Mating Romney ewes in November-December using CIDRs and pregnant mare serum gonadatrophin

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ABSTRACT

Mature Romney ewes were involved in three experimentsr at Flock House Agricultural Centre and Limestone Downs (near Raglan) to identify factors affecting the percentage of ewes pregnant to mating in November and December following treatment with CIDRs and PMSG. Dorset rams were no better than Romney rams for mating and increasing the ram percentage from 10% to 15% failed to overcome the low conception rate of 50-65%. Rams that had been used for mating 11 days previously increased the percentage of ewes pregnant. Ewes previously lambing in autumn had only a 4.8% increase in ewes mated and pregnant compared with ewes previously lambing in spring. Despite the reuse of CIDRs reducing the percentage of ewes mated by 6.1% it was still economical to reuse CIDRs. There was a consistent increase in ewes pregnant and multiple pregnancies with increasing dose of PMSG. By contrast live weight had no effect on the reproductive performance of ewes except for those ewes less than 40 kg live weight. Regulin implants failed to overcome the low conception rate of ewes mating following teatment with CIDRs and PMSG in December.

Keywords Out-of-season breeding; pregnant mare serum gonadotrophin; PMSG; CIDRs; oestrus; conception rates; Romney ewes.

INTRODUCTION

Out of season lambing may provide an opportunity to improve returns where there is good pasture growth in winter and early spring. However hormonal treatment of Romney ewes is essential for November-December matings. While the basic concept of using progestagens and PMSG for out-of-season mating is well known, the finer details have not been investigated for New Zealand conditions. Recommendations have usually been taken from overseas results based on synchronised mating in the breeding season (Bryant and Tomkins, 1975; Boland and Gordon, 1979).

The economics of hormonal induction of oestrus in Romney ewes depends on the reproductive performance of the ewes and cost of treatment. The aims of the three experiments presented in this paper were to identify factors influencing the pregnancy rate and fecundity of hormonally treated Romney ewes mated in November-December, and to reduce the cost of hormone treatment.

MATERIALS AND METHODS

Romney ewes were used and the first two experiments were at Flock House Agricultural Centre, and the third at Limestone Downs, near Raglan. In all experiments G type CIDRs were inserted for 12 days and the PMSG (Consep 45; Heriot Pty Australia) was injected at CIDR removal. The ewes in the three experiments were scanned 7-10 weeks after mating with a real-time ultrasound scanner to identify the pregnancy status of the ewe.

Experiment 1

This was a 3×2^3 factorial using 960 mature Romney ewes. The treatments were; 400 *v* 450 *v* 500 IU PMSG; mature Poll Dorset *v* mature Romney rams; 10% rams *v* 15% rams; ewes previously lambed in autumn (120 ewes) *v* ewes previous lambed in spring (840 ewes). Because of a limitation on the number of rams available, the experiment was split into two replicates with joining in the second replicate occurring 7 days

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after joining in the first replicate. CIDRs were removed on 20 and 27 November in replicates 1 and 2 respectively. The same rams were used in both replicates and rams were introduced at CIDR removal. Mating marks were recorded 5 days later.

Experiment 2

This was 2 x 3^3 incomplete factorial using 738 mature Romney ewes. The treatments were; used CIDR *v* new CIDR; 350 *v* 400 *v* 450 IU PMSG; ram introduction at 0 *v* 24 *v* 48 hours after CIDR removal; used Poll Dorset rams *v* used Romney rams *v* fresh Romney rams.

The used rams were rams used for mating 11 days previously in Experiment 1. The fresh Romney rams had not been used in the previous 6 months for mating. The 9 mating groups were separated by at least one paddock and the ram to ewe ratio was 1:10. The used CIDRs had been inserted into ewes for 12 days and upon removal they were washed in CIDR-wash. CIDR removal in this experiment occurred on 8 December and mating marks were recorded 5 days later.

Experiment 3

This was a 2 x 5 factorial using 1000 mixed aged Romney ewes. Treatments were; Regulin implants *v* no Regulin implants and 0 *v* 100 *v* 200 *v* 400 *v* 600 IU PMSG. Regulin was inserted on 4 November and CIDRs were removed on 11 December. Dorset rams at the ratio of 1 : 10 were introduced to the 5 treatment groups at CIDR removal. Five days later a sample of 50 ewes from each PMSG treatment were laparoscoped to determine ovulation rate.

Statistical Analysis

Data were analysed on an individual animal basis using either linear regression or logit models. In addition the ewes in Experiments 1 and 2 were divided into 5 kg liveweight categories and the differences between categories in percentage ewes pregnant per ewe treated and percentage of multiple pregnancies per ewe pregnant was compared using Chi square analysis. The percentage ewes conceiving was calculated from percentage ewes pregnant per ewes mated.

TABLE 1 The effect of treatment on reproductive traits in Experiment 1.

