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EFFECTS OF WEANING AGE ON EXPORT LAMB PRODUCTION

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SUMMARY

Five experiments were conducted over a period of 4 years (1973-7) in which lambs were weaned at 4, 5, 6, 9, 12, 15 or 18 weeks of age. Slaughter ages ranged from 12 to 30 weeks. Early weaning at 4, 5 or 6 weeks caused varying post-weaning growth checks, lasting from 1 to 4 weeks, the most severe following 4-week weaning. Subsequent growth rates were similar to those for later-weaned lambs. The reductions in final slaughter weights (up to 21%) were associated with lower killing out percentages, reduced carcass fat, and lower economic returns. In one experiment, where adjustments were made for differences in carcass weight, 4-week weaning resulted in 8 to 12% lower levels of chemical carcass fat and 6 and 4% higher values for water and protein, respectively, than in later-weaned lambs. Weaning lambs at 9 weeks of age resulted in similar final liveweights to weaning at 12 or 15 weeks.

The desirability of a liberal supply of milk and grass prior to early weaning and the lack of subsequent compensatory growth are discussed. Application of the practice for reducing carcass fat and removing the competition of ewes or in conjunction with sheep dairy production, accelerated lambing and progeny test programmes, is suggested. It is recommended that conventional lamb weaning ages be reduced to between 8 and 9 weeks.

INTRODUCTION

Lambs destined for export are traditionally weaned around 12 or 16 weeks of age, a policy which has in the past suited the requirement of the prime grade, enabling a high proportion of lambs to be drafted directly off their mothers. With a changing accent by the industry towards leaner lamb carcasses, this management practice needs to be reviewed.

Experimental work in New Zealand has suggested that early weaning at 3 to 5 weeks of age has resulted in reduced carcass fat levels immediately following weaning owing to fat mobilization (Fennessy *et al.*, 1972) and an increased requirement of energy for protein deposition in lambs consuming pasture alone (Rattray and Jagusch, 1977). Possible carryover effects of early weaning on carcass composition at heavier slaughter weights have not been clearly established.

The experiments reported here were carried out to investigate the effect of weaning age on subsequent growth rate and carcass composition.

EXPERIMENTAL

ANIMALS AND TREATMENTS

Five experiments were conducted over a period of 4 years as summarized in Table 1.

TABLE 1: SUMMARY OF EXPERIMENTS

Exp.	*Year*	*Pasture Type* *Pre-wng*	*Post-wng*	*Weaning Ages*[1] *(weeks)*	*Slaughter Ages* *(weeks)*
A	1973	grass	lucerne	4(Cr), 12(Cr), 12	12, 24
B	1974	grass	lucerne	6, 9, 12	12, 18, 24
C	1976	grass	lucerne	5, 5(R1), 5(R3), 9, 15	15
D	1977	lucerne	lucerne	4, 6, 18	18, 30
E	1977	grass	grass	6, 12, 18	12, 18, 24, 30

[1] Management treatments in brackets: Cr = creep grazed; R1 = restricted milk, week 5; R3 = restricted milk, weeks 3, 4 and 5.

In Experiments A, B and E, crossbred ewes were mated to Southdown (A, B and E), Suffolk (A, B and E), Border Leicester (B and E), and Dorset Down (E) rams as outlined by Geenty and Clarke (1977). Experiments C and D involved single-sire matings between Corriedale rams (5 per year) and Dorset ewes. Following lambing, lambs were allocated to weaning and slaughter age treatments balanced for genotype, individual sires and birth-rearing rank.

MANAGEMENT AND ANIMAL HEALTH

Ewes and lambs grazed either grass or lucerne dominant pasture (Table 1) at approximately 15 ewes/ha. Pre-weaning lamb treatments included creep grazing of lucerne from approximately 2 weeks of age (Exp. A) and the restriction of milk intake by allowing suckling access for only 8 hours a day (Exp. C). These measures were used in an attempt to hasten rumen development prior to early weaning. Weaned lambs were offered herbage *ad libitum*. The sizes of paddocks used ranged from 2 to 5 ha and, with the exception of Exp. D, animals were shifted to a fresh paddock as pasture allowance dictated. Half of the animals in each treatment of Exp. D were set-stocked and half rotationally grazed with a grazing interval of approximately 1 week.

