AN ASSAY FOR BYPASS PROTEIN

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SUMMARY

A bioassay for bypass protein in a supplement is described. The increase in wool growth in sheep to 100 g of a protein meal supplement to a basal diet of 700 g oaten chaff plus minerals and urea is compared with wool growth increases to supplements of formaldehyde protected casein. There was a relationship between the level of supplementation with protected casein and wool growth. Some selected results for protein meals are given.

INTRODUCTION

The protein requirements of ruminants are now described in terms of rumen degraded protein (RDP or fermentable N) and rumen non-degraded protein (RNP or bypass protein). Balancing a diet with bypass protein has become significant because of the large responses in feed intake and production of ruminants on practical diets supplemented with bypass proteins (see for reviews, Leng et at. 1974; Leng 1983). However, at the present time there are no reliable methods for predicting the content of bypass protein in a meal.

Wool growth is highly dependent on the quantity of amino acids absorbed, in particular the sulphur amino acids (Reis and Schinckel 1961; 1963). Thus increases in wool growth rate in response to ingestion of a supplement may be indicative of its bypass protein content. The assumptions are made' here that differences in S-amino acid content of. plant proteins are not large and that S-amino acids only move in protein from the rumen to the small intestines. Preliminary results of wool growth as a bioassay for bypass protein are very encouraging.

METHODS

Sixty-six, mixed sex cross-bred Merino-Border Leicester sheep (1 year old) were housed in single pens and given a basal ration of 700 g oaten chaff containing 3% complete mineral mix and 1% urea. The sheep were randomised into 11 groups of six sheep. Groups of lambs were given one of the following, 0, 20, 40, 60 g formaldehyde-treated casein (HCHO-casein), or 100 g of the test proteins. Wool growth was estimated by clipping a 10 cm midside patch every three weeks. Initial studies indicated that carryover effects of diet on wool growth were negligible in the second three weeks of a six week feeding period. In subsequent experiments, the sheep were re-randomised into groups before being allocated to treatments. The wool growth in the second three week period was then related to the N in the supplement.

RESULTS AND DISCUSSION

The response of wool growth to feeding formaldehyde-treated casein in three experimental periods is shown in Figure 1. Some selected results for the response in wool growth to high fibre protein meals are given in Table 1.

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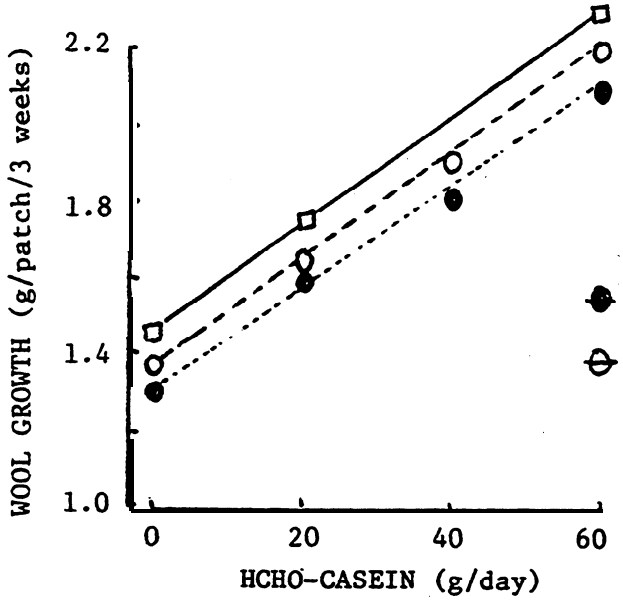

Fig. 1 Wool growth rate in sheep given a standard basal diet supplemented with HCHO-casein. The three experiments were of six weeks duration and were run consecutively. Wool growth was estimated over the final 3 weeks of each period. □—□ Expt. 1; o--o Expt. 2; ●--● Expt. 3; ⊖ response to 60 g casein in Expt. 2; ⊖ response to 60 g casein in Expt. 3.

TABLE 1 Wool growth in sheep in response to protein meal supplementation (6 sheep/group)

Supplement	Clean wool weight (g/patch/3 weeks)	**Increased wool growth (g/patch/3 weeks/100 g of N fed)
Nil	1.36 ± 0.12	
60g casein	1.39 ± 0.12	3
60g HCHO-casein	2.20 ± 0.28	100
100g cotton seed meal	1.77 ± 0.14	72
*100g pellets	1.80 ± 0.14	75

*Pellets as used by Hennessy *et al.* (1981) and contained fishmeal (1), meatmeal (1), cotton seed meal (8)

The results clearly indicate that the wool growth response to feeding HCHO-casein (which is generally recognised as a protected protein) is linear. Wool growth rate between experiments decreased with decreasing day length.

Supplements to sheep and cattle on poor quality fibrous diets of a cotton seed meal that had been produced by solvent extraction and a protein pellet both of which had given large increases in feed intake of sheep (Abidin and Kempton 1981) and cattle (Hennessy *et al.*, 1981) respectively, were apparently highly protected whereas untreated casein gave no increase in wool growth.

The preliminary data suggest that this technique may provide a relatively easy bioassay for routinely comparing the bypass protein content of various supplements.

REFERENCES

ABIDIN, Z. and KEMPTON, T.J. (1981). Anim. Feed Sci. Tech. 6: 145.
HENNESSY, D.W., WILLIAMSON, P.J., LOWE, R.F. and BAIGENT, D.R. (1981). J. Ag. Sci. (Camb.) 96: 205.
LENG, R.A. (1983). In "Herbivore Nutrition in Subtropics and Tropics" South Africa, 1983 (in press).
LENG, R.A., KEMPTON, T.J. and NOLAN, J.V. Aust. Meat. Res. Corn. Rev. 33: 1.
REIS, P. and SCHINCKEL, P.G. (1961). Aust. J. Agric. Res. 12: 335.
REIS, P. and SCHINCKEL, P.G. (1961). Aust. J. Agric. Res. 15: 218.