INCREASED OVULATION RATE AT THE RAM-INDUCED OVULATION AND ITS COMMERCIAL APPLICATION

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There is evidence that the ovulation rate (number of ovulations per ewe ovulating) of successfully teased ewes was increased relative to that of their second ovulation or relative to spontaneously ovulating flock mates. The effect was observed in Merino, Préalpes and Ile-de-France breeds and may have been prevented in ewes primed with progestagen before the introduction of rams (Oldham and Cognie, unpublished). Progestagen priming ensures oestrus at the ram-induced ovulation, and ensures that the CL persist for a normal period (Hunter *et al.* 1971; Oldham *et al.* 1980). All of these factors will affect commercial application of teasing. The effects of teasing and progesterone on ovulation rate were tested in experiments on three breeds of ewe, and the possibility of commercial application of teasing to an intensive breeding system was tested in a fourth experiment. Progesterone was administered over 12 days by injections in Experiments 1 and 3 (10 mg/day) or by intravaginal sponges impregnated with fluorogestone acetate (FGA) in Experiments 2 and 4.

RESULTS

Experiment 1. In Western Australia, successfully teased Merino ewes had more twin ovulations than spontaneously ovulating flockmates with the same average live weight ($P < 0.01$, Fig. 2). Among the teased ewes, those primed with progesterone had less twin ovulations than unprimed controls (4/18 vs 10/29) but the difference was not significant. The percentage of twins was high only at the teased ovulation, and fell to control levels at the next ovulation (Oldham 1980).

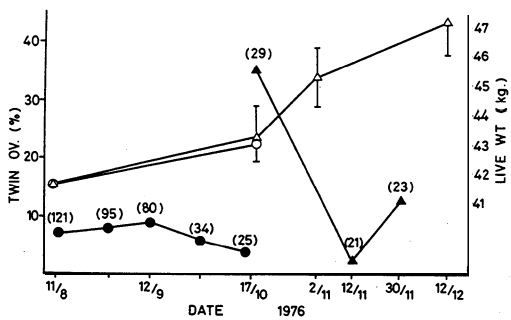

Fig. 2. Live weight (mean±SE) and the incidence of twin ovulations (%) among Merino ewes (Exp.1) ovulating spontaneously or at the ram-induced and subsequent ovulations in successfully teased ewes. Figures in parentheses are the number of ewes ovulating.

Ewes ovulating spontaneously -
●—● % twins
○—○ live weight

Successfully teased ewes -
▲—▲ % twins
△—△ live weight

Experiment 2. In France, the ovulation rate of successfully teased Préalpes ewes was 1.58 compared with 1.31 in unteased controls ($P < 0.05$). Again, the ovulation rate at the second ovulation after teasing fell to control levels. Progesterone priming did not influence ovulation rate.

Experiment 3. In Ile-de-France ewes, teasing increased the mean ovulation rate from 1.54 to 2.15. The progestagen used in this experiment (fluorogestone acetate, FGA) did not affect the proportion of ewes ovulating but had a marked effect on ovulation rate. In FGA-primed ewes the ovulation rate at teasing was only 1.09.

Experiment 4. Results are shown in Table 2. Teasing to induce ovulation, after FGA priming, substituted identically with a dose of PMSG (530 IU) when the results are measured by ovulation rate, fertility, prolificacy or the number of lambs marked. In this experiment, with Berrichon ewes in France, FGA apparently did not depress ovulation rate, as it did in Experiment 3 where Ile-de-France ewes were used. No reason for this discrepancy can be advanced.

CONCLUSION

There is a commercially significant increase in ovulation rate when ewes are teased, which is probably not affected by the progesterone priming that is necessary if the ewes are to mate and conceive. This high ovulation rate can be used to advantage in intensive breeding programmes, and may also be useful in less intensive systems such as those used in Australia.

TABLE 2 Reproductive performance of Berrichon ewes injected with 530 IU PMSG and artificially inseminated (-RAM), or teased and hand-mated (+RAM) after withdrawal of FGA sponges (June 1980)

		OR					FERTILITY			PROLIFICACY[1]					LAMBS TAILED
			Distribution[2]					Ewes preg. day 18	Ewes lambing		Distribution[3]				
TR	n	%	1	2	3	4	n	%	%	%	1	2	3	4	(%)
(-RAM)	15	200	3	9	3		33	81.9	78.7	177	13	9	1	3	158
(+RAM)	15	210	1	12	1	1	30	80.0	76.6	161	10	12	1		157

1. lambs born per ewe lambing.
2. number of ewes with 1, 2, 3 or 4 CL.
3. number of ewes with 1, 2, 3 or 4 lambs.

