3.97, 115/253; BF 6.10/5.72, 66/85, 3.83/2.67, 105/93; BU 5.02/5.43, 189/110, 1.46/2.36, 542/220; BUF 5.38/5.58, 96/103, 0.79/4.42, 163/238. Rumen pH tended to rise with treatment and fall with urea inclusion; conversely VFA levels tended to fall with treatment and rise with urea inclusion. The expected big increase in ammonia levels with urea inclusion occurred when A:P increased or remained stable; it did not occur when A:P decreased. The expected decrease in ammonia levels with treatment occurred when A:P decreased or remained stable; it did not occur when A:P increased. Thus a microbial population characterized by high A:P used ammonia less effectively. These findings are consistent with those of Ishaque, Thomas and Rook (1971) that, with concentrate feeding, either of two patterns of rumen fermentation may occur, one of which (high A:P) may be associated with less efficient protein synthesis than the other. The need for supplements of intact protein in high concentrate production rations (Preston and Willis 1970) may be related to the low rumen pH and variable A:P which accompany their feeding. Formaldehyde treatment of the diet may partly replace this need.

FAICHNEY, G.J., and DAVIES, H. LLOYD (1973). Aust. J. agric. Res. 24: 613.
ISHAQUE, M., THOMAS, P.C., and ROOK, J.A.F. (1971). Nature *New* Biology, 231: 253.
PRESTON, T.R., and WILLIS, M.B. (1970). "Intensive Beef Production" (Pergamon Press: Oxford).

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