CAN THE "RAM EFFECT", OR THE "RAM EFFECT" PLUS PMSG BE USED TO ADVANCE THE BREEDING SEASON OF SOUTHDOWN EWES?

C.M. OLDHAM*, T. BOYES* and D.R. LINDSAY*

SUMMARY

The 'ram effect' induced some seasonally anovular Southdown ewes (23%) to ovulate within 5 days of introducing Southdown rams on 10 December. Priming the ewes with medroxy progesterone acetate from intravaginal sponges for 12 days, immediately before the introduction of the rams, ensured that most of the ewes displayed oestrus at the ram-induced ovulation. The proportion of anovular ewes ovulating increased ($P < 0.001$) as the date of joining moved from December (4/25) to February (15/16). At all times of joining the proportion of ewes ovulating and their ovulation rate was improved by an intramuscular injection of pregnant mare's serum gonadotrophin at sponge withdrawal. On another farm greater than 92% of Southdown ewes, synchronised with the same regime, lambed to the synchronised oestrus from joinings in late January or early February. An injection of PMSG did not increase the proportion of ewes ovulating but it did increase their ovulation rate (+PMS, 1.75 vs -PMS, 1.17; $P<0.001$) and proportion of multiple births (+PMS, 42% vs -PMS, 7%; $P<0.001$).

INTRODUCTION

The 'ram effect' will induce ovulation within 3 to 4 days in seasonally anovular ewes of many breeds (see review by Oldham 1980). Ewes of some British breeds such as the Romney will respond to the 'ram effect' but only during the month immediately before the onset of their spontaneous breeding season (Edgar and Bilkey 1963).

The Australian prime. lamb industry is based primarily on the progeny of British breed rams and Merino cross ewes. The Southdown is commonly used as a terminal sire. Both the breeders and users of these rams would benefit if the birth date of rams were advanced relative to the onset of the spontaneous lambing season of their breed (July/August). Spontaneous ovulations were not observed in Southdown ewes, run in isolation from rams at York in Western Australia, until March/April (T Boyes, unpublished data). Progestagen priming and an injection of pregnant mare's serum gonadotrophin (PMSG) have often been used to induce out-of-season breeding in European breeds. PMSG is an expensive component in such programmes, but the results presented by Cognie et al. (1980) suggest that the 'ram effect' alone may be used to replace PMSG both as an inducer of ovulation and stimulator of ovulation rate (OR).

A series of experiments was designed to determine the earliest date at which the 'ram effect' alone or in combination with progestagen priming or progestagen priming plus an injection of PMSG, would successfully induce breeding in Southdown ewes.

MATERIALS AND METHODS

The Southdown flocks were either a mixture of Western Australia and mixed Western Australian and New Zealand stock at York 100 km east, or mixed Western Australian and New Zealand stock at Pinjarra 100 km south of Perth. In each experiment progestagen priming was provided by medroxy progesterone acetate (MAP) incorporated into intravaginal sponges (Repromap 60 mg; Upjohn) inserted on day 0 for 12 days. Ovulation at sponge withdrawal was induced by the introduction of 10% of Southdown rams 2 days before the sponges were withdrawn

*Dept. of Animal Science, University of Western Australia, Nedlands, W.A. 6009.

(Day 10) or by rams on day 10 plus an intramuscular injection of PMSG at sponge withdrawal (Day 12). The PMSG used was standardised against PMSG (Folligon, Intervet) in a bioassay using prepubertal rat testicular growth.

All the ewes were isolated from rams for at least one month before the experiments began. The rams were fitted with 'Sire Sine' harnesses and raddles when the sponges were withdrawn from the ewes, and ewes marked were recorded on day 17. The ovaries of a random sample of ewes were examined by laparoscopy on day 17 or 18 (i.e. 5 or 6 days after sponge withdrawal) (Oldham et al. 1976).

Experiment 1 One hundred adult Southdown ewes at York, W.A. were allocated at random, after stratification on genetic background, into four groups. The first group received no progestagen priming and groups 2, 3 and 4 all received MAP sponges. Rams were introduced to all groups but groups 3 and 4 also received 500 or 750 iu PMSG.

