Effects of month and PMSG on the interval from CIDR removal to ovulation in Romney and Merino ewes

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ABSTRACT

Five groups (15-30) of Romney or Merino ewes were synchronised with CIDR devices for 12 days in March or April. In all but one group of Romney ewes 400IU PMSG was injected at CIDR removal. Intervals to onset of oestrus and ovulation were determined by recording crayon marks and laparoscopy respectively every 4 hours. Interval to ovulation was not affected by ewe breed or month of treatment, but it was 7.9 hours earlier in ewes injected with PMSG (48.9h vs 56.8h $P<0.001$) and the variance was less (13.4h vs 35.7h $P<0.05$). Interval to oestrus was affected by breed of ewe, date of synchronisation and use of PMSG.

Keywords Oestrus, ovulation, Merino, Romney.

INTRODUCTION

Increased use of A.I. in sheep is dependent on achieving high conception rates and reducing the variability in conception rates between farms and seasons. One factor affecting this is the time of insemination with respect to ovulation (Dziuk 1970). With fixed time insemination, this is dependant on a constant mean interval from progestagen withdrawal to ovulation and a high degree of synchronisation of ovulation in the flock. A number of factors can influence this interval including strain of ewe, season (Walker *et al.* 1989), type of progestagen (Shackell 1991) and use of PMSG (Cognie *et al.* 1970).

This paper presents results on the effect of ewe breed (Romney and Merino), month (March and April) and use of PMSG on the interval from CIDR device removal to ovulation and the degree of synchronization of ovulation.

MATERIALS AND METHODS

A CIDR device (Carter Holt Harvey Ltd) was inserted on 27 February (March group) into the vagina of each of 16 mature NZ Merino and 30 mature Romney ewes for 12 days. CIDR devices were removed at 12 noon on 11 March (0 hours) when each ewe was injected with 400 I.U. PMSG (Folligon: Intervet Australian Pty Ltd). Sixteen hours after CIDR removal, 2 vasectomised Merino rams, each fitted with a harness and crayon, were joined with the Merino ewes and 2 more with the Romney ewes. Marked ewes were recorded every 4 hours and put together in a pen with 2 vasectomised rams. All rams were replaced every 4 hours from a pool of fresh rams.

Starting at 48 hours, each ewe was laparoscoped every 4 hours until it had ovulated. The ewes were tranquillized with 1ml acepromazine maleate (ACP, Delta Veterinary Laboratories Australia) injected 15 minutes before the first laparoscopy and thereafter with 0.5ml of ACP 15 minutes before each subsequent ovarian examination.

This procedure was repeated with a second group (April group) of 15 mature Merino and 30 mature Romney ewes which had CIDR devices inserted on 27 March and removed at 12 noon on 3 April (0 hours). In this series, one sub-group of 15 Romney ewes was not injected with PMSG.

Statistical Analysis

The interval from CIDR device removal to either on-set of oestrus or ovulation was the mid-point of the 4 hour period during which the event had occurred. Variances for intervals were compared using a *F tests*. A Wilcoxon Score (SAS Institute Inc.) was used to make comparisons between means.

RESULTS

Romney ewes were heavier ($P<0.001$) than Merino ewes (54.30 ± 0.56 kg vs 41.93 ± 0.73kg) but there were no liveweight differences between months or PMSG treatments. There were no effects of liveweight on any of the intervals when liveweights were included as a covariate within breed, month and PMSG treatment.

Interval to Oestrus

The distribution of intervals from CIDR device removal to onset of oestrus for ewes injected with PMSG indicates a rapid onset with peaks at 20 and 24 hours (Fig. 1). In contrast, ewes not injected with PMSG had a slow onset to a peak at 28 hours (Fig. 2). Variances for interval from CIDR removal to onset of oestrus differed ($P<0.05$ to $P<0.01$) amongst breeds and month of treatment (Table 1). Romney ewes in April which were injected with PMSG had a shorter ($P<0.01$) interval to oestrus than Merino ewes or both breeds in March. The interval to oestrus in these ewes was 8.3 hours shorter ($P<0.01$) and the variance was smaller ($P<0.01$) than Romney ewes not injected with PMSG.

Interval to ovulation

The distribution of interval to ovulation for ewes injected with PMSG was similar to the distribution of interval to oestrus but with less positive skew and a slower onset to a peak activity (Fig. 1). For ewes not receiving PMSG, peak ovulatory activity occurred at 56 and 60 hours with a small proportion of ewes

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ovulating 6 hours earlier and 8 to 12 hours later (Fig 2). The variance and mean interval to ovulation were no different for Merino and Romney ewes, or in March and April groups (Table 1). Romney ewes injected with PMSG had a smaller variance ($P<0.05$) and the interval from CIDR device removal to ovulation was 7.9 hours shorter ($P<0.001$) than ewes not injected with PMSG.

