A STUDY OF THE EFFECT OF LONG AND SHORT ACTING PROGESTAGENS ON ANOESTROUS MERINO AND ROMNEY EWES

E. M. ROBERTS AND B. M. BINDON*

*School of Wool Technology, The University of New South Wales,
Kensington, N.S.W., Australia*

(Received 11th September 1965)

Summary. One hundred and four anoestrous Merino ewes and 120 Romney Marsh ewes were treated in separate experiments of factorial design with combinations of a single injection of 6-chloro Δ^6 -17-acetoxypregesterone (CAP), followed some days later by the oral administration of 6-methyl-17- α -acetoxypregesterone (MAP). An injection of pregnant mare's serum (PMS) was then given at two different times in relation to the final MAP treatment.

Dose of CAP, number of MAP treatments and time of PMS injection all influenced the proportion of ewes exhibiting oestrus.

In the first experiment, twenty-six ewes lambled of the twenty-seven ewes served, in the second experiment only four ewes lambled of the twenty-four served.

INTRODUCTION

A minimum of 8 to 12 days progesterone treatment at daily rates similar to those used in the breeding season (5 to 10 mg) has proved most satisfactory for the priming of anoestrous ewes before induction of ovulation (Robinson, 1955a, 1962). Attempts to replace daily or 2-daily progesterone injections have been unsuccessful (Robinson, 1955a, 1960, 1962) although Wagner, Reineke, Nellor & Henneman (1960) achieved moderate success in this respect by giving a large dose (280 mg) of progesterone in macrocrystalline suspension.

Recently Bindon & Roberts (1964) reported the use of a 'combined technique' of an intramuscular injection of long acting 6-chloro- Δ^6 -17-acetoxypregesterone (CAP—Chlormadinone, Eli Lilly & Co.) to suppress oestrus and ovulation during the major portion of the oestrous cycle followed by an abruptly terminating series of short acting progestagens such as oral administrations of 6-methyl-17- α -acetoxypregesterone (MAP—Provera, the Upjohn Company) or injections of progesterone.

The purpose of the present paper is to report on the application of this technique to anoestrous ewes to provide a period of progestational priming before the production of ovulation.

* Present address: C.S.I.R.O. Division of Animal Physiology, St Lucia, Queensland, Australia.

MATERIALS AND METHODS

Experiment 1. One hundred and four Merino 2-year-old maiden ewes which had not exhibited oestrus during the previous 3 months were allotted to eight groups in an experiment of factorial design. Each treatment group and a ninth untreated group contained thirteen ewes.

The factors varied were:

- (i) Dose of CAP (3 or 5 mg): given on Day 0.
- (ii) Interval of MAP treatment (50 mg): Days 6, 8 and 10 or 6 and 9,
- (iii) Time of PMS (Gestyl, Organon Laboratories Ltd) injection (1000 i.u.): Day 12 or 13.

Injections of CAP were given on the morning of 31st October. Raddled vasectomized rams were run with the ewes until Day 11 and were then replaced by eight raddled Border Leicester entire rams. Dates of service were recorded for 9 days following PMS injections. Ewes served were removed from rams until lambing.

Experiment 2. One hundred and twenty Romney Marsh maiden 1-year-old ewes were allotted to twelve groups each of ten ewes as follows:

- (i) Dose of CAP (5 or 7.5 mg): given on Day 0.
- (ii) Interval of MAP treatment (50 mg): Days 6, 8 and 10, 6 and 9, or 10 only.
- (iii) Time of PMS injection (1000 i.u.): Day 11 or 12.

Another group of ten ewes received no treatment. Raddled vasectomized Merino rams were run with the ewes until Day 11 and were then replaced with raddled Romney rams of known fertility and libido. CAP injections were given on 5th December 1962 between 14.00 hours and 15.00 hours and subsequent treatments were programmed at this time throughout the experimental period. Ewes were examined daily for evidence of mating for 9 days following PMS injections. Ewes served were again run separately until lambing.

RESULTS

Experiment 1. The number of ewes served and subsequent lambing results for the Merino ewes of Experiment 1, together with a summary of the analysis of variance are presented in Table 1. The analysis indicates that the number of ewes exhibiting oestrus was dependent upon:

- (i) The dose level of CAP—5 mg of CAP was more effective than 3 mg.
- (ii) The interval of MAP treatment—MAP on Days 6, 8 and 10 was more effective than MAP on Days 6 and 9.
- (iii) The timing of PMS injection—PMS on Day 12 was more effective than PMS on Day 13.

Of the thirty-seven ewes served, twenty-six (70%) produced lambs to the experimental mating. Untreated ewes did not exhibit oestrus.

Experiment 2. Table 2 presents the numbers of Romney ewes exhibiting oestrus in 9 days after PMS injection and subsequent lambing results. The analysis of variance indicates that the number of Romney ewes exhibiting oestrus was dependent on the dose of CAP (5 mg more effective than 7.5 mg) and

time of administration of PMS (more effective on Day 12 than Day 11). The effect of the number of treatments with MAP was apparent only after the low level of CAP (see interaction term in analysis). Lambing results indicate almost complete failure of conception. Only four ewes of the twenty-four served (17%) produced lambs. Untreated ewes did not exhibit oestrus.

