

NUTRIENT SUPPLY AND ENDOCRINE CONTROL OF MUSCLE GROWTH IN LAMBS

S.R. EDWARDS*, V.H. ODDY*, P.A. SPECK**, H.M. WARREN* and K.D. RILEY*

Lambs supplemented with dietary escape protein (DEP) show a disproportionate growth of muscle relative to other body tissues (Edwards et al. 1989). This reflected an increased amino acid supply, but may have also been modulated by changes in endocrine status. For example, in rats increased protein synthesis in response to insulin (Ins) is enhanced by elevated concentrations of leucine (Leu), a branched chain amino acid which is primarily metabolized in muscle (Garlick and Grant 1988). We report the concentration of Leu and of some hormones - Ins, growth hormone (GH), and insulin like growth factor 1 (IGF-1) - in lambs of differing growth patterns supplemented with DEP.

Wether weaners, 12 weeks old (20 kg live weight (LW)) were fed as two groups. In one (LL), LW was maintained at 20 kg for 12 weeks, while the other (HL) was grown to 40 kg LW. All sheep were then individually penned and fed *ad libitum* wheat straw (40% digestible dry matter, 0.5% N) plus 12 g urea, minerals and 50 g lucerne chaff for 4 weeks. Thereafter, a supplement of either 0, 20, 40, 60, 80 g formaldehyde-treated casein (mixed with 10 g molasses) was added for a further 14 weeks. The lambs were sampled 5 weeks after the start of supplementation. Nine jugular blood samples were taken hourly, commencing one hour after the morning feeding. Selected muscles (*M. triceps*, *M. vastus lateralis* and *M. semi-tendinosus*) were dissected at slaughter. Empty bodyweight gain (GEBW) was determined from 18 h fasted weights prior to and at the end of supplementation. Effects of animal group and supplement levels were examined by analysis of variance for unbalanced data,

Table 1 Effect of supplementation with dietary escape protein

Group	Treatment	n	GEBW g/d	Muscles g	Leu uM	Ins ug/l	GH ug/l	IGF-1 [#] ug/l
LL	0	2	8.1	208	64.3	0.40	4.56	46.5
	20	4	14.3	256	73.3	0.23	17.93	45.7
	40	2	47.8*	240	118.0*	0.22	18.26	53.1
	60	4	40.7*	298*	120.3*	0.92*	7.99	73.4
	80	4	37.6*	284*	139.8*	0.52	6.71	146.5
HL	0	4	-71.5	410	56.0	0.41	7.43	112.2
	20	4	-45.7	502*	74.5	0.72	6.10	127.7
	40	4	-6.4*	542*	103.3*	1.19*	4.65	126.8
	60	4	-26.7	614*	100.4*	1.20*	6.32	134.4
	80	4	8.2*	682*	112.8*	1.36*	12.31	132.2

* indicates a significant response to supplement ($P < 0.05$)[#] IGF-1 analysis carried out on pooled samples

DEP supplementation increased ($P < 0.05$) GEBW, muscle, Leu, Ins and IGF-1. Enhanced muscle growth most likely reflects the combined influence of supply of essential amino acids and hormones.

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* Nutrition and Physiology Group, Elizabeth Macarthur Agriculture Institute, NSW Agriculture & Fisheries, Menangle, N.S.W. 2568.

** CSIRO Division of Animal Production, Prospect, N.S.W. 2148.