Just prior to lambing, all ewes were treated with a multi-purpose clostridial vaccine containing selenium, while lambs were drenched with an anthelmintic plus selenium at weaning and thereafter at 4-weekly intervals until slaughter. Mineral salt blocks were provided for lambs grazing lucerne pastures not containing significant quantities of weeds or grasses.

Slaughter Procedures

Lambs were slaughtered at a local freezing works and data collected as described by Geenty and Clarke (1977). In Exp's C, D and E, weight of kidney fat and fat measurement GR were recorded. Carcasses from Exp's C and D were stored in a deep-freeze at $-10°C$ for further analyses.

Carcass Analyses

Frozen carcasses were halved with a bandsaw and the left half of each analysed for chemical fat, protein, water and ash (Geenty *et al.,* 1979). Eye muscle areas between the 12th and 13th ribs were measured.

Statistical Analyses

Least squares means were obtained using a model in which effects for sex, birth-rearing rank, age of dam, sire and dam breed were fitted along with birth day as a covariate. Developmental trends in carcass components were examined using logarithmic regression and covariance techniques as outlined by Geenty *et al.* (1979).

RESULTS

Lamb Growth

Growth patterns of the lambs in Exp's A, C and D are illustrated in Fig. 1. Rotationally grazed lambs only are included for Exp. D, as intermediate weights were not obtained for those set-stocked. Weaning at 4 weeks, in association with creep grazing, resulted in only a slight growth check (Exp. A). Abrupt weaning at the same age (Exp. D) caused a more definite check. Lambs weaned at 5 weeks of age (Exp. C) in a different season showed only a slight reduction in growth rate, restricted milk intake causing markedly slower subsequent growth. The duration of the growth check, following weaning at 4 or 5 weeks of age, was

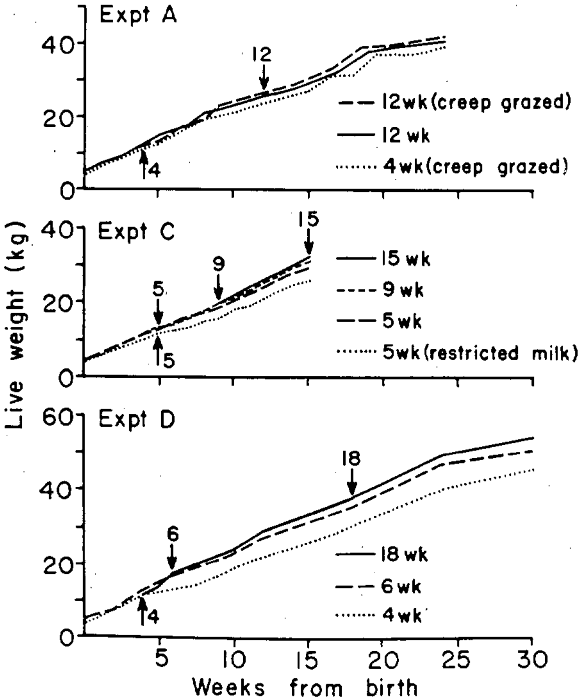

FIG. 1: *Growth performance (actual means) of lambs weaned at different ages* (↓ = *weaning point*).

1 to 4 weeks. Subsequent growth followed patterns similar to those for lambs weaned at older ages.

Mean pre-slaughter liveweights (PSLW) at the average slaughter age for the different weaning age treatments in Exp's A, C and D are set out in Table 2. Differences were largest in Exp's C and D, with a maximum reduction of 10 kg caused by 4-week compared with 18-week weaning in Exp. D. Set-stocked lambs in the latter experiment had, on average, 8% higher PSLW than those rotationally grazed. Comparisons of PSLW indicated that first order interactions between weaning treatments and slaughter ages were non-significant in all experiments.