TABLE 1
TREATMENTS AND RESULTS OF EXPERIMENT 1

Group	n	Dose of CAP on Day 0 (mg)	Day of treatment with		Ewes served	Ewes lambing
			MAP (50 mg)	PMS (1000 i.u.)		
1	13	3	6, 8, 10	12	5	3
2	13	3	6, 8, 10	13	4	3
3	13	3	6, 9	12	1	1
4	13	3	6, 9	13	0	0
5	13	5	6, 8, 10	12	10	7
6	13	5	6, 8, 10	13	5	4
7	13	5	6, 9	12	7	5
8	13	5	6, 9	13	5	4
9	14	—	—	—	0	0
Total					37	26

Summary of Analyses of variance

Source of variation	d.f.	Ewes served (mean square)	Ewes lambing (mean square)
Dose of CAP (C)	1	1188.3***	500.8**
Interval of MAP (I)	1	603.8**	144.5
Time of PMS (T)	1	352.5*	40.9
Interactions			
C × I	1	223.7	33.2
Remainder	3	96.4	20.2
Error		63.1	63.1

Transformed to angles, $n = 13$.

*** $P < 0.001$; ** $0.001 < P < 0.01$; * $0.01 < P < 0.05$.

DISCUSSION

Differences due to dose of CAP were evident in both experiments. It is probable that the optimum dose level lies within narrow limits and that it will vary with factors such as breed and age of ewe. The number and interval of MAP treatments and subsequent time of administration of PMS were also important. It may be noted that the most successful combination of treatments was similar in both experiments (i.e. 5 mg CAP followed by MAP on Days 6, 8 and 10 with PMS given on Day 12).

Fertility as measured by the proportion of ewes served which lambed, appeared unimpaired by treatments in Experiment 1. Only a small proportion of ewes served in comparable groups of Experiment 2 produced a lamb. This

discrepancy may be related to age and breed differences, to the different location and time of year or to the possibility of ram fertility differences.

The technique examined here may be compared with earlier studies of the induction of oestrus and ovulation in anoestrous ewes. Daily or 2-daily treatments with progesterone (Robinson, 1955b) or daily oral administration of

TABLE 2
TREATMENTS AND RESULTS OF EXPERIMENT 2

Group Romney†	Dose of CAP on Day 0 (mg)	Day of treatment with		Ewes served	Ewes lambled
		MAP (50 mg)	PMS (1000 i.u.)		
1	5	6, 8, 10	11	5	1
2	5	6, 8, 10	12	5	2
3	5	6, 9	11	0	0
4	5	6, 9	12	5	0
5	5	10	11	1	0
6	5	10	12	5	1
7	7.5	6, 8, 10	11	0	0
8	7.5	6, 8, 10	12	1	0
9	7.5	6, 9	11	1	0
10	7.5	6, 9	12	0	0
11	7.5	10	11	0	0
12	7.5	10	12	1	0
13	—	—	—	0	0

† Ten ewes/group.

Analysis of variance—Ewes served

Source of variation	d.f.	Mean square
Dose of CAP (C)	1	1708.8***
Interval of MAP (I)		
Days 6, 8 and 10 <i>vs</i> day 10	1	88.4
Days 6 and 9 <i>vs</i> (days 6, 8 and 10 and day 10)	1	167.4
Time of PMS (T)	1	675.0**
C × T	1	235.9
CIT	1	782.1**
Remainder	5	87.4
Error		82.1

Transferred to angles, $n = 10$.

*** $P < 0.001$; ** $0.001 < P < 0.01$.

MAP (Pursel & Graham, 1962), are more demanding in terms of both labour and progestagen requirements than the present method.

ACKNOWLEDGMENTS

The authors wish to acknowledge the assistance of Mr J. Scott and Mr C. Friend of Yuulong, Dubbo, and Messrs J. and H. Rowlands, Werribee, Cowra, New South Wales.

REFERENCES

- BINDON, B. M. & ROBERTS, E. M. (1964) Control of ovarian activity in ewes using progestagens. *J. Reprod. Fert.* **7**, 397.
- PURSEL, V. G. & GRAHAM, E. F. (1962) Induced oestrus in anoestrous ewes by use of progestagens and follicle stimulating hormone. *J. Anim. Sci.* **21**, 132.
- ROBINSON, T. J. (1955a) Endocrine relationships in the induction of oestrus and ovulation in the anoestrous ewe with progesterone and pregnant mares serum. *J. Endocr.* **10**, 117.
- ROBINSON, T. J. (1955b) Endocrine relationships in the induction of oestrus and ovulation in the anoestrous ewe. *J. agric. Sci.* **46**, 37.
- ROBINSON, T. J. (1960) Advances in controlled sheep breeding. *Proc. N.Z. Soc. Anim. Prod.* **20**, 42.
- ROBINSON, T. J. (1962) Comparative studies of several gonadotrophins, progestin and oestrogen treatment in the anoestrous ewe. *J. Endocr.* **24**, 33.
- WAGNER, J. F., REINEKE, E. P., NELLOR, J. E. & HENNEMAN, H. A. (1960) Hormonal control of reproductive activity in the cycling and anoestrous ewe. *J. Anim. Sci.* **19**, 607.