Effect of steroid immunisation and vaginal artificial insemination on the fertility of synchronised ewes

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ABSTRACT

Romney ewes were used for a 2 x 2 factorial trial, 2 injections (boosted) *v* 1 injection of Fecundin® pre-artificial insemination (AI) x controlled internal drug releaser (CIDR) re-insertion *v* no CIDR reinsertion post-AI. The ewes were all synchronised with CIDRs for the AI carried out intravaginally without a speculum 52 h after CIDR withdrawal. Those ewes failing to conceive to AI were naturally mated at the next oestrus.

Fecundin® boosting decreased the percentage of CIDR synchronised ewes becoming pregnant to AI (12.6 *v* 21.3, $P<0.01$) but increased multiple pregnancy rate (50.4 *v* 30.2, $P<0.001$) at the subsequent natural mating. Reinsertion of CIDRs for 5 to 8 d, 9 to 12 d after removal of the first CIDR had no effect on pregnancy rate to AI. The response to Fecundin® boosting in terms of multiple pregnancy rate at the natural mating was essentially the same in light ewes as in heavy ewes.

Keywords Ewe; Romney; steroid immunisation; artificial insemination; CIDR; fertility; prolificacy.

INTRODUCTION

About 80,000 ewes are artificially inseminated (AI) intravaginally without the aid of a speculum using fresh diluted semen in Western Australia annually (D.R. Barnes, pers. comm.). These *shot-in-the-dark* (SID) inseminations result in pregnancy rates of up to 64% (Maxwell and Hewitt, 1986). This cheap method of achieving genetic progress on a large scale could be duplicated in New Zealand. One drawback is that the ewes are normally inseminated at a natural oestrus, requiring many farm visits.

Kerton *et al.* (1984) have obtained non-return rates of 31% with SID inseminations using fresh diluted electroejaculated semen, while Maxwell and Hewitt (1986) have obtained pregnancy rates of 17% with SID inseminations using frozen-thawed pellets. Both trials used ewes synchronised with progestagen sponges.

In this study SID inseminations using fresh diluted semen were carried out following synchronisation with a controlled internal drug releaser (CIDR). Treatment with Fecundin® and reinsertion of CIDRs following AI were superimposed on the trial. Both these techniques have the potential for increasing genetic progress through increases in the number of lambs born (Smith, 1985; Peterson *et al.*, 1984).

MATERIALS AND METHODS

Seven hundred and eighty five Romney ewes from 2½ to 5½ years of age were used. The design was a 2 x 2 factorial with 2 injections (boosted) *v* 1 injection (unboosted) of Fecundin® x post-AI CIDR reinsertion *v* no post-AI CIDR reinsertion. All ewes were weighed and received a Fecundin® injection on 7 February. A matched half of the ewes received a second injection of Fecundin® on 27 February. The ewes were weighed and type S CIDRs inserted on 12 or 14 March, for 12 to 13 d. AI was carried out between 26 and 29 March about 52 h after CIDR removal. Vasectomised rams fitted with a mating harness were joined with the ewes at the time of CIDR removal, and tup marks recorded at the time of AI. Within Fecundin® treatments CIDRs were reinserted into half the ewes on 5 April (7 to 10 d after AI) and removed between 10 and 13 April, (15 days after AI). Reinsertion periods were from 5 to 8 d.

Semen from 25 Waihora strain Romney rams was collected by means of an artificial vagina each morning AI was carried out. Ejaculates were diluted to 800 million per ml with caprogen (Shannon, 1964) at 32°C, allowed to cool slowly to ambient temperature and then loaded into 0.25 ml straws, which were kept at ambient temperature for 2 to 11 h

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TABLE 1 Effect of Fecundin® treatment and CIDR reinsertion on lambing and pregnancy rates.

Treatment		Total ewes	Artificial insemination Lambing[1] (%)	ELM/EL[2] (%)	Pregnant[3] (%)	Natural mating EMP/EP[4] (%)	LB/EJ[5]
Fecundin®	-reinsert	193	11	33	94	49	1.40
Fecundin®	-no reinsert	191	14	22	96	53	1.49
No Fecundin®	-reinsert	201	20	24	94	26	1.19
No Fecundin®	-no reinsert	200	22	18	94	35	1.26
Total		785	17	23	95	41	1.34

[1] Ewes lambing/ewes inseminated
[2] Ewes lambing multiples/ewes lambing
[3] Ewes pregnant to natural mating/ewes not pregnant to AI
[4] Ewes multiple pregnant/ewes pregnant to natural mating
[5] Lambs born/ewes joined not pregnant to AI

before being loaded in a pistolette and discharged into the anterior vagina without the aid of a speculum.