Data from Exp's B and E, involving larger numbers of lambs (540 and 800, respectively), are not tabulated owing to lack of space. Weaning at 6, 9 or 12 weeks of age, in Exp. B, resulted in no significant differences in PSLW at the mean slaughter age, while 6-week weaning in Exp. E caused significant ($P < 0.001$)

TABLE 2: MEAN PRE-SLAUGHTER LIVEWEIGHTS (PSLW), CARCASS WEIGHTS (CSSW), RETURNS, AND FAT MEASUREMENTS BY WEANING AGES

Wng Age (wk)	*No.*	*Wng Wt (kg)*	*Sltr Age (wk)*	*PSLW (kg)*	*CSSW (kg)*	*D*[1] *(%)*	*Carcass Ret. ($)*	*Kidney Fat (g)*	*GR (mm)*
				Experiment A					
4 (Cr)	44	11.6	18	30.4	13.7	45	8.85		
12	52	24.3	18	31.1	14.6	47	9.29		
12 (Cr)	55	25.5	18	32.6	15.0	46	9.70		
SE (d)		0.58		0.77	0.44		0.24		
		***		*	**		n.s.		
				Experiment C					
5 (R1)	18	13.6	15	28.5	13.0	46	8.74	134	6.8
5 (R3)	16	12.8	15	26.2	11.7	45	8.08	118	5.8
5	16	13.3	15	28.3	12.4	44	8.79	116	5.3
9	15	20.0	15	32.9	15.6	47	10.40	173	9.6
15	15	33.1	15	32.8	16.1	49	10.85	211	10.3
SE (d)		1.23		1.72	0.90		0.57	23.3	1.12
		***		***	***		***	***	***
				Experiment D					
4	39	12.8	24	38.9	17.7	46	10.30	422	15.6
6	34	18.3	24	42.1	19.7	47	10.10	498	18.3
18	23	43.4	24	48.1	24.5	50	11.00	935	25.7
SE (d)		0.69		1.34	0.70		0.39	59.9	1.16
		***		***	***		***	***	***

[1] Killing out percentage (CSSW/PSLW × 100).

TABLE 3: ADJUSTED MEANS FOR CHEMICAL CARCASS COMPONENTS, CARCASS MEASUREMENTS AND KIDNEY FAT (EXP. D)

Component	*Unit**	*Weaning Age (wk)* 4	6	18	*Av. SE (d)*	*Sig.*	*b ± SE*	
Css fat	kg	4.8	5.2	5.4	0.04	*	1.55	0.08
	(%)	(27)	(30)	(32)				
Css water	kg	9.2	8.9	8.7	0.02	***	0.76	0.03
	(%)	(52)	(50)	(48)				
Css protein	kg	2.7	2.6	2.6	0.02	*	0.83	0.04
	(%)	(15)	(14)	(14)				
Css ash	kg	0.82	0.80	0.78	0.02	n.s.	0.87	0.05
	(%)	(5)	(5)	(4)				
Kidney fat	g	376	407	596	0.10	***	1.34	0.21
GR	mm	16.4	15.2	15.2	0.08	n.s.	1.97	0.17
Eye m. area	cm^2	11.7	11.4	11.4	0.03	n.s.	0.71	0.06

* % of carcass weight in parentheses.

reductions of 4% and 2% compared with 12- and 18-week weaning, respectively.

No lamb deaths were recorded post-weaning in any of the experiments.

Carcass Weights, Fat Measurements and Returns

The reductions in carcass weight (CSSW) caused by early weaning (Table 2) were of similar order to differences in PSLW but were normally associated with lower killing out percentages and reduced carcass fat. Lower carcass fat was evidenced both by fewer lambs from early-weaned groups grading prime at 12 to 15 weeks (37 to 45% of 4- and 5-week weaned lambs compared with 71 to 100% of later-weaned lambs) and by significantly lower GR measurement and kidney fat weights in Exp's C and D. Gross carcass returns were closely related to CSSW, with the exception of Exp. D, where the incidence of overfats in lambs weaned and slaughtered at 18 weeks (40%), and in 6- and 18-week weaned lambs slaughtered at 30 weeks (79%), reduced returns considerably.

Carcass Composition

Carcass composition of lambs in Exp's C and D was adjusted to a common carcass weight (12.3 and 17.5 kg, respectively) using covariance analysis. There were no significant differences between treatments in Exp. C. In Exp. D (Table 3) the weights of carcass fat were 8 and 12% higher in the 6- and 18-week weaned groups, respectively, than in the 4-week group, while carcass water and protein were 6 and 4% lower, respectively, in these groups. The mean weight of kidney fat was 52% higher in 18-week weaned lambs than in those weaned earlier. Logarithmic regression coefficients for carcass components on carcass weight showed no significant differences between weaning age treatments in either experiment.

