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DISCUSSION

These results show that increased live weight resulting from nutritional manipulation did not increase sensitivity to immunisation as both control and immunised ewes had similar slopes for increase in ovulation rate with increase in live weight. However because of the effects on conception rate and embryonic mortality, increased live weight at mating improves a ewe's chances of maintaining the extra ovulations and presenting them as extra lambs.

Differences in ewe mating weight unconfounded by effects of age, breed, or immediate pre-mating nutrition showed a non-significant trend (an increase in the response to immunisation measured as LB/EJ with increasing live weight) similar to that reported from field trials (Scaramuzzi *et al.*, 1983; Geldard,

Scaramuzzi and Wilkins, 1983; Geldard, Dow and Kieran, 1984; C. Kelly, Glaxo NZ, personal communication). It is also important to note that ewe live weight at joining had no effect on lamb mortality in this experiment.

The failure to obtain a response in LB/EJ to flushing in the immunised ewes in contrast to the response obtained in the control ewes is interesting and reflects the additive effects of these treatments on embryonic mortality and contrasts with previous reports (Smith *et al.*, 1981a).

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Ovulation and lambing responses with alternating steroid immunisation over 3 years

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ABSTRACT

Forty Romney hoggets were immunised against oestrone during March. A similar number served as untreated controls. Half of each group was treated with progestagen sponges to induce oestrus. Their ovulation rates were determined 7 days after sponge withdrawal and in mated hoggets within 14 days of first oestrus.

Half of the immunised ewes were boosted as 2- and 4-tooths, the balance receiving only a 4-tooth booster. Half of the untreated controls were first immunised as 4-tooths. Ovulation and lambing rates were recorded.

Immunisation increased hogget multiple ovulation rates by 50%. Unboosted 2-tooth ewes had multiple ovulation rates, multiple birth rates and numbers of lambs born similar to untreated controls. Boosted 2-tooths had more multiple ovulations (37%), ewes lambing multiples (28%) and lambs born (28%) than control ewes. The ovulation rate of 4-tooth ewes was 2.24. Untreated control ewes had the lowest proportion of triple ovulating ewes (11%), with first treated 4-tooths and 4-tooths missing their 2-tooth booster intermediate (22%) and annually boosted 4-tooths highest (38%). Control 4-tooths lambed fewest multiples (53%), first treated 4-tooths were intermediate (63%) and 4-tooths missing their 2-tooth booster and annually boosted 4-tooths highest (75%). However, differences in 4-tooth ovulation and lambing responses were not significant.

The limited data demonstrate that annual immunisation against oestrone can increase ovulation and lambing rates. Ewes missing an annual booster perform at levels similar to untreated control. Furthermore, the immunomemory system for oestrone appears to last for at least 24 months since the ewes gave birth to 189% of lambs compared to 194% in annually boosted ewes and 159% in untreated controls.

INTRODUCTION

Active immunisation against steroid hormones can improve sheep reproductive performance. The most striking responses are an increase in ovulation rate and fecundity in annually boosted ewes (Smith *et al.*, 1981a). The effect on ewes less than 1 year old and the consequences of missing annual boosters have yet

to be determined.

The aims of this study were to evaluate the effect on reproductive performance of

- 1) immunising 6 to 8 month old ewes;
- 2) omitting an annual booster in these ewes one year later and
- 3) first immunising ewes as 4-tooths.

MATERIALS AND METHODS

Forty Romney hoggets received a sensitising vaccination against an oestrone-HSA conjugate in DEAE dextran on 5 March 1982, followed 21 days later by a booster. A similar number remained untreated. Half of the hoggets in each group were treated for 14 days from 30 March with progestagen sponges to induce oestrus as part of another experiment. Ovulation rates were determined in progestagen treated hoggets 7 days after sponge withdrawal and in all mated hoggets within 14 days of first mating by a vasectomised ram.

Half of the immunised ewes were boosted 3 weeks prior to joining in late March 1983 (2-tooths) and 1984 (4-tooths). The balance of previously immunised ewes missed their 2-tooth booster in 1983 but were boosted as 4-tooths the following year. Half of the non-immunised ewes were sensitised and boosted as 4-tooths, the remainder being untreated. At the 4-tooth joining, there were 4 groups of about 20 ewes which had received a total of 0 (untreated controls), 2 (first treated as 4-tooths), 3 (treated as a hogget and 4-tooth) and 4 (treated as a hogget, 2-tooth and 4-tooth) vaccinations against oestrone.

Logit analysis, adjusting for joining live weight, was carried out using Genstat.

RESULTS

Immunisation increased hogget multiple ovulation rates measured within 7 days of sponge withdrawal by 50% (Table 12). Ovulation rate at first oestrus tended to be higher in immunised hoggets (1.22 v 1.10, NS). A 2-tooth booster increased multiple ovulation and birth rates by about 33% and 27%

respectively (Table 12). Untreated controls and non-boosted 2-tooth ewes had similar reproduction rates. There were no barren 2-tooth or 4-tooth ewes.

The mean incidence of 4-tooth ewes having multiple ovulations and multiple births was 95% and 66% respectively (Table 12). Almost one-quarter of the ewes had 3 ovulations. Compared to untreated 4-tooth controls, immunised ewes tended to have higher ovulation rates (2.27 v 2.06), multiple birth rates (71% v 53%) and % lambs born (182 v 159) (Table 12). The data suggest a greater response in terms of lambs born in ewes immunised as hoggets and boosted as 4-tooths than in ewes immunised as 4-tooths only (192% v 163%). Although ewes first immunised as 4-tooths tended to have higher ovulation rates than untreated 4-tooths, there was no advantage in the number of lambs born. However, none of the 4-tooth treatment differences was significant.

DISCUSSION

The mechanism regulating the ovarian response to immunisation against oestrone is functional prior to puberty since immunisation increased hogget ovulation rates. In addition, boosting previously immunised hoggets 1 and 2 years later improved reproductive performance.

The magnitude of the hogget response compares favourably with that recorded with older ewes (Smith *et al.*, 1981a). The low response at first oestrus may have been due to the 7 to 8 week mean interval between boosting and oestrus. This is consistent with the reported decline in response 7 to 9 weeks post-boosting (Cox *et al.*, 1984). Antibody titre levels may

TABLE 12 Reproductive performance (%) in ewes with differing immunisation backgrounds.

	Hogget	2-tooth			4-tooth			
	EOM EO	EOM EO	LM EL	LB EJ	EOM EO	OR	ELM EL	LB EJ
Untreated control	0	21	15	115	89	206	53	159
Immunised 4-tooth only					95	224	63	163
Immunised hogget boosted 2- and 4-tooth	50))	58	43	143	100	237	75	194
Immunised hogget boosted 4-tooth only))	30	18	118	95	219	74	189
Significance	**	**	*					

EOM = ewes ovulating multiples

EO = ewes ovulating

ELM = ewes lambing multiples

EL = ewes lambing

LB = lambs born

EJ = ewes joined

OR = ovulations/EO (raw mean)