

MILK PRODUCTION IN EWES FED HIGH GRAIN DIETS

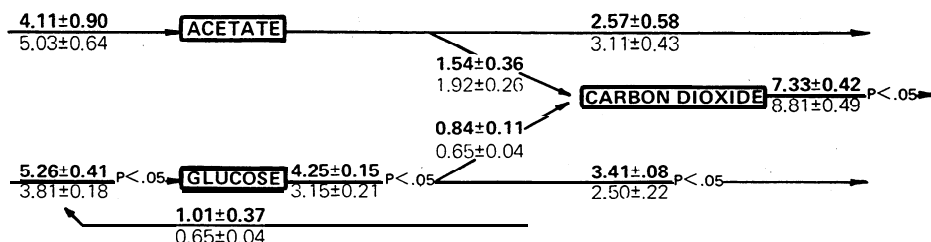
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Lactating ewes eating high-grain (>80% grain) rations produce less milk, and their lambs grow slower, than ewes eating similar amounts of net energy as low-grain (<50%) rations (Clements, unpublished). I tried to determine if the mechanisms are similar to those observed in the 'low-fat syndrome' of dairy cows.

Eight Merino ewes (42.6 ± 1.4 kg) with five-week-old lambs at foot were offered rations at 2.5 times calculated maternal maintenance net energy requirements. Three ate a diet of 85.5% whole wheat grain, 9% hammermilled lucerne hay and 5.5% meat meal, 90/10, (880 g DOM, 26.9 g N/kg DM) and five ate 50% whole wheat grain and 50% hammermilled lucerne hay, 50/50, (745 g DOM, 26.9 g N/kg DM). The ewes and lambs were weighed; and the ewes milked, weekly from 5 to 9 weeks after lambing. The rates of entry and oxidation of $1\text{-}^{14}\text{C}$ -acetate and $\text{U-}^{14}\text{C}$ -glucose and rates of entry of $2\text{-}^3\text{H}$ -glucose and ^{14}C -bicarbonate into the ewes, and the concentrations of insulin and free fatty acids in the ewes' plasma were measured..

The ewes eating 50/50 produced more milk (1101 ± 58 v. 878 ± 52 ml/day, $P < 0.05$) and more milk fat (72.2 ± 7.6 v. 49.2 ± 2.4 g/day, $P < 0.05$), but similar amounts of milk protein (42.5 ± 2.9 v. 39.9 ± 4.8 g/day) were produced by both groups. Whilst the growth rates of lambs on the ewes eating 50/50 tended to be higher (201 ± 29 v. 138 ± 8 g/day) and the live-weight gains of the ewes on 50/50 tended to be less (10 ± 96 v. 94 ± 49 g/day) the differences were not significant. Plasma insulin concentrations were similar in both groups (26.3 ± 3.2 v. 29.4 ± 4.6 $\mu\text{U/ml}$) but free fatty acid concentrations were greater in the ewes eating 50/50 than in those eating 90/10 (116 ± 19 v. 64 ± 2 μM , $P < 0.05$). The carbon balance model derived from measured rates of acetate and glucose entry and oxidation and bicarbonate entry in the ewes is shown in figure 1.

Figure 1. Glucose and acetate flux ($\text{mgC/min/kg}^{3/4}$) in lactating ewes (mean $\pm$ SE, 90/10, 50/50)



The higher rate of glucose entry and disposal in ewes on the high-grain diet in conjunction with reduced plasma free fatty acid concentration is consistent with enhanced acetate deposition in adipose rather than mammary tissue and hence reduced supply of both acetate and triglycerides for milk synthesis. The mechanisms are similar to those operative in the 'low-fat syndrome' of dairy cows.

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