

## MAMMARY METABOLISM OF ACETATE IN LACTATING EWES

K.R. KING, J.M. GOODEN and E.F. ANNISON

Although there are many reports of acetate metabolism in mammary tissue from goats and cows, there are few similar reports for sheep (see Pethick and Lindsay 1982). Production, utilisation and oxidation of acetate in mammary glands of fed lactating ewes are reported here.

Six trained lactating Merino x Border Leicester ewes were hand-milked twice daily and fed continuously to calculated requirements a pelleted ration. Daily feed intake, daily milk yield, stage of lactation and liveweight were, respectively,  $16.9 \pm 0.7$  MJ ME,  $1.6 \pm 0.2$  kg,  $32 \pm 7$  d and  $58 \pm 2$  kg (mean  $\pm$  SEM). Uniformly-labelled  $^{14}\text{C}$ -acetate was infused continuously via the jugular vein for 8 h. During the last 2-3 h of infusion four pairs of arterial and venous blood samples were withdrawn simultaneously via indwelling catheters located in a femoral artery and the medial subcutaneous mammary vein. Specific radioactivities and concentrations of blood acetate and carbon dioxide (see Table 1), together with concentrations of other blood metabolites, were measured. A blood flow:milk yield ratio of 450:1 was assumed (Hough 1982; Pethick and Lindsay 1982).

Table 1. Acetate kinetics in the lactating ewe (means  $\pm$  SEM; n = 6)

Irreversible loss ( $\mu\text{mol}/\text{min}/\text{kg LW}$ )	Arterial concentration (mM)	Extraction (%)	CO <sub>2</sub> from acetate		Mammary gland	
			whole body (%)	udder (%)	EP*	GU <sup>†</sup> (mM)
$75 \pm 7$	$1.6 \pm 0.1$	$60 \pm 3$	$22.1 \pm 2.7$	$19.6 \pm 3.9$	$0.28 \pm 0.02$	$1.22 \pm 0.10$

\* EP = endogenous production; † GU = gross utilisation.

Arterio-venous difference of acetate was related linearly to arterial concentration and the proportions of CO<sub>2</sub> derived from acetate were similar in both whole body and udder. Gross utilisation of acetate by the udder was  $15.0 \pm 2.4\%$  of whole body irreversible loss. Endogenous production contributed a constant proportion ( $23.7 \pm 2.5\%$ ) of gross utilisation and, when expressed as a percentage of irreversible loss (Y%), increased with milk yield (MY, kg/d) as follows:

$$Y\% = -2.93 + 4.04 (\pm 0.67) MY \quad (r^2 = 0.90, P < 0.01).$$

Arterial concentrations (mM) for blood 3-hydroxybutyrate (3HB) and plasma glucose (GL), non-esterified fatty acids (NEFA) and total esterified fatty acids (TEFA) were, respectively, 0.62, 4.01, 0.23 and 3.35. Corresponding values for mammary extractions (%) were 42, 30, 12 and 12. Acetate (after allowance for the amount oxidised), 3HB, NEFA and TEFA (no allowance for possible oxidation) taken up by the mammary gland could account for 23%, 11%, 4% and 58%, respectively, of the fatty acids in milk.

It seems that mammary metabolism of acetate in ewes may be similar to that in goats and quantitatively more important than in cows.

HOUGH, G. (1982). M.Sc.Agr. Thesis, Univ. of Sydney.

PETHICK, D.W. and LINDSAY, D.B. (1982). *Br. J. Nutr.* **48**: 319.