Interval from Oestrus to Ovulation

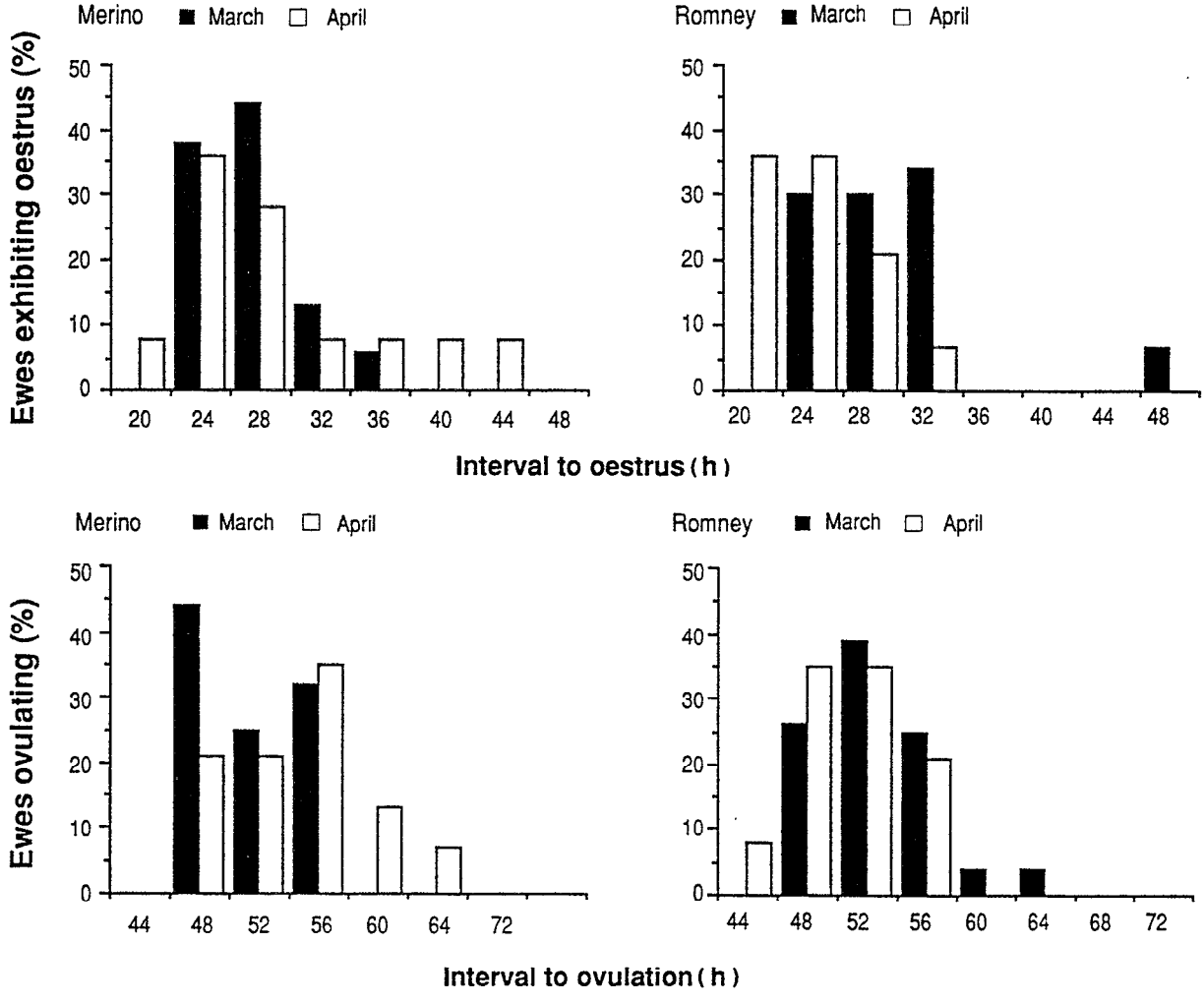
The variances in interval from oestrus to ovulation were lower ($P<0.05$) for Romneys in April than Merino and Romney ewes in March. There were no differences in interval from oestrus to ovulation between the treatments. This suggested that the interval from CIDR removal to ovulation could be predicted from the interval to oestrus. The linear regression equation for

TABLE 1 Effects of breed of ewe, month of synchronisation and use of 400 IU PMSG on mean and variance of the intervals from CIDR device removal to oestrus and ovulation.