DISCUSSION

After an initial check, the post-weaning growth rate (177 to 329 g/day) of lambs weaned at 4, 5 or 6 weeks of age in the experiments reported here was comparable with that of suckled lambs (203 to 332 g/day). This characteristic growth check, which was most marked in lambs weaned at 4 weeks, has been reported previously (Jagusch *et al.*, 1970; Rattray *et al.*, 1976). A possible reason for this temporary reduction in growth rate is inadequate reticulo-rumen development caused by an insufficient consumption of solid food prior to weaning (Wardrop and Coombe, 1961; Rattray *et al.*, 1976). An attempt to overcome this by restricting milk intake (Exp. C) prior to 5-week weaning did not appear to be successful, as indicated by prolongation of the post-weaning growth check. A similar result was reported by Penning and Treacher (1975), a restriction of milk substitute offered to lambs having an adverse affect on subsequent growth performance. On the other hand, creep grazing associated with 4-week weaning (Exp. A) appeared to lessen the growth check. The most severe growth check in the present series of experiments was caused by abrupt weaning at 4 weeks of age, although this did not penalize growth rate following the initial check.

As a result of the similar subsequent growth rates, differences in final liveweights in each of the experiments were largely accounted for by differences in this initial period, suggesting that compensatory growth did not occur following early weaning. Work with calves (Everitt *et al.*, 1969; Everitt, 1972) has also shown a lack of compensatory growth following restricted milk intakes during the initial 3 to 4 months of life. It is thus important to attain maximum individual weights prior to early weaning in order to minimize the growth check. This should be done by a combination of liberal milk feeding and early access by lambs, through creep grazing if necessary, to good quality pasture.

Some of the problems associated with early weaning in the past, such as lucerne red gut (Rattray *et al.*, 1976; Jagusch *et al.*, 1977a) and symptoms of sodium deficiency (Jagusch *et al.*, 1977b), were not experienced in the present experiments. This was possibly due to the presence of weeds and grasses in most of the lucerne pastures used, and the provision of salt blocks in more pure stands. Precautions such as routinely vaccinating lambs and administering anthelmintics plus selenium probably also contributed to the complete absence of lamb mortality.

Weaning at 9 weeks of age resulted in subsequent weights comparable to those for 12- or 15-week weaning. Previous work has shown similar results both for 8-week (Rattray *et al.*, 1976) and 9-week weaning (Barnicoat *et al.*, 1957). The results of lactation experiments at Templeton have shown that, under liberal pasture feeding conditions, milk production has most influence on lamb growth during the initial 6 weeks of life (Geenty, 1979). These findings, along with the results of the present experiments, indicate that the lamb weaning age for optimum growth rate is 8 to 9 weeks, depending on early growth, which is influenced by ewe milk supply and seasonal pasture production. Leaving lambs with ewes to older ages than this causes unnecessary competition for available pasture.

The results of detailed chemical carcass composition, adjusted for differences in carcass weight, showed no effects due to weaning age in Exp. C, although reductions in carcass fat and increases in both protein and water were caused by 4-week weaning in Exp. D. While previous work has shown similar changes in composition (Mitchell and Jagusch, 1972; Penning and Treacher, 1975; Searle and Griffiths, 1976), it has also been suggested that early nutritional effects on composition tend to be less pronounced at liveweights above 40 kg. The carryover effects of early weaning to heavier weights as reported here, however, should be treated with some caution because of the small numbers of animals involved in the particular experiment and the fact that it was not designed to compare treatments at the same subsequent carcass weights. There is need for more work to clarify this aspect, particularly in relation to the effects of weaning at 8 to 9 weeks on carcass composition.

CONCLUSIONS

Early weaning at 4 to 6 weeks of age can reduce the risk of overfat lambs and remove the competitive effect of ewes, particularly under conditions of adverse feed shortages. It also allows the utilization of ewes for dairy production or in accelerated lambing programmes, and can be used to remove the maternal influence on lambs involved in progeny testing. Conventional weaning age can be reduced to between 8 and 9 weeks with little or no adverse effect on export lamb production.

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