USE OF TEASING IN AN A.I. PROGRAMME

D.G. CORKE*

Introducing rams to a flock of Merino ewes in November in Western Australia results in two peaks of oestrous activity about 19 and 25 days later. This is caused by some ewes having a six-day cycle immediately after teasing, then a normal 17-day cycle, while others have the normal cycle only (Oldham and Martin 1979).

For synchronizing oestrus in an A.I. programme, the two peaks partially nullify the benefits of teasing. To make the best use of teasing, and to even out the daily work load, rams were introduced to half of the flock on one day and the other half three days later. This should provide two sets of peaks of oestrus which are out of phase and overlapping.

In 1976, joining of teasers was not staggered, and the number of ewes in oestrus varied from 56 to 553 per day (Fig. 3). In 1977, after staggered teasing, the range was 100-327 ewes per day and oestrus was more evenly distributed about the mean of 221 ewes per day. In 1978 and 1979, teasing was also staggered, and similarly produced even numbers of ewes in oestrus each day. Although the

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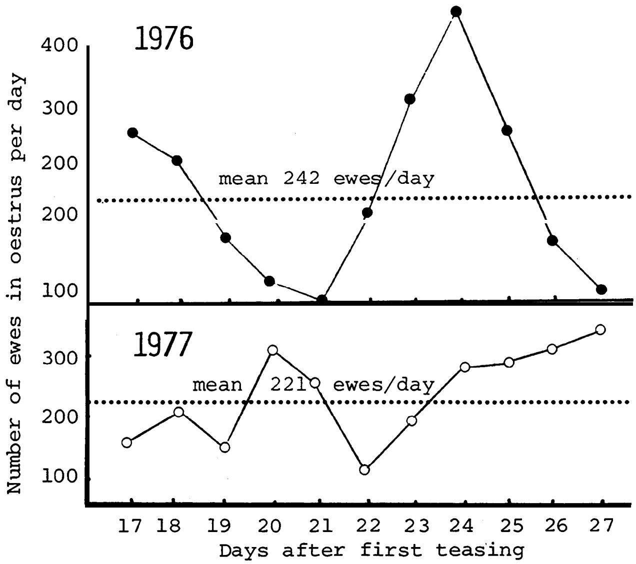

Fig. 3. Effects of staggered teasing on the daily distribution of ewes in oestrus.

1976 (n=2665) teasing not staggered

1977 (n=2434) teasing staggered

comparison between 1976 and 1977 is confounded by year differences, the effects of staggered teasing are repeatable.

Eighty-three to 85% of ewes were artificially inseminated by the eleventh day in 1976, 1977 and 1978. The A.I. programme was therefore not extended beyond 11 days. In 1979, teasing was less effective at inducing oestrus and only 56% of ewes were marked in 13 days. No reason for this can be advanced.

Teasing is useful for synchronizing oestrus and, if staggered, provides a relatively constant work load in an A.I. programme.

DO EWES CONTINUE TO CYCLE AFTER TEASING?

C.M. OLDHAM and Y. COGNIE

More than half of the Merino ewes in Western Australia are joined between September and January during the last half of their non-breeding season, and of those which mate, about 24% apparently conceive then fail to lamb (Knight *et al.* 1975; Oldham 1980). Ewes which are successfully teased (i.e. ovulate in response to the introduction of rams), cycle once or twice then re-enter anoestrus before conceiving, would fit this category of reproductive wastage. It was proposed to test whether ewes do rapidly return to anoestrus and therefore contribute to reproductive inefficiency.

EXPERIMENTAL

Experiment 1. Merino ewes '(Perth, W.A.) were used and, for this experiment only, the control ewes were continuously associated with rams. Ewes which return to anoestrus were those which ovulated in response to the introduction of rams, then become anovular again before the onset of the normal breeding season.

'Experiments 2 and 3 were both conducted at Nouzilly (France) with Préalpes and Ile-de-France ewes respectively. Ovarian activity was monitored by regular endoscopy (Oldham et *al.* 1976a) or by analysis of progesterone levels in plasma samples taken twice weekly (Thimonier 1978). Ewes were considered to be seasonally anovular if they had low (< 1 ng/ml) levels of progesterone or no corpus luteum for at least 17 days. The control groups were kept in isolation from rams, while the treated groups were teased. The number of ewes ovulating was monitored at each cycle. After the initial teasing, in Experiment 3, the rams were removed for two weeks, then re-introduced to tease the ewes a second time.

