

Insulin-like growth factor-1 mRNA and fractional protein synthesis rate in the skin of Merino lambs

SM Liu, LM Sammels, N Fitzgerald, G Mata, NR Adams

CSIRO Livestock Industries, Private Bag 5, PO Wembley, WA 6913, Australia

We previously reported the fractional protein synthesis rates (FSR) in skin of young Merino lambs fed two types of dietary protein (canola meal vs lupins seeds) offered to maintain liveweight of the sheep (M) or 0.6 M (1). Insulin-like growth factor-1 (IGF-1) is associated with anabolism of body protein. In a previous experiment we found plasma concentrations of IGF-1 were significantly related to the amount of IGF-1 mRNA in both liver and muscle of adult Merinos (2). The current work reports the IGF-1 mRNA values in the skin of the lambs.

Two groups of 32 five-month-old Merino lambs, initially weighing either 25 or 33 kg, were fed a lupin seed/hay diet in individual pens in the animal house to maintain live-weight for one month. Each group was then split into four groups, and allocated respectively to two diets (canola meal vs lupin seeds) offered at two levels (M vs 0.6 M). Therefore, the experiment was a 2 × 2 × 2 factorial design. The two diets contained 25 % either canola meal or lupin seeds, plus 72 % oaten hay, 1 % urea and 2 % minerals. Crude protein concentrations were measured to be 162 and 164 g/kg dry matter (DM), and metabolizable energy contents were estimated to be 9.6 MJ/kg and 9.9 MJ/kg DM for the canola meal and lupin seed diets respectively. Skin biopsies from three sheep of each group were taken on day four of the treatments for determination of FSR (1), and from the remaining five sheep in each group for determination of IGF-1 mRNA (2).

To simplify comparisons, combined results from the two weight groups are presented. Similar patterns were seen in both FSR and IGF-1 mRNA. There was a significant interaction in IGF-1 mRNA between intake and diet, and the animals fed to maintenance on the canola diet had the highest IGF-1 mRNA value. There were no significant main effects of diet and intake above the interaction. These results indicate that the animals responded to the canola diet only at a higher intake. FSR was significantly influenced by both protein type and intake. The correlation between mean FSR and the concentration of IGF-1 mRNA in skin was not statistically significant ($P=0.10$).

	Maintenance fed		Fed to 0.6 M		SE	Statistical significance		
	Lupin	Canola	Lupin	Canola		Intake	Diet	I×D
IGF-1 mRNA (OD units)	0.12	0.31	0.09	0.12	0.02	ns*	ns*	0.001
FSR (% / day)	16.7	18.5	14.2	16.5	0.52	0.001	0.001	0.69

* Main effects were tested over the mean square of the interaction

It was concluded that IGF-1 mRNA was responsive to canola meal at high intake and IGF-1 was not the only regulator to skin protein synthesis.

1. Liu SM, Mata G, O'Donoghue H, Masters DG. The influence of live-weight, live-weight change and diet on protein synthesis in the skin and skeletal muscle in young Merino sheep. *Br J Nut* 1998; 79:267-274.
2. Adams NR, Briegel JR, Thompson MJ, Sammels LM. Metabolic hormones and tissue concentrations of mRNA for insulin-like growth factor-1 in sheep selected for or against staple strength. *J Endocr* 2000. In Press.