IMMUNIZATION AGAINST ANDROSTENEDIONE AND OUT-OF-SEASON BREEDING IN SHEEP

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SUMMARY

Five experiments were conducted in anoestrous Border Leicester x Merino ewes. Ovulation and oestrus were induced using progestagen sponges and Pregnant Mare Serum Gonadotophin (PMSG). Half the ewes in each experiment were immunized with Fecundin® before mating. Ewes were mated and oestrus, ovulation rate, conception rate and lambing performance were recorded. There was no effect of immunization on the percent of ewes mated. Immunization delayed mating by 6 h and there was a dose related advancement of mating with increasing dose of PMSG. Both increasing dose of PMSG and immunization increased litter size while the former improved lambing performance while the former also increased the percentage of ewes lambing. These increases are attributed to the action of immunization on the effect of PMSG on ovulation rate. These data highlight the importance of multiple ovulations in ensuring optimum fertility and prolifacacy.

(Keywords: Fecundin, sheep, PMSG, anoestrus)

INTRODUCTION

The commercial development of antibodies to androstenedione (Fecundin® Glaxo Australia Pty Ltd) for enhancement of ovulation rate in the ewe (Scaramuzzi and Hoskinson 1984) raises the question of the potential for such products used with the current technique for out-of-season breeding in anoestrous ewes (Robinson 1976). This paper reports the results of an investigation of the use of Fecundin® progestagen/PMSG treated anoestrous ewes.

MATERIALS AND METHODS

Ewes were 2-4 yr old Border Leicester x Merino, about 1/3 of which were lactating during Experiments 1, 2 and 3. Rams were Poll Dorsets and South Suffolks. Numbers of ewes joined are indicated in Table 2. Half the ewes were selected at random and immunized with 2 ml of Fecundin®. Four weeks was allowed to elapse between primary and booster immunization, with a further interval of 15 days (Expts 1 and 3), 23 days (Expts 4) or 49 days (Expts 2 and 5) to mating. The experiments were conducted on a property in the central west of NSW.

Sponges impregnated with 30 mg of Cronolone® were inserted intravaginally to batches of ewes for 12 days. At removal PMSG (dose range 250-1000 IU) was injected intramuscularly into groups of ewes selected at random. Three sources of PMSG were used in Experiment 3 namely Gravimed (Beresford Laboratories, Cheltenham, Vic.), Pregnecol (Heriot Agencies, Boronia, Vic.) and PMSG prepared by Dr. A. Gidley-Baird (Dept. Veterinary Physiology, University of Sydney) while the remaining experiments used only one or two of these. An intensive mating procedure was used, this involved removing sponges from batches of 25-35 ewes every 12 h over several days and joining to 8-l 0 harnessed rams. Ewes in oestrus were recorded 3-4 times daily and mated ewes were drafted off every 12 h.

Pregnancy was diagnosed from plasma progesterone levels (Early Pregnancy Diagnosis: EPD), and endoscopy, 19-20 days post mating. Progesterone concentrations were determined by radioimmunoassay (Pearce and Robinson 1985). Ewes diagnosed pregnant were distributed between several small paddocks. A continuous watch was kept for ewes lambing. Ewes and lambs were moved to a larger paddock

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48-72 h after lambing. Data were analysed by the Chi^2 test or by an analysis of variance as appropriate.

RESULTS

Oestrus was recorded in 1244 ewes following 1309 treatments. There was no significant effect of immunization or dose of PMSG on the percentage of ewes mated but there were significant effects on the time of mating. The onset of oestrus was delayed by a mean of 6 h in immunized ewes which received a booster immunization 3 weeks or less before mating (Fig. I). There was a consistent linear effect of dose of PMSG advancing the time of mating.

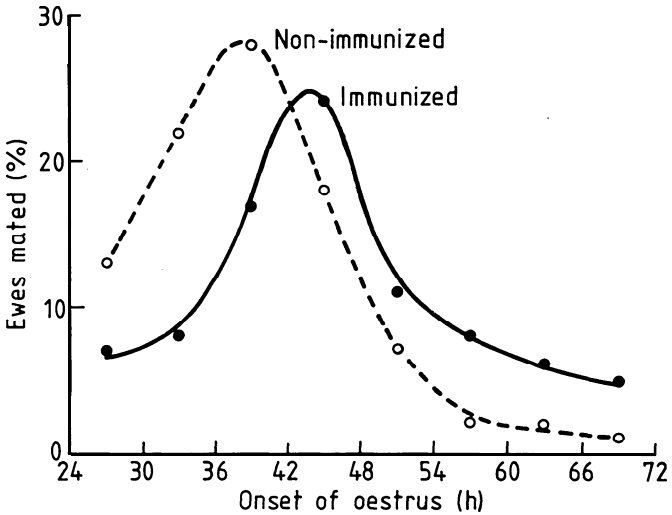

Fig. I. The distribution of onset of oestrus for immunized and non-immunized ewes expressed as hours from the removal of progestagen sponges. Data are from Experiment I. (Chi^2 = 20.1; P < 0.01).

