

NUTRITION ALTERS THE ACTIVITY OF CALPAIN I IN LAMBS

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The role of calcium activated proteinases (calpains) in the nutritional regulation of protein degradation in muscle is unclear. The results from previous trials investigating the effect of nutritional level are contradictory (Higgins et al. 1988; Thomson et al. 1991). In weaned lambs fed lucerne chaff, moderate feed restriction (900 g/d) increased calpain I and calpastatin activities relative to ad libitum-fed controls, whilst fasting only increased calpastatin (Thomson et al. 1992). These changes were not clearly related to protein degradation. We present here data on the calpain activity in the muscle of lambs fed at levels known to provide different relative and absolute rates of muscle protein synthesis and degradation.

Nine Border Leicester Merino first cross wether lambs (age 6 months, wt 30 ± 1.1 kg) were allocated into three groups of 3. They were fed 3.7, 5.4 or 10.8 MJME/d of lucerne chaff, calculated to provide 0.6, 1.0 or 1.9 times the requirement for liveweight maintenance, for 19 days. The animals were then slaughtered and samples of m. semitendinosus were taken. Calpain I and II, together with calpastatin were separated on a DEAE-sephacel column using ion exchange chromatography, and assayed against casein.

The rate of liveweight gain and weight of m. semitendinosus (ST) increased with feeding level (see Table). Feed intake significantly affected calpain I, (U/g muscle) the activity of which was highest in the underfed lambs ($P < 0.05$). Neither calpain II or calpastatin activity was affected by feed intake, but the ratio of calpastatin to calpain I was lower in the underfed lambs ($P < 0.05$) (see Table). These results conflict with those of Sainz et al. (1992), who found that calpain I and calpastatin activities were increased and decreased, respectively, in muscles of pigs restricted to 80% of ad-libitum intake.

	FEED LEVEL			LSD	P
	0.6 M	1.0 M	1.9 M		
LWT change (kg)	-1.2	-0.1	1.8	1.5	0.05
ST wt (g)	70.5	77.1	82.4	7.1	0.05
Calpastatin	3.7	3.9	4.0	1.3	NS
Calpain I	2.2	1.3	1.6	0.7	0.05
Calpain II	1.0	0.9	1.0	0.3	NS

Rate of degradation of muscle protein is elevated during acute undernutrition and declines under longer term nutritional restriction. At feed intakes above maintenance protein synthesis is increased with only a small increase in the rate of degradation. The alterations in enzyme activities reported here are consistent with these observations, and suggest that the calpain system is involved in the normal regulation of protein degradation in skeletal muscle in lambs.

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