ESTIMATION OF BYPASS PROTEIN BASED ON WOOL GROWTH

R.A. LENG,* J. DAVIS* and M.K. HILL**

SUMMARY

A means of estimation of bypass protein in a supplement is described. The increase in wool growth in sheep due to 100 g of a protein meal supplement above a basal diet of 700 g oaten chaff plus minerals and urea is compared with wool growth increases due 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 also given.

INTRODUCTION

The N requirements of ruminants are described in terms of rumen degraded protein (RDP) or fermentable N and undegraded dietary protein (UDP) or bypass protein. The use of supplementary bypass protein to increase the availability of amino acids from a diet has applied significance because of the responses in feed intake and production of ruminants on low quality feeds that occur to such supplements (see for review, Leng et al. 1974). However, at the present time there are no reliable methods for predicting the amount of protein in a supplement that leaves the rumen and is digested in the small intestine.

Wool growth in sheep is highly dependent on the quantity of amino acids absorbed from the intestines, in particular the sulphur amino acids (Reis and Schinckel 1961; 1963). Thus increases in wool growth rate in response to ingestion of a protein supplement may be indicative of its bypass protein content. Preliminary results of wool growth as a measure of bypass protein are very encouraging.

MATERIALS AND 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 groups of six having equal wool growth rates. A group of these sheep was given one of the following, 0, 20, 40, 60 g formaldehyde-treated casein (HCHO-casein), or 100 g of a protein meal. Wool growth was estimated by clipping and weighing the wool from 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 period. In subsequent experiments, the sheep were re-randomised into groups before being re-allocated to treatments.

The wool growth in the second three week period was related to either the N in the supplement or to the N apparently insoluble in buffer. N was estimated by titration following Kjeldahl digestion and soluble N was estimated on the supernatant fluid after shaking the protein meal (5 g) in 25 ml of buffer at 39" for 1 hour.

RESULTS AND DISCUSSION

The response in wool growth to feeding varying amounts of formaldehyde-treated casein to sheep on a basal diet of oaten chaff in three separate

&Department of Biochemistry and Nutrition and **Department of Animal Science, University of New England, Armidale, N.S.W. 2351.

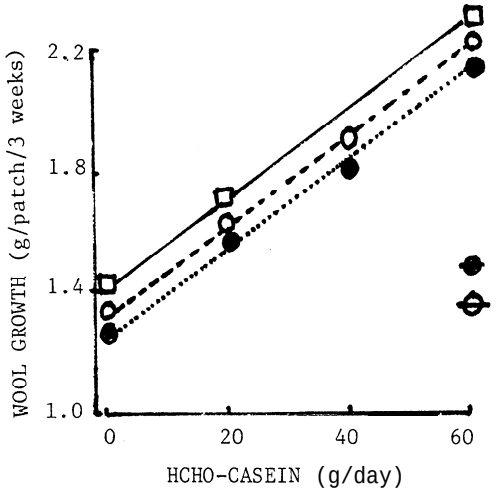

Fig. 1 Wool growth rate (clean wool) in sheep given an oaten chaff diet supplemented with HCHO-casein. The three experiments were of six weeks' duration and were run consecutively. Wool growth was estimated over the final three weeks of each period. □—□ Expt. 1; o--o Expt. 2; ●--● Expt. 3; -o- response to 60 g casein in Expt. 2; -●- response to 60 g casein in Expt. 3

RESULTS AND DISCUSSION

The response in wool growth to feeding varying amounts of formaldehyde-treated casein to sheep on a basal diet of oaten chaff in three separate experiments is shown in Figure 1. Some selected results for the response in wool growth in these same sheep to supplements of high fibre protein meals are shown in Table 1.

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

Supplement	Clean wool weight (g/patch/ 3 weeks)	SE	**Increased wool growth (g/patch/3 weeks/100 g of N fed)	
			A	B
Nil	1.36	0.12		
60 g casein	1.39	0.12	3	-
60 g HCHO-casein	2.20	0.28	100	110
*100 g pellets	1.80	0.14	75	84
100 g cotton seed meal	1.77	0.14	72	82
100 g sunflower seed meal (solvent extraction)	1.65	0.14	56	71
100 g sunflower seed meal (expeller extraction)	1.45	0.12	33	64

* Pellets as used by Hennessy et al. (1981) and contained fishmeal (1), meatmeal (1), cotton seed meal (8)
** A, based on total N in the feed, B based on insoluble N

The results clearly indicate that the wool growth response to feeding HCHO-casein (which is generally recognised as a protected protein) is linear.

The results of supplementation of these sheep with various protein meals gives support for the reliability of the assay. For instance supplements that have resulted in increased feed intake and production of ruminants on poor quality diets were apparently high in bypass protein. These are cotton seed meal (sheep - unpublished results) and pellets (cattle - see Hennessy et al. 1981). Untreated casein as a supplement had no significant effect on wool growth.

Marked differences in wool growth response were obtained to supplementation with sunflower seed meal prepared by two methods. It appears that oil extraction from sunflower seed by expeller techniques renders less protection to the proteins than processes dependent on solvent extraction. However, if account is taken of the soluble protein in the supplement (which is likely to be fermented in the rumen) then wool growth per 100 g of insoluble N for all meals is much less variable.

The preliminary data suggest that this technique may provide a relatively easy bioassay for routinely comparing the amount of protein digested and absorbed from the intestines from various protein meals fed to ruminants.

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