Experiment 2 Southdown ewes at York and Pinjarra were allocated at random to three groups (N=25 to 30) at each site. All the ewes received MAP sponges. The experiment was replicated at each site with sponges inserted on 18th December, 14th and 28th January at York, and 16th and 23rd January at Pinjarra. The three treatment groups received 0, 200, or 250 iu PMSG. The low doses of PMSG were determined as being appropriate for Southdown ewes by Oldham and Pearce (1984).

In experiment 2, at York, the ewes were lambed in flocks according to the date when their sponges were inserted (Day 0) and the proportion of ewes lambing within the treatment groups was assessed 10 days after lambing commenced by the method of Dun (1963). At Pinjarra the two experimental flocks were drift lambed and the ewes lambing and number of lambs born were recorded at least three times per day.

RESULTS

None of the ewes examined by laparoscopy in either experiment 1 or 2 were ovulating spontaneously before rams were introduced. In the absence of MAP (experiment 1) there were no corpora albicantia (CA) or corpora lutea (CL) greater than 4 days old (Oldham and Lindsay 1980). After priming with MAP in experiment 2 there was no evidence of past ovulations (CA) in any of the ewes examined.

Experiment 1 The reproductive performance of the ewes is shown in Table 1. In early December at York the 'ram effect' alone induced some seasonally anovular Southdown ewes to ovulate. The ovulatory response was not changed by progestagen priming but was significantly increased by the injection of PMSG ($P<0.001$). No ewes were marked by the rams in the absence of MAP but after priming with MAP most ewes that ovulated were also marked. The injections of PMSG dramatically increased the ovulation rate of ewes ovulating ($P<0.01$). The ovulation rate of the ewes given 750 iu PMSG was less than those given 500 iu but their ovaries contained many additional large follicles.

Experiment 2 The effects of season and lower doses of PMSG on the reproductive performance of ewes at York are shown in Table 2. The number of ewes marked ($P<0.001$) and the ovulation rate of ewes ovulating ($P<0.05$) increased as the date of the start of progestagen-priming approached the onset of the spontaneous breeding of Southdown ewes (March/April). An injection of either 200 or 250 iu of PMSG induced more ewes to ovulate ($P<0.05$) and be marked by rams ($P<0.05$) with an increased ovulation rate ($P<0.001$) than no injection. Neither the date of treatment nor injections of PMSG affected the proportion of ewes marked at the synchronised oestrus which lambed.

TABLE 1 The reproductive performance in the 5 days following sponge withdrawal in the four groups of ewes in experiment 1 (day 0 = November 28)

Group	Treatment MAP : PMSG	Ewes* marked	Ewes# ovulating	Ovulation δ rate (range)
1	Zero : Zero	$0/25^{a}$	$6/25^{a}$	1.17^{a} (1-2)
2	60 mg : Zero	$4/25^{a}$	$6/17^{a}$	1.17^{a} (1-2)
3	60 mg : 500 iu	$24/25^{b}$	$16/17^{b}$	4.20^{b} (1-9)
4	60 mg : 750 iu	$24/25^{b}$	$16/16^{b}$	3.20^{b} (1-9)

* of ewes joined; # of ewes laparoscoped; δ of ewes ovulating - values bearing different superscripts are significantly different (x^2)

TABLE 2 The reproductive performance, at the synchronised oestrus, of the three groups of ewes at three times of joining at York in experiment 2

Treatment PMSG	Day 0	Ewes* marked (%)	Ewes# ovulating (%)	Ovulation δ rate (range)	Ewes β lambing (%)
Zero	Dec 18	12/29 (41)	15/21 (71)	1.13 (1-2)	4/10 (40)
	Jan 14	24/30 (80)	19/20 (95)	1.16 (1-2)	10/16 (63)
	Jan 28	30/33 (91)	15/16 (94)	1.27 (1-2)	13/21 (62)
200 iu	Dec 18	17/26 (65)	17/18 (94)	1.60 (1-3)	9/15 (60)
	Jan 14	23/29 (79)	18/18 (100)	2.90 (1-11)	12/16 (75)
	Jan 28	28/28 (100)	16/16 (100)	1.88 (1-3)	12/16 (75)
250 iu	Dec 18	20/24 (83)	20/20 (100)	1.60 (1-4)	6/16 (38)
	Jan 14	26/30 (87)	17/17 (100)	2.50 (1-6)	16/21 (76)
	Jan 28	30/31 (97)	15/16 (94)	2.60 (1-6)	11/17 (65)

* of ewes joined; # of ewes observed; δ of ewes ovulating; β ewes lambing of ewes marked at the synchronised oestrus and present at lambing.

