

THE INFLUENCE OF THE 'RAM EFFECT' IN 10-11 MONTH-OLD MERINO EWES ON THEIR
SUBSEQUENT PERFORMANCE WHEN INTRODUCED TO RAMS AGAIN AT 15 MONTHS OF AGE

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SUMMARY

An experiment was conducted to test the hypothesis that the response of 15 month-old ewes to the 'ram effect' in spring would be improved if they had been conditioned by exposure to rams for six weeks at an earlier age. In June, only 5% of 10-11 month-old Merino ewes were ovulating spontaneously. The introduction of 3% of harnessed testosterone - primed wethers (TW) induced a further 7% of anovular ewes to ovulate within five days. The ovular ewes were heavier than their anovular flockmates (33.2 ± 0.62 v 29.9 ± 0.27 , kg, $\bar{x} \pm$ S.E.M.; $P < 0.01$). Four months later, in October the ewes were 14-15 months old with an average live weight of 40 kg and 18% were ovulating spontaneously. Introduction of TW induced a further 30% of the anovular ewes to ovulate compared with 74% of seasonally anovular adult flockmates ($P < 0.001$). During the 45 joining period more young ewes with prior contact with TW were marked (38%, 77/204) than their flockmates with no prior contact (24%, 48/200; $P < 0.01$). However, more adult ewes (62%, 31/50; $P < 0.001$) were marked than young ewes.

INTRODUCTION

Between October 1981 and January 1982 the ovulatory stimulus associated with the introduction of rams, the 'ram effect', and a single injection of progesterone (Cognie et al. 1982) were used to synchronise 7,500 adult and 1,500 14 to 15 month-old Merino ewes for A. I. In that programme less than 25% of the young ewes displayed oestrus compared with 75% of the adult flockmates (Lindsay et al. 1984). The low proportion of young ewes detected in oestrus could result from three causes: 1) a low proportion of anovular ewes and hence few ewes available to be synchronised; 2) a poor response to the 'ram effect' among anovular ewes; 3) a good response among anovular ewes but failure of many ewes to re-ovulate with oestrus following the ram-induced ovulation.

The 'ram effect' will induce puberty in many 10 month-old Merino ewes irrespective of their season of birth (Oldham and Gray 1984). Therefore an experiment was designed to test the hypothesis that the ovulatory and oestrous response of 15 month-old ewes to the introduction of rams in spring would be improved if they had been conditioned by exposure to rams for six weeks at 10 to 11 months of age.

MATERIALS AND METHODS

Animals At Yearling, 200 km south-east of Perth, a flock of 444 commercial Merino ewes born in July/August 1981 was studied in June/July 1982 and again in October/November 1982. In the second period, 50 dry multiparous adult ewes were added to the experimental flock.

Experimental In June 1982 the young ewes were randomly allocated to two groups. One remained isolated from rams while the other was exposed to 3% of harnessed testosterone-primed wethers (TW) for 45 days. Fulkerson et al. (1981) showed that TW were equal to rams with respect to the 'ram effect' and the identification of oestrous ewes. The TW received a maintenance injection of testosterone each 14 days. The two groups of ewes were re-united after 45 days and run together in the absence of rams, until October when the ewes were exposed to 3% of TW for 45 days.

The ovaries of a sample of ewes from the treatment group were examined by laparoscopy five and 45 days after the TW were introduced in June and five days after TW were introduced in October. The absence of a corpus luteum (CL) or

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corpus albicans (CA) classified ewes as anovular, whereas if a CL or CA was observed the ewe was classified as being ovular and the age of the CL was recorded (Oldham and Lindsay 1980). In the analysis of the observations five days after introducing the TW, ovular ewes with CL greater than four days old were deemed to be ovulating spontaneously before teasing. By contrast, ovular ewes with CL less than four days old were deemed to have been anovular but successfully stimulated to ovulate by the 'ram effect'.

Marked ewes were recorded at least every 14 days throughout the two periods of 'ram contact' and the ewes were weighed before and after the first period of contact with TW. In October the ewes examined were weighed before laparoscopy. The ewes were shorn in October and their individual fleece weights were used to adjust their liveweights assuming a constant rate of growth of wool between shearings. Differences in liveweights of ewes were studied by analysis of variance. The ovarian and oestrous data were compared by chi-square analysis.

RESULTS

The 'ram effect' in 10 to 11 month-old ewes In June, only 5% (11/241) of the young ewes had reached puberty and were ovulating spontaneously. The 'ram effect' induced a further 7% (15/206) to ovulate within the first five days and a further 10% ($P < 0.001$) of the young ewes ovulated during the 45 days of contact with TW (Table 1). By contrast, in the young ewes isolated from TW there was no increase in the number of spontaneously ovulating ewes between June 9 and July 29.

