Reproductive performance of ewe offspring from ewes immunised against steroid hormones

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ABSTRACT

One hundred and four ewe lambs born in 1980 to either ewes that had been immunised against steroid hormones or untreated control ewes were retained for study of their subsequent growth and reproductive performance. There was no significant effect of dam immunisation on growth rate or reproductive performance as hoggets, 2-tooths or 4-tooths. Dam breed (Coopworth or Romney) was the major factor influencing reproductive performance. Mean lamb birth weight was 3.7 kg, weaning weight 18.7 kg, hogget mating weight 40.0 kg, 2-tooth mating weight 54.4 kg and 4-tooth mating weight 60.4 kg. At 9 months of age 83% had exhibited oestrus and their ovulation rate was 1.08, as 2-tooths, 96% mated in the first cycle with an ovulation rate of 1.68 and a conception rate of 80% to first service. They had a lamb drop of 1.49 lambs born/ewe joined and weaned 1.35 lambs/ewe joined. The respective figures as 4-tooths were 98%, 1.88, 85%, 1.43 and 1.34. These data indicate that immunisation of ewes against steroid hormones has no adverse effects on the performance of their progeny.

Keywords Ewes; Coopworth; Romney; immunisation; ovulation rate; progeny

INTRODUCTION

Immunisation of ewes against steroid hormones increases ovulation rate and lambing performance (Smith *et al.*, 1981; Cox *et al.*, 1982). In sheep there is no antibody transfer *in utero* (Brambell, 1958) and at parturition the steroid antibody titre in steroid-immunised ewes is negligible (Cox *et al.*, 1982). Thus the expected antibody transfer from ewe to new-born lamb would be minimal. However it was considered essential to know what effect dam treatment had on the performance of progeny.

EXPERIMENTAL

One hundred and four ewe lambs born in 1980 to either ewes treated with steroid immunogens or untreated control ewes, were retained for study. Details of ewe treatment are given by Smith *et al.* (1981). Dorset Horn rams were used as sires in that trial and the lambs were selected on the basis of birth rank, date of birth and dam breed (Coopworth or Romney) from each of the 4 treatment groups.

The ewe progeny were managed as a single flock and regular live-weight recordings were made. In March 1981 (at 6 months of age) they were joined with harnessed vasectomised Southdown rams for 4 months and oestrous onset recorded. In June 1981 an assessment of the ovulation rate was made by laparoscopy. In 1982 and 1983 they were synchronised with intravaginal sponges containing 70 mg medroxy progesterone acetate (MAP: Upjohn Pty.) and were joined for 6 weeks with entire Southdown rams at the second oestrus following sponge withdrawal. This oestrus occurred in the first week in April each year. Ovulation rate was determined after mating (day 5 to 9) by laparoscopy. Ewe lambing performance, lamb weaning weight and ewe wool production were recorded in each year.

RESULTS

The performance of the control ewes of each dam breed in the 1980 trial is shown in Table 1. The antibody titre levels of the treated ewes that were the dams of the selected progeny are shown in Table 2. Because of the very wide range, treatment group titre levels were not significantly different from one another.

Live weights

Live weights of the progeny from birth to their 4-tooth mating are summarised in Table 3. There were no significant effects of dam immunisation treatment or dam breed on progeny weight at any stage. Progeny birth rank had a effect ($P<0.05$) on both birth and weaning weights but this had disappeared by the time of hogget mating.

TABLE 1 Reproductive performance of dam breeds in 1980 (control ewes only).

Breed	No. ewes	Ovulation rate	Lambs born/ ewe joined
Coopworth	52	1.87	1.47
Romney	52	1.48	1.18

TABLE 2 Steroid antibody titre levels of the dams of progeny retained for study.

Immunisation group	Dam breed	No. ewes	Mean titre ($\times 10^3$)	Range
Oestrone 1	Coopworth	13	2.16	(0.28- 5.42)
	Romney	13	2.53	(0.39- 7.20)
Oestrone 2	Coopworth	14	1.30	(0.31- 3.84)
	Romney	11	2.38	(0.46- 5.28)
Androstenedione	Coopworth	8	2.38	(0.20-10.29)
	Romney	16	6.59	(0.05-24.73)

TABLE 3 Ewe progeny mean live weights (kg).

Main effect	No. lambs	Birth wt	Weaning wt	Mating weight		
				Hogget	2-tooth	4-tooth
Dam immunisation						
Oestrone 1	27	3.7	19.3	41.7	59.7	62.5
Oestrone 2	28	3.3	17.6	39.4	55.9	59.3
Androstenedione	25	3.9	18.2	38.2	55.4	58.6
Control	24	3.9	19.6	40.7	58.2	61.0
Birth rank						
Single	26	4.3	21.2	41.2	59.1	61.3
Twin	60	3.6	18.2	39.7	56.9	60.4
Triplet	18	2.9 *	16.5 *	39.6	56.4	59.2
Dam breed						
Coopworth	46	3.7	18.8	40.2	58.6	61.5
Romney	58	3.7	18.6	39.9	56.4	59.6
Overall	104	3.7	18.7	40.0	57.4	60.4

TABLE 4 Ovulation rate of ewe progeny.