Treatments	Ewes mated /ewes present (%)	Ewes pregnant /ewes present (%)	Multiple pregnancies /ewes pregnant (%)	Ewes conceiving /ewes ewes mated (%)
Breed of Ram				
Dorset	93.3	59.5	17.5	63.7
Romney	95.0	57.3	20.4	59.2
Ram ratio				
10%	93.5	57.9	20.3	61.2
15%	94.8	58.9	17.6	61.6
Dose PMSG				
400 IU	93.7	56.4	16.6	59.1
450 IU	95.2	58.7	19.2	62.1
500 IU	93.4	60.0	20.9	63.1
Lambing time				
Autumn	98.3	62.2	19.0	62.5
Spring	93.5*	57.9	18.9	61.3
Replicate				
First	93.5	55.0	15.2	58.3
Second	94.8	61.8*	22.3*	64.5*

* Value differs from value above it ($P<0.05$)

RESULTS

Weight of Ewes

Mean (±SEM) live weight of the ewes at CIDR insertion was 49.8 ±0.23 kg and 48.6 ± 0.23 kg for ewes in Experiments 1 and 2 respectively. In Experiment 1, autumn lambing ewes were heavier ($P<0.001$) than spring lambing ewes (59.4 kg *v* 48.4 kg). There were no other differences in live weight between treatment groups.

There were no linear relationships between live weight and the reproductive traits and in Experiment 1 there was no difference in percentage pregnant ewes and multiple pregnancies between the 5 kg liveweight categories. Ewes less than 40 kg in Experiment 2 had a 25% lower ($P<0.01$) percentage of ewes pregnant than the ewes in other liveweight categories.

Experiment 1

Breed of ram and ram : ewe ratio had no effect on any of the reproductive traits (Table 1). There were no indications that reuse of rams in the second replicate had a detrimental effect on the reproductive performance of the ewes. Percentage ewes pregnant, percentage ewes conceiving and percentage of multiple pregnancies was higher ($P<0.05$) in the second than in the first replicate.

While the trend was for percentage ewes pregnant and percentage of multiple pregnancies to increase with increasing dose of PMSG the differences were not significant.

Ewes previously lambing in autumn had 4.8% more ($P<0.05$) ewes mated than ewes previously lambing in spring. While this was reflected in the percentage of ewes pregnant the differences were not significant.

Experiment 2

Used Poll Dorset rams mated fewer ($P<0.05$) ewes than used or fresh Romney rams but the percentage ewes conceiving and the percentage ewes pregnant were higher ($P<0.05$). Used Romney rams had been mated on two previous occasions within the month with synchronised ewes and still their performance was better than

TABLE 2 The effect of treatments on reproductive traits in Experiment 2.

Treatments	Ewes mated /ewes present (%)	Ewes pregnant /ewes present (%)	Multiple pregnancies /ewes pregnant (%)	Ewes conceiving /ewes ewes mated (%)
Ram group				
Used Dorset	84.3	56.2	16.7	63.2
Used Romney	92.1	51.1	13.1	54.4
Fresh Romney	88.4*	46.5*	20.7*	51.2
Time of ram introduction				
0 hours	92.6	49.7	15.4	52.3
24 hours	84.9	48.3	12.5	56.4
48 hours	87.3*	54.1	22.8	58.2
Dose PMSG				
350 IU	86.3	46.9	15.0	51.5
400 IU	89.8	50.2	16.8	54.4
450 IU	88.6	54.9	19.3	60.6
CIDR				
New	91.3	53.5	19.8	57.1
Used	85.2**	47.9	14.2	53.8

* Ram groups/times of introduction differ ($P<0.05$)
** Value differs from value above it ($P<0.01$)

that of the fresh Romney rams (Table 2).

Percentage of ewes mated was 5-8% higher ($P<0.05$) when rams were introduced at CIDR removal but percentage ewes conceiving and percentage of pregnant ewes were 2-6% higher when rams were introduced 48 hours after CIDR removal (Table 2).

Reuse of CIDRs reduced ($P<0.01$) the percentage of ewes mated by 6.1% and this was reflected in a similar reduction in percentage ewes pregnant.

TABLE 3 Effect of dose of PMSG on reproductive traits in Experiment 3.

	Dose of PMSG (IU)				
	0	100	200	400	600
Ewes mated (%)	83	80	86	93	92
Ovulations / ewe ovulating	1.10	1.24	1.19	1.50	1.50
Conception rate (%)	66	66	66	66	67
Ewes pregnant (%)	56	53	57	61	64
Litter size	1.12	1.24	1.31	1.21	1.25

As in experiment 1, percentage of pregnant ewes, percentage ewes conceiving and percentage of multiple pregnancies tended to increase with increasing dose of PMSG (Table 2). There was however a significant ($P<0.01$) interaction between dose of PMSG and used *v* new CIDRs for percentage multiple pregnancies. As dose of PMSG increased from 350 to 400 to 450 IU, the percentage multiple pregnancies increased from 11.1% to 18.8% to 27.4% for the new CIDR but decreased from 19.4% to 14.2% to 8.8% for used CIDR.