Endoscopy was performed on 1134 ewes. The immunized ewes shed more ova than non-immunized (Table 2). There was a significant linear effect of dose of PMSG and an interaction between immunization and dose of PMSG (P < 0.001) on ovulation rate. Immunized ewes were more responsive to high doses of PMSG than were non-immunized (Fig.2) and there was a significant interaction between dose and source of PMSG (Fig. 3). Of the 1062 ewes with complete data, 660 (62%) were diagnosed pregnant by EPD and 616 (58%) by endoscopy but a total of only 569 ewes lambed (54%), there were effects of dose of PMSG (Table I) and of the time between booster immunization and mating (Table 2).

Table 1 Effect of PMSG on lambing performance (pooled data from Experiments 1-5)

	Dose of PMSG				
	250	500	750	1000	Total
Ewes treated	160	423	410	69	1062
Ewes lambed	58	238	246	27	569
Percent lambed	36.2	56.3	60.0	39.1	53.6

Group sizes vary because all doses of PMSG were not used in all experiments, see Table 2

Associated with these effects was a relationship with the number of ovulations. Ewes which lambed had a mean of 2.2 ovulations whereas those that did not had a mean of 1.8 ($P < 0.001$). There was a linear increase in the percentage of ewes lambing with an increase from one to three ovulations with no increase above three (Table 3).

Table 2 Lambing in Fecundin® treated anoestrous ewes bred out-of-season

Experiment	Number of ewes	Boost to mating (days)	Ewes mating (%)	Time from sponge removal to oestrus (h)	Ovulations per ewe treated††	Ewes lambing (%)	Litter size	Lamb (%)
ONE	95	15	88	45.8***	1.7*	39	1.70**	0.66
(Sept 27-29)	98	Control	94	39.2	1.3	48	1.43	0.68
THREE	168	15	94	43.2***	2.9***	26	1.80**	0.47
(Nov 1-3)	168	Control	98	38.1	2.2	34	1.42	0.48
FOUR	193	23	97	40.4*	2.8***	64	1.81**	1.16*
(Dec 3-4)	199	Control	98	38.3	1.8	66	1.34	0.88
TWO	79†	49	94	37.9	2.2	69*	1.53	1.05***
(Nov 1-3)	75	Control	88	37.1	1.8	48	1.47	0.70
FIVE	124†	49	97	37.7	1.7***	66	1.45	0.95
(Dec 3-5)	110	Control	94	35.7	1.3	61	1.35	0.82

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

† Non-pregnant ewes from preceding experiments included in these groups

†† Doses of PMSG Expts 1 and 2 (250,500,750 IU), Expt. 3 (250,500,750,1000 IU), Expts 4 and 5 (500,750 IU)

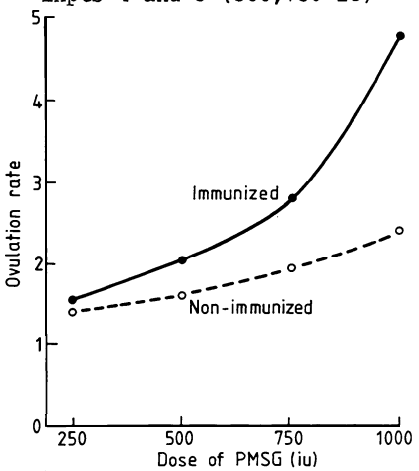

Fig. 2. The effect of immunization with Fecundin® on the ovulation response to PMSG. Pooled data from Expts 1-5.

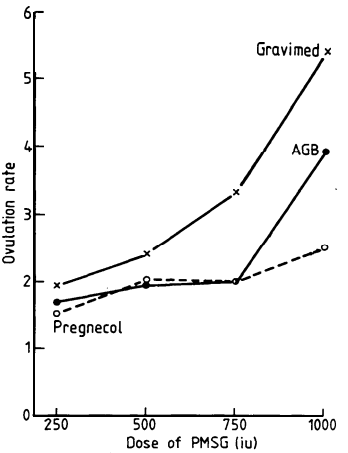

Fig. 3. Ovulation rate dose response lines for three batches of PMSG. Data from Expt 3.

DISCUSSION

The technologies of synchronized out-of-season breeding and immunization