

GLUCOSE KINETICS AND THE HEPATIC ACTIVITIES OF KEY GLUCONEOGENIC ENZYMES  
IN LAMBS BEFORE AND AFTER SUDDEN WEANING

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During the development of the rumen in the sheep the irreversible loss (IL) and the pool size of glucose decrease (Jarrett *et al.* 1964). These changes have been shown to occur gradually but have only been studied in lambs suckling the ewe and with solid food available from birth. The hepatic activity of pyruvate carboxylase (PC) has been shown to vary according to the physiological condition of ruminants but the activity and intracellular distribution of phosphoenolpyruvate carboxykinase (PEPCK) shows little or no adaptation (Ballard *et al.* 1968; Taylor *et al.* 1971).

Nine lambs born on the same day were used to examine the effect of sudden weaning on glucose kinetics and on the hepatic activities of PC and PEPCK and on the intracellular distribution of PEPCK. Glucose kinetics in each animal was studied while in the post-absorptive state using a single intrajugular injection of [2-<sup>3</sup>H] glucose (100 $\mu$ Ci) and [U-<sup>14</sup>C] glucose (100 $\mu$ Ci) (Katz *et al.* 1974); the animal was sacrificed two days later and the hepatic activities of PC and PEPCK assayed. One such experiment was done each week. Five lambs were used while being fed milk, one while receiving milk to satisfy its maintenance energy requirements and with access to solid food (18% CP calf weaner pellets), and three consuming only pellets and with their metabolisable energy (ME) intake adjusted as close as possible to the intake in the milk fed animals.

	milk fed	weaned	significance
ME intake kJ/kg <sup>0.75</sup> /d	829	892	
Glucose IL(2- <sup>3</sup> H) mg/h/kg <sup>0.75</sup>	582	241	P<0.050
Glucose IL(U- <sup>14</sup> C)mg/h/kg <sup>0.75</sup>	531	227	P<0.010
Glucose recycled (%)	8.4	5.9	ns
Glucose pool g/kgBW	0.225	0.132	P<0.010
Glucose space l/kgBW	0.26	0.31	ns
Plasma glucose g/l	0.850	0.414	P<0.001
PC nmoles CO <sub>2</sub> /min/g	4928	7838	P<0.050
PEPCK - cytosolic nmoles CO <sub>2</sub> /min/g	982	2080	P<0.005
PEPCK - particulate nmoles CO <sub>2</sub> /min/g	4348	5634	ns

The results from the lambs in the transitional stages one and two weeks after weaning are not included in the table. The estimates of glucose pool size and space and of glucose recycling in the milk fed animal were much lower than earlier estimates (Jarrett *et al.* 1964; Muramatsu *et al.* 1974). Changes in PC and cytosolic PEPCK activities only occurred after weaning. The intracellular distribution of PEPCK was different to that previously observed in sheep (Taylor *et al.* 1971) and in cows (Ballard *et al.* 1968) fed roughage diets and the adaptation of cytosolic PEPCK during weaning was unexpected.

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