Experiment 3

Regulin implants inserted in November, 37 days before mating, had no effect on any of the reproductive traits. The main results from this experiment were the unexpected high incidence of ewes mating and conceiving in early December amongst ewes not injected with PMSG (Table 3). Overall, 87% of the ewes were mated immediately after CIDR removal. Higher doses of PMSG (400 and 600 IU) resulted in about 10% more ewes mating compared with the lower doses (93% *v* 83% $P<0.001$). There was a similar trend for percentage ewes pregnant to increase with increasing dose of PMSG. Ovulation rate also tended to increase with higher doses of PMSG but this was not reflected in an increase in litter size.

Of the ewes mated in the first cycle, 14% returned to service at the second cycle and a further 2% of ewes were mated for the first time. There was no effect of PMSG on the proportion of ewes mated at the second cycle. The conception rate was similar for the ewes mated at the first and second cycles (67% *v* 61%) with the net effect being that 8% of ewes were pregnant to the second cycle matings.

DISCUSSION

Percentage ewes pregnant following hormonal treatment in the three experiments was relatively low at 50-65%. The main problem was not with the onset of oestrus but with low conception rates of ewes mated. While there was no major factor which increased the percentage ewes pregnant, there were a number of factors each with a small influence on reproductive performance.

Poll Dorset rams were no better than Romney rams and increasing the percentage of rams used above 10% failed to improve reproductive performance. This latter finding contrasts with Bryant and Tomkins (1975) who found percentage ewes lambing increased with increasing ram percentage up to 17%. There was a strong indication that reuse of rams improves the lambing performance of the ewes. Possibly because rams in the non-breeding season have a store of poor quality semen in the lower part of the epididymides as a result of either aging of sperm or because of production of poor quality semen in the non-breeding season (Corteel, 1981). Thus staggering the mating of hormonally treated ewes not only reduces the requirement for large numbers of rams but can also improve lambing performance.

Introduction of rams at 48 hours after CIDR removal may result in more ewes pregnant but the results were equivocal. Boland and Gordon (1979) found introduction of rams at 48 hours increased ewes lambing to a synchronised oestrus in the

breeding season from 40% to 68%. By contrast Robinson *et al.* (1987) found no effect of time of ram introduction on reproductive performance. Both Boland and Gordon (1979) and Robinson *et al.* (1987) used sponges to prime their ewes and sponges have a longer interval from removal to onset of oestrus than CIDRs (Knight *et al.*, 1988). Thus 36 hours from CIDR withdrawal to ram introduction may be more appropriate when CIDRs are used.

The improved performance of ewes previously lambing in autumn compared with spring lambing ewes weaned 3 weeks before CIDR insertion was small. Thus farmers contemplating mating part of their normal spring lambing ewe flock in November-December are only going to have marginally lower reproductive performance of their ewes compared to farmers who have a regular autumn lambing flock.

The major means of reducing cost of hormone treatment was to reuse CIDRs. The difference between new and used CIDRs was 5.6% fewer ewes lambing and 9.3% fewer lambs born. At $4.00 per CIDR the extra lambs born from the use of new CIDRs would cost $43.00 per lamb. Thus it was economical to reuse CIDRs for at least a second out-of-season mating.

There was a trend for ewes pregnant and ewes with multiple pregnancies to increase with increasing dose of PMSG with a net effect of 4.6% potential lambs born per 50 IU. At present prices of $6.67 per 1000 IU PMSG the extra lambs per 50 IU PMSG would cost $7.25 per lamb. This cost was between the actual cost of hormone treatment per lamb born of $8.28 when only new CIDRs were used and $5.85 averaged over 2 years when CIDRs were reused. Thus the higher doses of PMSG (450 to 500 IU PMSG) appear the most economical when new CIDRs are used.

The reproductive performance of the ewes receiving CIDRs alone in Experiment 3 raises the question of the need for PMSG. The 83% of ewes mated in December without PMSG was clearly better than the 0% and 11% achieved in December by Taylor and Andrewes (1987) and Smith *et al.* (1988) but was consistent with the performance of Romney ewes in another trial in the same year (Moore pers. comm. 1988). It was unclear if these responses were associated with the genotype of the ewes, some management factor or some local seasonal factor.

CONCLUSIONS

The cost of hormonal treatment per lamb born to ewes mated in November- December for autumn lambing is generally too high unless a large premium is being offered for out of season lambs and there are no additional costs associated with extra feed requirements. A number of factors can influence the response and reduce the cost per lamb born but these are minor and do not make a substantial difference to the costs of producing autumn lambs from Romney ewes. The exception would be if Romney ewes could consistently be mated in early December without PMSG.

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