At Pinjarra results were similar regardless of the time of starting the treatment so the data were pooled and are presented in Table 3. The response of the ewes to the 'ram effect' alone was dramatic in terms of both ewes marked and ewes ovulating and was not improved by PMSG. The ewes were very fertile and most lambed to the synchronised oestrus whether or not they received PMSG. However PMSG significantly increased the ovulation rate ($P<0.001$) and fecundity ($P<0.001$) of ewes lambing to the synchronised oestrus.

TABLE 3 The reproductive performance, at the synchronised oestrus, of the 3 groups of ewes combined for the 2 times of joining ($\bar{x}$=Jan 20) at Pinjarra in experiment 2

Treatment PMSG (iu)	Ewes* marked (%)	Ewes# ovulating (%)	Ovulation rate (%)	Ewes δ lambing (%)	Lambs β born (%)
Zero	49/52 (94)	30/30 (100)	35/30 (117)	43/46 (93)	46/43 (107)
200	52/52 (100)	30/30 (100)	57/30 (190)	47/50 (94)	65/47 (138)
250	50/50 (100)	30/30 (100)	43/30 (177)	44/47 (94)	64/44 (145)

* of ewes joined; # of ewes whose ovaries were examined; δ of ewes present at lambing (the odd ewe died or lost its tag); β of ewes lambing

DISCUSSION

The results of experiment 2 suggest that the 'ram effect' alone can be used to advance the date of mating of Southdown ewes from March/April to at least mid January. This corresponds to a lambing as early as mid May. An injection of 200-250 iu of PMSG at the time of withdrawal of progestagen priming would probably advance the beginning of lambing by another month and would also substantially increase the fecundity of the ewes lambing to the synchronised oestrus.

The ability of the Southdown ewe to respond to the 'ram effect' appears to be confined to a restricted period before the spontaneous breeding season. In this respect it is similar to the Romney (Edgar and Bilkey 1963).

York is on the western edge of the sheep what zone in Western Australia and is subject to summer drought whereas Pinjarra is less than 20 km from the coast and pastures there may provide some green feed throughout the summer. The difference in the quality of the summer grazing at the two sites probably explains most of the superiority of the Pinjarra result. In addition the York shire suffered a severe drought during the course of the experiment and although the ewes were hand fed a number died just before or during lambing, probably from pregnancy toxaemia.

The sensitivity of Southdown ewes to PMSG shown in experiment 1 suggests that they are more sensitive than Merino ewes (Gherardi and Lindsay 1980). Whole PMSG has been shown to be more potent at inducing superovulations in ewes than purified freeze-dried PMSG but the published differences in potency (Gordon 1958) would not explain the responses seen in experiment 1. The doses used in experiment 2 produced similar ovulation rates at the two sites and an economic and practical increase in lambs born at Pinjarra.

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REFERENCES

COGNIE, Y., GAYERIE, F., OLDHAM, C.M. and POINDRON, P. (1980). Proc. Aust. Soc. Anim. Prod. 33: 80.
DUN, R.B. (1963). Aust. J. Exp. Agric. Anim. Husb. 3: 228.
EDGAR, D.G. and BILKEY, D.A. (1963). Proc. NZ Soc. Anim. Prod. 23: 79.
GHARARDI, P.B. and LINDSAY, D.R. (1980). J. Reprod. Fert. 60: 425.
GORDON, I. (1958). J. Agric. Sci. 50: 123.
OLDHAM, C.M. (1980). Proc. Aust. Soc. Anim. Prod. 13: 73.
OLDHAM, C.M. and LINDSAY, D.R. (1980). Anim. Reprod. Sci. 3: 119.
OLDHAM, C.M. and PEARCE, D.T. (1984). Proc. Aust. Soc. Anim. Prod. 15.
OLDHAM, C.M., KNIGHT, T.W. and LINDSAY, D.R. (1976). Aust. J. Exp. Agric. Anim. Husb. 16: 24.