

THE-REQUIREMENTS OF GROWING LAMBS ON CELLULOSE-BASED DIETS FOR SOLUBLE NITROGEN AND BYPASS PROTEINS

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Recent studies have shown that rapidly growing ruminants given low-protein, molasses-based or starch-based diets have a requirement for proteins which are not fermented in the rumen and are available for digestion in the small intestine. These we have termed "bypass proteins". In Australia, ruminant production is largely from pastures which are of variable availability and quality. During dry periods, these pastures are often characterised by low protein (2-4%) and high cell-wall content, and support low rates of production. The need for soluble N to supply the rumen microorganisms with ammonia is well-established, and this has led to attempts to increase intake and production of ruminants on dry pastures by supplementing them with urea. On these cellulose-based diets however it is not known whether a major limitation to production is the supply of soluble nitrogen for rumen microorganisms or a specific protein deficiency in the animal. For these reasons we have examined the growth of lambs on a low-protein basal diet of oat hulls and Solka-Floc (70:30) and supplemented with minerals and vitamins. To this we added either urea, urea + a soluble protein (casein) or urea + an insoluble protein which bypasses the rumen, formaldehyde-treated (HCHO-) casein.

Feed intake, growth rate and feed conversion ratio (FCR) were recorded. Voluntary feed intake and growth rate were increased with NPN and soluble protein supplementation (Table 1). However maximum intake and growth rate were only achieved with a combined supplement of urea and bypass protein. The limitation to production on this cellulose-based diet was firstly a requirement for soluble nitrogen by the rumen microorganisms to achieve maximum fermentation rate and, secondly, a requirement for bypass proteins presumably for supplying amino acids to the animal.

TABLE 1. Effect of amount and form of N intake on growth, feed intake. and feed conversion ratio of lambs.

Diet	Growth rate (g/d)	Voluntary intake DM (g/d)	Feed Conversion Ratio
Basal	-41	508	
Basal + urea (2.5%)	27	630	23
Basal + urea (2.5%) + casein (7.5%)	54	642	12
Basal + urea (2.5%) + HCHO-casein (7.5%)	112	806	7

The effect on growth rate when bypass proteins have been added to these diets has always been strictly related to increased voluntary feed intake. Therefore the primary limitation to feed intake on these diets was not the fermentability of, or energy in the basal diet or the limitation of "gut fill".

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