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The digestion of fresh perennial ryegrass fertilized at 2 levels of nitrogen in lactating dairy cows

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The digestion of protein in intensively fertilized grasses is characterized by high losses of nitrogen (N) in the urine. This experiment aimed at studying the effect of lowering N fertilization on N metabolism in the dairy cow.

The effect of 2 levels of N fertilization (0 or 80 Kg N/ha before and after the first cut in spring 1991) of fresh perennial ryegrass on digestion was tested with a second cut (30-d-old) in a cross-over design on 4 fistulated dairy cows (20 kg milk). Grass was given *ad libitum* in 3 meals per day. The flow of duodenal digesta was calculated from PEG and Yb recovered in faeces and their respective concentration in digesta. Feeding behaviour was also recorded.

The absence of N fertilizer resulted in a reduction in N content of grass (17.4 *vs* 24.2 g/kg DM) and N intake (NI) (table I) whereas organic matter (OM) intake was not affected (14 kg/d). OM and NDF digestibilities were reduced (0.79 *vs* 0.81 and 0.72 *vs* 0.78, respectively for OM and NDF, $P < 0.05$). Due to a higher DM content in unfertilized grass (197 *vs* 145 g/kg) time spent eating was reduced (495 *vs* 607 min/d). The non-ammonia nitrogen flow into the duodenum (NAN) expressed in g/d or as a fraction of digestible OM intake (32.5 g/kg DOMI), was similar in the 2 treatments ($P > 0.1$). NAN was equal to NI in the fertilized grass but exceeded NI by 95 g/d in the unfertilized grass. This net recycling matched the quantities of N excreted in urine (NU) which were indeed reduced by 95 g/d (in fact 86 g/d urea-N) with the unfertilized grass and could be related to the lower rumen concentration of ammonia (NH_3). Reduced N fertilization led both to a slight decrease in feed N degradability estimated *in sacco* (0.74 *vs* 0.77) and in the absolute amount of feed N escaping the rumen degradation – from 96 to 76 g/d if predicted from the *in sacco* degradability (Vérité and Peyraud, 1989). The efficiency of microbial synthesis was calculated to be 25 g N/kg DOMI and was unlikely to be modified according to the treatment.

In conclusion, these results suggest that reduced N fertilization greatly affects N metabolism in the dairy cow, resulting in lower N excretion in urine.

Vérité R, Peyraud JL (1989) *Ruminant Nutrition* (Jarrige R, ed) John Libbey and Co, London, 33-47

Table I. Effect of N fertilization of N metabolism in dairy cows.

Fertilization	*NI (g/d)*	*NAN (g/d)*	*NU (g/d)*	*NH_3 (mg/l)*
0	263 [a]	358	69 [a]	15 [a]
80	367 [b]	367	164 [b]	99 [b]
rsd	22	4	5	19

[a,b]: means with different superscripts in the same column are significantly different ($P < 0.05$); rsd: from the model: Y_{ijk} = mean + $(\text{fertilization})_i$ + $(\text{period})_j$ + $(\text{cow})_k$ + *eijk*.