The same rams were fitted with a mating harness and joined with the ewes on 8 April and removed on 7 May. Tup marks were recorded on 18 April and 7 May. Marked ewes were x-rayed on 17 August and the number of foetuses recorded. Date of lambing and number of lambs born was recorded for the unmarked ewes. The date of lambing was used to verify the ewes which lambed following AI.

RESULTS

Fecundin® boosting (2 injections) caused a decrease in the percentage of ewes lambing to AI (12.6 *v* 21.3, $P<0.01$), but had no effect on multiple lambing rate (Table 1). There were only 2 sets of triplets. Both were born to Fecundin® treated ewes.

In contrast, Fecundin® boosting had no effect on the percentage of ewes pregnant to natural mating, but caused a marked increase in multiple pregnancy rate (Table 1, 50.4 *v* 30.2, $P<0.001$). The response was the same for the 4 age groups. There were only 3 sets of triplet foetuses recorded to natural mating, all to Fecundin® treated ewes.

Fecundin® boosting decreased the percentage of ewes with tup marks at AI (76% *v* 88% $P<0.01$). Ewes with tup marks at AI had higher lambing rates to AI and there was no interaction with Fecundin® (Table 2).

There was no difference in live weight between ewes boosted with Fecundin® and the remainder on 7 February, with the mean live weight being 46.2 ± 0.2 (SEM) kg. The live weights of Fecundin® boosted and unboosted ewes on 12 March were 41.0 kg and 42.1 kg respectively (SED 0.3), with the 2 groups losing 5.2 and 4.0 kg respectively during this 5-week period.

TABLE 2 Effect of Fecundin® treatment and the presence of a teaser tup mark on the proportion of ewes lambing (%) to AI.

Treatment	Marked	Not marked
Fecundin®	15	6
No Fecundin®	22	17

Pre-treatment (7 February) live weight had a significant effect ($P<0.001$) on multiple pregnancy rate to natural mating, and the live weight and Fecundin® effects were additive. There was no effect of pre-treatment live weight on lambing or multiple lambing to AI, or percentage pregnant to natural mating.

Date of AI had a significant effect ($P<0.01$) on the percentage lambing to AI, with the mean on the 4 consecutive days being 10.8, 19.8, 14.1 and 23.4 respectively. The 2 days with the higher pregnancy rate corresponded with a 13 d CIDR insertion period, whereas the 2 other days corresponded with a 12 d insertion period. Date of AI also had a significant effect on multiple lambing rate to AI, with the percentages being 0.01, 23.7, 30.4, and 27.7 respectively.

CIDR reinsertion had no effect on pregnancy or multiple pregnancy rate in this study.

DISCUSSION

The overall lambing rate of 17% with SID inseminations at a synchronised oestrus agrees with Kerton *et al.* (1984) (31% non-return with fresh semen) and Maxwell and Hewitt (1986) (17% pregnancy with frozen-thawed semen). These low fertility rates contrast with reports of the successful use of SID AI with fresh semen at a natural oestrus. Under these conditions, Tervit *et al.* (1984) obtained a lambing rate of 65% and Maxwell and Hewitt (1986) a pregnancy rate of 64%.

The ewes that received 1 injection of Fecundin® can be regarded as untreated. J.F. Smith (pers. comm.) has found no fertility differences between unboosted and untreated ewes. There was no suggestion in this study that the heavier ewes responded better to Fecundin® treatment in terms of fecundity, as suggested by Scaramuzzi *et al.* (1983) and Smith *et al.* (1985). The gain in litter size in the light ewes was equal to that in the heavy ewes.

A 13 d CIDR insertion period led to a higher lambing rate at the subsequent AI than a 12 d CIDR insertion period. McMillan (1987) also obtained higher pregnancy rates following a 13 d rather than 12 d insertion period followed by natural mating.

An increase in lambing percentage as a result of progesterone supplementation was first reported by Peterson *et al.* (1984). It is not surprising that CIDR reinsertion had no effect on the lambing rate to AI in this study, as firstly a very low fertilisation rate led to a low number of embryos to help survive by progesterone supplementation, and secondly there were low levels of nutrition preceeding AI as shown by the liveweight losses at this time. Parr *et al.* (1986) showed that progesterone supplementation only helps the survival of early embryos under conditions of high nutrition.

CONCLUSIONS

Steroid immunisation with Fecundin® increased litter size in light hill country ewes. SID AI at a synchronised oestrus cannot be recommended.

ACKNOWLEDGEMENT

B.W. Dow for the statistical analysis, Dr D. Beach and DSIR for the x-ray data, and J.R. Wilson for the use of sheep and facilities. B Curson and New Zealand Dairy Board for help with semen handling.

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