

Proceedings of
THE NUTRITION SOCIETY
OF
AUSTRALIA

Volume 15

Fifteenth Annual Conference
Adelaide, South Australia, November 1990

NUTRIENT METABOLISM OF SHEEP FED A DIET SUPPLEMENTED WITH LUPIN
GRAIN

D.W. PETHICK and N.G. HARMAN

The aim of this work was to study the metabolism of volatile fatty acids and glucose by the gut, liver and muscle in sheep fed a maintenance ration of lucerne cubes compared to a similar diet supplemented with lupin grain.

Merino ewes aged 3-5 yr with body weight 39-46 kg were prepared with indwelling cannulae to study net splanchnic and muscle metabolism using the arterio venous difference technique (Katz & Bergman 1969; Oddy *et al.* 1981). The daily ration was either 700 g of lucerne cubes (maintenance, 6.2MJ ME/d) or 700 g of lucerne cubes plus 700 g of lupin seed (lupin supplemented, 14.5MJ ME/d). Both rations were fed semicontinuously. The full intake of lupin was achieved for at least 3d before experimentation. Glucose irreversible loss (glucose IRL) was measured using a continuous infusion of [U-¹⁴C]glucose. The following results were obtained.

	Maintenance ¹	Lupin Supplemented
Glucose IRL (mmol/h)	21.7±0.6 (7)	67.7±4.1* (7)
Hepatic BF (l/min)	1.9±0.1 (11)	2.1±0.1 (6)
Muscle BF (ml/min/kg)	81±3 (6)	101±6* (5)
Hepatic glucose release (mmol/h)	16.9±2.2 (7)	22.2±2.8* (6)
Muscle glucose uptake (mmol/h/kg)	1.1±0.2 (6)	1.5±0.3* (5)
Gut release of major fermentation products (mmol C/h) ²	382±77 (5)	732±134* (5)

¹ Results are shown as means±s.e.m., () no. animals, BF Blood Flow

² Sum of acetate, propionate, butyrate, D-3-OHbutyrate and CO₂.
* significantly different to maintenance, p<0.05.

Lupin supplementation was associated with a 3 fold increase in the glucose IRL. However most of this glucose was not available to the extra splanchnic tissues since the hepatic release of glucose increased by only 31%. Consistent with this was a 31% increase in the rate of glucose uptake by muscle. The 1.9 fold increase in the appearance of fermentation products in response to a 2.3 times increase in ME suggests that the methodology reliably detected changes in nutrient flux. Possible explanations include simultaneous uptake and release of glucose by the gut and/or liver.

Katz, M.L. & Bergman, E.N. (1969). *Am. J. Vet. Res.* 30: 655.

Oddy, V.H., Brown, B.W. and Jones, A.W. (1981). *Aust. J. Biol. Sci.* 34:419.