Main effect	1981 Hogget	1982 2-tooth	1983 4-tooth
Dam immunisation			
Oestrone 1	1.15	1.72	1.96
Oestrone 2	1.00	1.65	1.83
Androstenedione	1.15	1.67	1.88
Control	1.00	1.70	1.86
Birth rank			
Single	1.18	1.83	1.95
Twin	1.04	1.63	1.87
Triplet	1.00	1.65	1.82
Dam breed			
Coopworth	1.10	1.84	1.97
Romney	1.06	1.55 **	1.81 *
Overall	1.08	1.68	1.88 **

Ovulation Rate

The ovulation rates (OR) (Table 4) increased with age ($P<0.01$). There was no effect of dam immunisation treatment on ovulation rate at any of the ages studied nor was there any effect of progeny birth rank. Progeny from Coopworth dams had higher ovulation rates than those from Romneys at both the 2-tooth ($P<0.01$) and 4-tooth ($P<0.05$) mating. No significant interactions were observed.

Lambing

There was no effect of age nor of dam immunisation treatment at either age on numbers of lambs born or weaned (Table 5). Dam breed had a effect ($P<0.05$) on number of lambs born and weaned per ewe joined in 1982 (2-tooths). A similar but non-significant tendency for the progeny of the Coopworth dams to have the better performance was also observed at the 4-tooth stage. Progeny birth rank effects were not significant, but in 1982 there was a tendency ($P<0.10$) for a higher performance from single-born ewes. This difference was not apparent the following year.

Mortality and Growth Rate of Lambs

Lamb mortality was low in both years (9.6% in 1982 and 6.8% in 1983) and there were no significant effects of immunisation treatment of the grand dams, of breed, of progeny birth rank, or of lamb birth rank.

The lamb birth and weaning weights for 1982 and

TABLE 5 Lambing performance of progeny of immunised ewes. Lambs born (LB) and lambs weaned (LW) per ewe joined (EJ).

Main effect	1982		1983	
	LB/EJ	LW/EJ	LB/EJ	LW/EJ
Dam immunisation				
Oestrone 1	1.52	1.26	1.48	1.40
Oestrone 2	1.44	1.36	1.39	1.30
Androstenedione	1.50	1.33	1.46	1.29
Control	1.50	1.45	1.40	1.35
Birth rank				
Single	1.72	1.48	1.57	1.57
Twin	1.43	1.32	1.37	1.20
Triplet	1.35	1.24	1.53	1.47
Dam breed				
Coopworth	1.66	1.45	1.46	1.38
Romney	1.35	1.26	1.42	1.30
	*	*		
Overall	1.47	1.35	1.43	1.34

TABLE 6 Mean birth and weaning weights (kg) for lambs born to the progeny of immunised ewes in 1982 and 1983.

Main effect	1982		1983	
	Birth wt	Wean wt	Birth wt	Wean wt
Grand dam immunisation				
Oestrone 1	4.30	23.88	4.26	20.00
Oestrone 2	3.98	22.41	4.42	22.62
Androstenedione	3.85	22.14	4.13	20.83
Control	4.35	23.17	4.53	22.02
Dam birth rank				
Single	3.75	22.04	4.20	21.11
Twin	4.11	23.22	4.32	21.56
Triplet	4.42	22.86	4.48	20.85
Grand Dam breed				
Coopworth	4.00	22.70	4.29	21.54
Romney	4.11	22.96	4.35	21.13
Lamb birth rank				
Single	4.88	25.44	4.99	23.73
Twin	3.74	21.74	3.98	20.41
	*	*	*	*
Overall	4.05	22.83	4.32	21.49

1983 are presented in Table 6. There were no effects of age, grand dam treatment or breed, or progeny birth rank on either parameter. Single-born lambs were heavier ($P<0.05$) than twins in both years. There were no significant interactions.

Wool

Wool production of the ewes averaged 2.4 kg as hoggets, 5.4 kg as 2-tooths (shorn twice) and 3.8 kg as 4-tooths. There were no significant effects of dam immunisation treatment, breed or progeny birth rank on wool production at any stage examined.

DISCUSSION

These data indicate no effect of steroid immunisation of ewes on the growth and productive performance of their offspring. Similar findings for Merino ewes in Australia have recently been reported (Wilson *et al.*, 1983)

Of particular interest in the present experiment was that the difference in reproductive performance of the dam breeds was reflected in the performance of their crossbred progeny. There was no breed × treatment interaction and the breed difference for the crossbred progeny was approximately half the parental difference

(Table 7), as would be expected for animals with 50% of their breed ancestry in common. This suggests that the genetic potential of the offspring is not masked by the treatment of their dams with steroid immunogens. However these data do not answer the question of what progress for selection for increased fecundity would be made if all ewes in a flock were treated with steroid immunogens.

TABLE 7 Breed differences in reproductive performance of ewes and their crossbred progeny.

	Difference (Coopworth-Romney)	
	Parents[1]	Progeny[2]
Ovulation rate	0.39	0.23
Lambs born per ewe joined	0.29	0.18

[1] Control ewes only in 1980.
[2] Average of 2-tooth and 4-tooth performance.

There was no interaction between dam immunisation treatment and birth rank of the progeny on progeny performance. The indication of a better performance from the single-born progeny is of interest. It appears to be associated with higher live weights and may reflect an effect of level of rearing nutrition.

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