AMMONIA KINETICS IN THE RUMEN OF SHEEP FED RYE GRASS OR CLOVER

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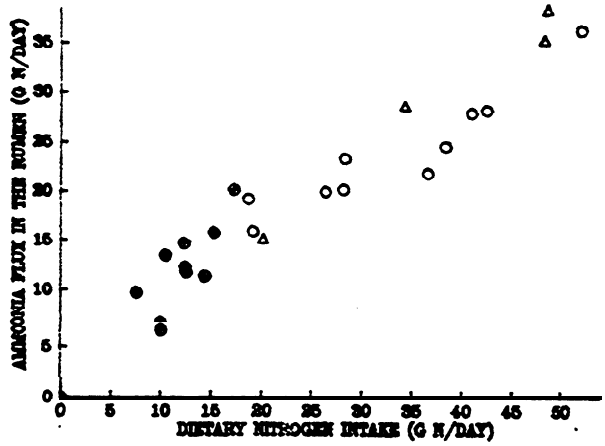
Proteins and other nitrogenous substances in feeds are fermented in the rumen to varying degrees, according to their physical and chemical properties, by anaerobic microorganisms; the products, including peptides, amino acids and ammonia are used by the micro-organisms to synthesise proteins and other materials required for their growth. The nitrogen (N) requirements of rumen bacteria can be met largely by ammonia if adequate concentrations are present in rumen fluid; in a survey of 89 strains of predominant culturable rumen bacteria more than 56% grew with ammonia as the main source of N (Bryant & Robinson, 1962). Ammonia production and utilization in the rumen can be studied by tracer dilution methods using ^{15}N (for review, Nolan & Leng, 1974) and estimates of the flux of ammonia through the rumen pool reflect the extent of fermentation of the proteins in various diets,

In this study, the kinetics of rumen ammonia were estimated in sheep, in metabolism cages, given a range of intakes of early- or late-cut perennial rye grass (Lolium perienne) or cut clover (Trifolium repens L.). The volume of rumen fluid was estimated using Cr-EDTA and checked by complete emptying of the rumen and the ammonia pool size (g N) was calculated by multiplying fluid volume (L) by ammonia concentration (g N/L.). The flux of ammonia through this pool was estimated from the rate of turnover of a single intra-ruminal injection of $^{15}NH_4Cl$, i.e. from the product of pool size (g N) and the zero-time slope of the fitted enrichment v. time curve which, to obviate possible errors arising from slow mixing of tracer, was constrained to an intercept defined by the independently estimated pool size (see Nolan and Leng, 1974).

The flux of ammonia (F ; g N/d) increased with increasing dietary N intake (NI; g N/d). The slopes and intercepts of the relationships for sheep given early (o) or late (●) cut perennial rye grass or clover (A) did not differ (P>0.05). The combined relationship (P<0.0001) was:

$$F = 6.5 + 0.51\ NI \qquad R^2 = 0.89 \qquad R.S.D. = 2.4$$

which indicates that less than 51% of the ammonia entering the ammonia pool in these sheep was derived directly from fermentation of the diet. A considerable fraction of the dietary N was therefore leaving the rumen undegraded. Extrapolation of the results to zero N intake leads to the cautious suggestion that 6.5 g ammonia N/d was derived from fermentation of lysed microorganisms or of endogenous materials.



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