	400 IU PMSG	No ewes	Interval from CIDR removal to: oestrus (h) Mean	Var.	ovulation (h) Mean	Var.	Interval from oestrus to ovulation (h) Mean	Var
March Group								
Merino	+	16	25.4^{a}	1.5^{a}	49.5	12.5	24.1	16.3^{ab}
Romney	+	30	26.8^{a}	24.9^{b}	50.7	16.1	23.9	24.6^{b}
April Group								
Merino	+	15	26.9^{a}	47.2^{c}	52.6	23.7	25.7	38.7^{b}
Romney	+	15	22.0^{bx}	14.8^{abx}	48.9^{x}	13.4^{x}	26.9	10.9^{a}
Romney	-	15	30.3^{y}	73.3^{y}	56.8^{y}	35.7^{y}	26.5	14.8

Means and variances (VAR) with different superscripts differ significantly for comparisons among breeds and date of synchronisation ($^{a, b, c}$) and for comparisons between Romney ewes with or without PMSG in the April group (^{x,y})

FIG 1 Interval from CIDR device removal to oestrus and to ovulation in March and April in Merino and Romney ewes.



the pooled data was

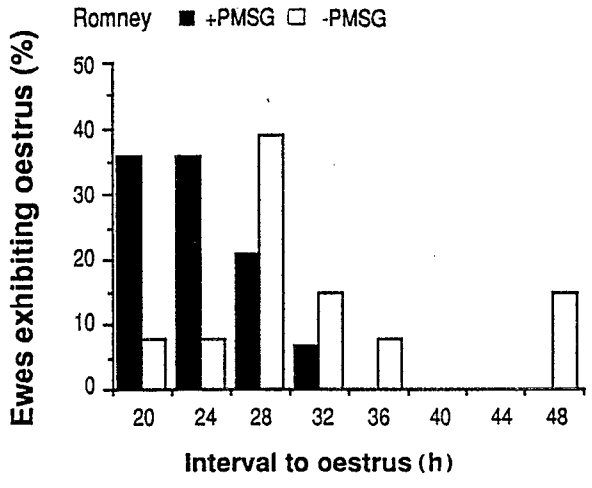
Y =37.289 (± 1.882) ± 0.536 (± 0.070) X.

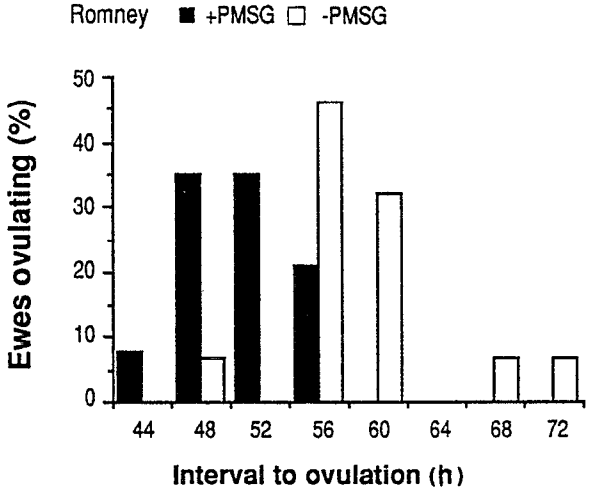
(R2 = 0.41; P<0.001)

where Y was the interval from CIDR device removal to ovulation (in h) and X was the interval in h from CIDR removal to oestrus. A negative correlation (r = -0.59) between intervals from CIDR removal to oestrus and from oestrus to ovulation indicated that the longer the interval to oestrus, the shorter was the interval from oestrus to ovulation.

DISCUSSION

Interval from CIDR device removal to ovulation in ewes injected with PMSG was not affected by ewe breed or month of treatment (March vs April). This contrasts with results obtained





by Walker *et al.* (1989) who found differences in the interval to ovulation between flocks and between times of the year in the same flock in South Australian Merino (SAM) ewes. The interval from CIDR device removal to ovulation for Merino and Romney ewes injected with PMSG (50.4 ± 0.58h) was similar to the interval of 51 hours for SAM ewes treated with CIDRs (Walker *et al.* 1989). The interval from CIDR removal to ovulation of 56.8 ± 1.7 hours for Romney ewes not injected with PMSG was similar to the 58.8 hours found by Shackell (1991). The present experiment demonstrates that some of his ewes (8%) could have ovulated up to 8 hours before he made his first laparoscopy.

In addition to the interval from CIDR device removal to ovulation being 8 hours shorter in Romney ewes injected with 400 IU PMSG in the April group, there was a more synchronised ovulation. Intervals to ovulation are shorter and ovulations more synchronised in ewes treated with CIDR devices than MAP or FGA (Walker *et al.* 1989; Shackell 1991). The injection of PMSG reduces the interval to ovulation and the variation in ewes synchronised with MAP or FGA (Cognie *et al.* 1970). This experiment indicates that even in ewes treated with CIDR devices, the injection of PMSG will also reduce the interval to ovulation and improve the synchronisation.

Manipulation of the reproductive tract at the time of ovulation interferes with the transfer of ova to the oviduct (Evans & Maxwell 1987). Intrauterine insemination should not occur 46 to 56 hours after removal of the CIDR devices in ewes injected with PMSG or 52 to 60 hours for ewes not injected with PMSG because this was the period when 92% and 77% respectively of ewes were ovulating. If optimum time of insemination is 4 to 14 hours before ovulation (Dziuk 1970; Findlater *et al.*1988), then insemination should occur 42 to 46 hours after CIDR removal for ewes injected with PMSG and 48 to 52 hours for ewes not injected with PMSG.

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