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# Influence of age of early weaned lambs on intake, digestibility and retention time of clover hay

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## ABSTRACT

Twelve lambs, weaned at 6 weeks of age, were used to study the development of rumen function from 6 to 24 weeks of age when offered clover hay *ad libitum*. Six of the lambs were cannulated at the abomasum on weaning and the remaining 6 remained intact.

Dry matter intake (g/kg live weight) increased rapidly until 10 weeks of age and subsequently remained constant at 33 to 37 g DM/kg LW. *In vivo* DM digestibility and marker rumen retention time decreased initially (0.693 in week 7 v 0.664 in week 9 and 14.5 hours in week 8 v 10.9 hours in week 12 respectively) but were constant thereafter. The proportion of digestible DM apparently digested in the rumen was low (0.45) but was similar at 8, 12 and 16 weeks of age.

There were no differences between the intact and cannulated lambs in DM intake and digestibility or in marker retention time in the rumen.

**Keywords** Sheep; early-weaning; dry matter intake; digestibility; site of digestion; marker rumen retention time

## INTRODUCTION

The increasing emphasis on efficient pasture utilisation and possible introduction of high fecundity sheep flocks mean that early weaning of lambs will become an increasingly critical and frequently used management technique. Our ability to meet the high nutrient requirements of these lambs from pasture will require an intimate knowledge of the development of rumen function in very young lambs and its effect on intake and site of digestion of nutrients.

Rumen development has been considered to reach adult status by 8 to 10 weeks of age in lambs given access to solid feed (Wardrop and Coombe, 1961) and it has been demonstrated that the ability of rumen microflora to digest herbage (*in vitro*) reaches adult status by 3 weeks of age (Joyce and Rattray, 1970). We have few data, however, on quantitative aspects of intake and digestion in very early weaned lambs. Recent research has concentrated on older lambs and has ignored the immediate post-weaning period (Weston and Margan, 1979; Egan and Doyle, 1982).

High quality forages appear to be digested less in the reticulorumen and more in the caecum and proximal large intestine (Ulyatt, 1971; Ulyatt and MacRae, 1974) and it has been suggested that this effect is more pronounced in young lambs (Jagusich *et al.*, 1976).

This paper describes a study of rumen development in early weaned lambs and the quantitative changes in dry matter (DM) intake, rumen retention time of marker, site of DM digestion and apparent DM digestibility.

## MATERIALS AND METHODS

### Animals and Housing

Twelve Polled Dorset lambs were obtained from a synchronised lambing. Six lambs were weaned at 38 days of age (average live weight 14.9 kg) and were fitted with a simple 'T' cannula in the abomasum. A further 6 lambs were weaned at 44 days of age (average body weight 16.2 kg) and remained intact.

All lambs were then placed in metabolism crates where they remained for the duration of the experiment. A continuous lighting regime was adopted to eliminate effect of changing daylength on intake.

### Diets and Feeding

Chaffed clover hay (clover content 73%) was offered *ad libitum*; i.e., previous days intake plus 25%. Feed was delivered every 2 h from an automatic feeder.

### Measurements

Dry matter intake (DMI) was recorded daily and *in vivo* DM digestibility determined during weeks 7, 9, 11, 13, 15, 17 and 23. During weeks 8, 12 and 16 abomasal flow and retention time in the rumen of the DM marker <sup>103</sup>ruthenium phenanthroline (<sup>103</sup>Ru-P) was estimated. Retention time of <sup>103</sup>Ru-P was also estimated in week 24.

Live weight was determined at weekly intervals.

Abomasal flow of DM was measured by the technique of Faichney (1975). A solution containing the digesta markers <sup>103</sup>Ru-P and <sup>51</sup>chromium ethylene

diamine tetra-acetic acid ( $^{51}\text{Cr}$ -EDTA) was continuously infused into the rumen of cannulated lambs via a temporary catheter for 8 days. Samples of abomasal digesta (approx. 50g) were collected at 8 hourly intervals over the last 4 days. Of this a 20 g sample of whole digesta was bulked. The remainder was strained through panty hose and a 20 g sample of filtrate was also bulked. Samples were bulked within lambs over the first and last 2-day period.

Retention time of  $^{103}\text{Ru}$ -P in the rumen was calculated from the rate of decline of  $^{103}\text{Ru}$ -P concentration in faeces (counts/g DM) (Grovmum and Williams, 1973). Samples of faeces were collected at approximately 4 h intervals during the 10 to 95 h after the cessation of infusion in cannulated lambs and 25 to 110 h after the injection of  $^{103}\text{Ru}$ -P directly into the rumen of intact lambs.

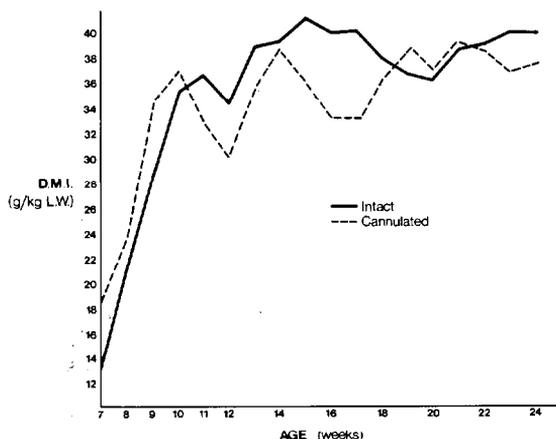
## RESULTS

Dry matter intake and apparent DM digestibility of feed in cannulated and intact lambs are given in Fig. 1 and Table 1 and indicate no apparent effect of simultaneous weaning and surgery.

