

## MAMMARY METABOLISM OF LIPOPROTEIN IN EWES

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In cows and goats, triglycerides from chylomicron (chylo), very low (VLDL) and low density (LDL) lipoproteins contribute about half the milk fatty acids, whereas no mammary uptake of fatty acids from phospholipid or cholesterol ester fractions occurs (see Moore and Christie 1979). As similar data are not available for sheep, we have studied mammary metabolism of lipid fractions from lipoproteins in ewes.

Seven trained lactating Merino x Border Leicester ewes were hand-milked twice daily and fed continuously to calculated requirements. Feed intake, milk yield, milk fat content, stage of lactation and liveweight were, respectively,  $17.8 \pm 1.1$  MJ ME/d,  $1.5 \pm 0.1$  kg/d,  $59.6 \pm 3.2$  g/kg,  $53 \pm 4$  d and  $57 \pm 2$  kg (mean  $\pm$  SEM). On the day of sampling, pairs of arterial and venous blood samples were withdrawn simultaneously at 1000, 1400 and 1800 hours from a femoral artery and the subcutaneous medial mammary vein via indwelling catheters. Lipoproteins were isolated from plasma by ultra-centrifugation (Lascelles and Wadsworth 1971). Plasma lipids were extracted with chloroform: methanol and triglyceride, cholesterol ester and phospholipid were separated by thin-layer chromatography. The amount of fatty acid present in each fraction (Table 1) was determined by gas-liquid chromatography. A blood flow:milk yield ratio of 450:1 was assumed (Hough 1982; Pethick and Lindsay 1982).

Table 1. Arterial concentrations (A) and mammary arterio-venous differences (A-V) of fatty acids in chylo, VLDL, LDL and high (HDL) density plasma lipoproteins in lactating ewes (means  $\pm$  SEM; n = 7; values represent mg fatty acid/100 ml plasma; \*\* P < 0.01, arterio-venous difference compared with zero).

Lipo-protein	Triglyceride		Cholesterol Ester		Phospholipid	
	A	A-V	A	A-V	A	A-V
chylo	$1.1 \pm 0.2$	$0.5 \pm 0.1^{**}$	$0.9 \pm 0.3$	$0.1 \pm 0.1$	$0.8 \pm 0.2$	$0.0 \pm 0.2$
VLDL	$4.0 \pm 0.7$	$2.2 \pm 0.3^{**}$	$0.9 \pm 0.2$	$0.0 \pm 0.1$	$0.8 \pm 0.2$	$0.0 \pm 0.1$
LDL	$6.3 \pm 0.7$	$2.8 \pm 0.7^{**}$	$39.7 \pm 3.0$	$2.8 \pm 1.3$	$32.2 \pm 2.7$	$1.1 \pm 1.7$
HDL	$0.5 \pm 0.1$	$-0.1 \pm 0.1$	$2.7 \pm 0.1$	$0.0 \pm 0.2$	$4.5 \pm 0.9$	$0.6 \pm 0.2^{**}$

A total of 87% of the plasma fatty acids were associated with cholesterol ester and phospholipid lipid fractions and 13% with triglyceride. Chylo and VLDL accounted for only 7% of total plasma fatty acids, but contained 43% of the fatty acids associated with triglycerides. Triglyceride was the major lipid fraction taken up by the mammary gland. The extraction rate of triglyceride fatty acids was approximately 50% for chylo, VLDL and LDL. Fatty acid carbon taken up from chylo, VLDL and LDL as triglyceride was sufficient to account for  $2.9 \pm 0.8\%$ ,  $14.8 \pm 2.6\%$  and  $17.3 \pm 3.5\%$  respectively, of the carbon in the milk fat. Thus, total milk fat accounted for by the uptake of triglyceride was  $35.0 \pm 4.2\%$  (range 22.9 - 50.9).

In lactating ewes, metabolism of fatty acids from the various lipid fractions of plasma lipoproteins is similar to that for cows and goats.

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