The ewes that were ovulating 5 days after the introduction of TW were on average 3.3 kg heavier than their anovular flockmates (33.2 ± 0.62 v 29.9 ± 0.27 , kg, $\bar{x} \pm \text{SEM}$; $P < 0.01$). The difference in liveweight in favour of ovular ewes over anovular ewes was still significant 40 days later (33.0 ± 0.43 v 31.3 ± 0.26 kg, $\pm \text{SEM}$; $P < 0.01$).

The 'ram effect' in 14 to 15 month-old and adult ewes in spring In October, the incidence of spontaneous ovulation among the young ewes, exposed to TW in June, had decreased from 22 to 12 percent ($P < 0.05$, Table 1). By contrast, in the ewes which had remained isolated from males throughout it had increased from 5 to 23 percent ($P < 0.001$). Eight percent of the adult ewes were ovulating spontaneously. The influence of the 'ram effect' was greatest in the adult ewes, followed by the young ewes with previous experience of TW and lastly by the young ewes exposed to TW for the first time (74% v 38% v 27% of the anovular ewes were induced to ovulate respectively). Although 38% of the anovular young ewes with previous experience with TW were induced to ovulate compared with only 27% flockmates isolated from TW, this difference was balanced by the reverse trend in the proportion of young ewes spontaneously ovulating, resulting in a similar total incidence of ovulation in the two groups (Table 1).

The average liveweight of the young ewes was 40.5 kg and that of the adults was 49.9 kg. There was no association, within age group, between ovarian activity and liveweight.

Sixty-two percent (31/50) of the adult ewes were marked by the TW, compared with either 38% (77/204) of young ewes with prior experience of TW or 24% (48/200) of young ewes with no prior experience of TW ($P < 0.001$). Within the young ewes the difference in ewes marked by the TW, in favour of those with prior contact, was also significant ($P < 0.01$). A similar pattern of oestrus was observed in ewes with ovarian records. More young ewes with prior experience of TW were marked than were young ewes previously isolated from TW (45% v 33% respectively). This difference was largely due to the fact that more of the young ewes with prior experience to TW and which responded to the 'ram

effect' were marked than were similar ewes in the group with no prior experience of TW (66% v 43% respectively).

TABLE 1 The influence of testosterone-primed wethers (TW) on the ovarian activity of Merino ewes

Date of laparoscopy	Treatment (ewe age)	Number observed	Percentage of ewes ovulating		
			Spontaneously	TW-induced#	Total
14 June (a)	Young	- TW 25	4		4
		+ TW 216	5	7	12
29 July (b)	Young	- TW 44	5		5
		+ TW 205	22		22
6 October (a)	Young	June - TW 100	23	27	44
		June + TW 100	12	38	45
	Adult	50	8	74	80

Laparoscopy (a) 5 days and (b) 45 days after introducing TW
% of ewes anovular before introducing TW

DISCUSSION

Exposing ewes to the 'ram effect' for six weeks when they were 10 to 11 months old caused more to be marked during 45 days contact with TW when the ewes were 15 months old. The ovulatory response, to the 'ram effect', among 15 month-old anovular ewes was also greatest in those with prior experience of TW. However the overall level of cyclicity among the 15 month-old ewes was low and similar to that reported by Lindsay et al. (1984). The very poor response to the 'ram effect' involved both a poor initial ovulatory response among anovular ewes and subsequently the apparent failure of many ewes to continue ovulating and therefore they failed to display oestrus. The young ewes, in October, were 430 - 450 days old, weighed around 40 kg and more showed spontaneous ovulatory activity than adult flockmates (18% v 8%, respectively). Thus the young ewes were post pubertal on the basis of both their age and liveweight (Watson and Gamble 1961) and might have been expected to respond to the 'ram effect' better than the adult ewes (Lindsay and Signoret 1980).

The relatively poor cyclicity among the adult ewes in October in this study (62% marked in 45 days) contrasts markedly with the observations of Knight et al. (1975) that only 3% of 5,103 ewes joined in October/November failed to mate. Eighty percent of the adult ewes were ovulating 5 days after the TW were introduced but as Lindsay et al. (1984) have shown many ewes, in some years, cease ovulating even before their second ovulation and therefore never display oestrus.

The ability of the 'ram effect' to advanced puberty in Merino ewes agrees with the findings of Oldham and Gray (1984). The relatively poor ovulatory response among the 10-11 month-old ewes in our study relative to that reported by Oldham and Gray (1984) in 9-10 month-old ewes is probably explained by the lower liveweights of our ewes. Foster (1981) hypothesises that so long as the influence of photoperiod is positive (short days) the onset of puberty is controlled by an interaction between the age and liveweight of ewes. In our

study the pubertal ewes, in June, and the prepubertal ewes that responded to the 'ram effect' were 3 kg heavier than flockmates who remained anovular and prepubertal. In October this clear relationship between the liveweight of ewes and their ovarian state was no longer apparent.

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