Feed intake (g DM/d) increased throughout the duration of the experiment. When related to body weight

**TABLE 1** Effect of cannulation on *in vivo* DM digestibility.

Age (weeks)	Intact	Cannulated
7	0.682	0.705
9	0.656	0.672
11	0.662	0.675
13	0.637	0.635
15	0.671	0.672
17	0.673	0.665
23	0.661	0.675
S.E.	0.017	



**FIG. 1** Comparison of DMI between cannulated and intact lambs.

the increase was rapid until week 10 after which no further change occurred (Fig. 1).

Marker retention time in the rumen and *in vivo* DM digestibility decreased initially and subsequently remained relatively constant (Table 2).

The proportion of DMI apparently disappearing in the rumen did not change with age (Fig. 2). The overall regression equation was:

$$\text{Abomasal DM flow} = 0.706 (\pm 0.033) \text{DMI} - 14.9$$

(n = 14, r<sup>2</sup> = 0.975)

That for week 8 above was:

$$\text{Abomasal DM flow} = 0.693 (\pm 0.056) \text{DMI} - 15.5$$

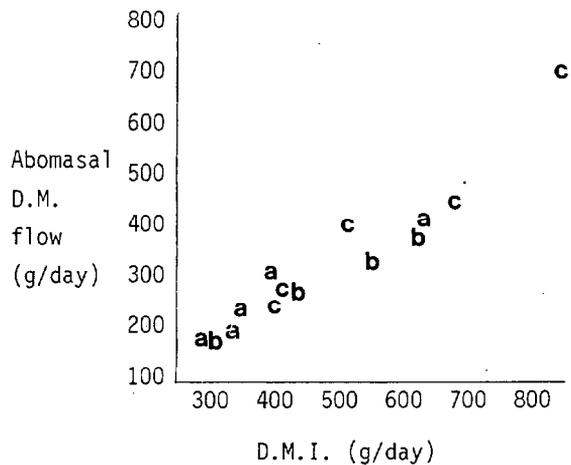
(n = 5, r<sup>2</sup> = 0.92).

Thus 29.4% of ingested DM apparently disappeared from the rumen irrespective of age, live weight or intake. This represents 45% of the total DM digestion occurring in the alimentary tract.

The average body weight gain over the experiment was 130 g/d.

**TABLE 2** Average *in vivo* DM digestibility and marker rumen retention time.

Age (weeks)	DM digestibility	RRT (h)
7	0.693a	
8		14.5 <sup>a</sup>
9	0.664b	
11	0.668b	
12		10.9 <sup>b</sup>
13	0.636c	
15	0.671b	
16		12.3 <sup>ab</sup>
17	0.669b	
23	0.668b	
24		10.8 <sup>b</sup>
SE	0.017	1.7



**a: week 8 b: week 12 c: week 16**

**FIG. 2** Dry matter digestion in the rumen.

## DISCUSSION

Abomasal cannulation of these young lambs had no effect on DMI, DM digestibility and marker rumen retention time. This result agrees with other studies on the effect of cannulation on adult sheep (MacRae *et al.*, 1982; MacRae and Wilson, 1977).

Dry matter intake (g/kg LW) increased rapidly until week 10 and was constant thereafter which agrees with the results of Wardrop and Coombe (1961) who studied lambs weaned at 6 weeks of age and offered lucerne hay.

The higher DM digestibility during week 7 and longer marker rumen retention time in week 8 were associated with the lower DMI. As the DMI increased there was a decrease in DM digestibility and marker rumen retention time which agrees with the results obtained by Grovum and Williams (1977) studying the effects of level of intake on digestion. The marker retention times in the rumen measured in this experiment were low (10.8 to 14.5 h) when compared to those observed by Egan and Doyle (1982) (13.9 to 17.1 h) and Margan *et al.* (1982) (16.2 to 24.3 h).

Age, live weight or DMI were shown to have no influence on the proportion of DM digestion occurring in the rumen despite the initial changes in DMI and marker rumen retention time.

Digestion in the rumen accounted for 45% of the total apparent DM digested. This is comparable with the results obtained with calves offered fresh clover (Beever *et al.*, 1980), lambs offered a ground and pelleted ration (Margan *et al.*, 1982) and chopped hay (M. R. Alam, pers. comm.). It is, however, lower than that observed in lambs (0.625) by Weston and Margan (1979) and adult sheep (0.65) by Hogan (1973) and Egan *et al.* (1975), all of whom offered dried subterranean clover.

It is concluded that intake increased rapidly following early weaning of these lambs and, in this experiment, no change in the proportion of DM apparently digested in the rumen was observed between 8 and 16 weeks of age. Abomasal cannulation of 6-week old lambs had no effect on intake, DM digestibility and marker retention time in the rumen.

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