Experiment 4. A commercial flock of 1,000 mature Merino ewes was isolated from rams in August (Western Australia). Beginning on October 25, random samples of 50 ewes were drawn weekly for 14 weeks from the flock and placed with harnessed vasectomized rams. Crayon marks were recorded and crayon colours were changed weekly. The vasectomized rams were exchanged for harnessed entire rams on January 24 and the last record of oestrus was taken on February 7. To analyse the data, the following assumptions were made: (a) ewes first marked between days 0-14 were cycling spontaneously at teasing, (b) ewes not marked between days 0-28 were not cycling spontaneously and were not stimulated by teasing, (c) ewes first marked between days 14-28 were successfully teased, (d) ewes marked in successive 7-day periods were in oestrus on the day the crayon colour was changed, (e) ewes cycling continuously were those marked during 7-day periods separated by at least one, but not more than two periods, (f) ewes experiencing discontinuous cycles were those marked during 7-day periods separated by more than two periods (cycle length > 28 days).

RESULTS AND DISCUSSION

Experiments 1, 2 and 3 (Fig. 4). In all three experiments, a significant proportion of successfully teased ewes rapidly became anovular again, particularly the Ile-de-France ewes teased in the middle of their non-breeding season (Experiment 3). By contrast, some ewes teased towards the end of their non-breeding season continued to cycle regularly through to the start of their spontaneous breeding season, while 50-60% of their flockmates experienced a short period of anovulation.

In Experiment 1 (Fig. 4a), 20, 30 and 35% of the ewes were marked by the rams once, twice or three times during the first 60 days after teasing, and 15% were not marked at all. If the ewes had been joined with entire rams instead of vasectomised rams, and if the conception rate were, say, 60%, at least 18% of those ewes mated in the first eight weeks of joining would have failed to return to service, and failed to lamb. These ewes returned to anoestrus and did not begin their normal breeding season until after the rams were removed.

Experiment 4 (Fig. 5). The percentage of ewes marked within the first 28 days was constant for each sample (c. 85%), independent of the date of joining, and was composed of a variable proportion of ewes cycling spontaneously (2-25%) and a highly repeatable response to teasing. Most of the ewes in the last sample joined on January 24 were still in anoestrus, but the trend indicates that the spontaneous breeding season was about to begin.

Of successfully teased ewes, only about 35% again became anoestrous, compared with 65% in Experiment 1 which was conducted at the University of W.A. This difference may be a reflection of their past nutritional environment (Smith 1965; Oldham 1980). However, while the proportion of successfully teased ewes re-experiencing anoestrus was relatively uniform between samples, the speed with which ewes returned to anoestrus was related to their date of joining (Fig. 6). The incidence of anoestrus within the first 51 days increases as the date of teasing approaches the start of the new breeding season ($P < 0.01$). This re-

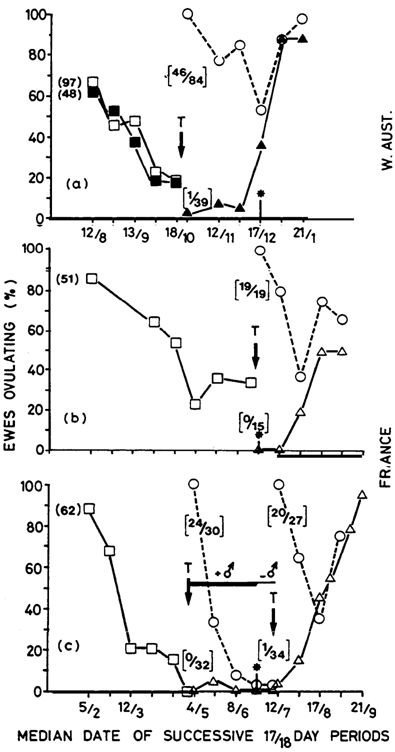

Fig. 4. Proportion of ewes with active CL during successive 17-18 day periods for
a) Merinos in Experiment 1,
b) Préalpes in Experiment 2, and
c) Iles-de-France in Experiment 3.

T teasing (introduction of rams)

( ) number of ewes in the experiment

[ ] proportion ovulating

□—□ / △—△ ewes isolated from rams

■—■ / ▲—▲ ewes continually associated with rams

○—○ successfully teased ewes

+♂ teasing and presence of rams

-♂ re-isolation from rams

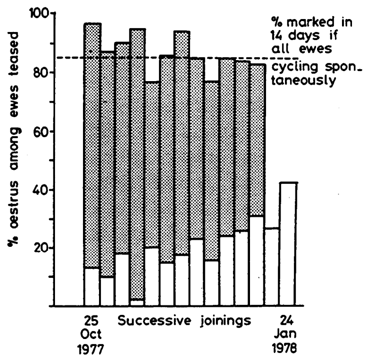

Fig. 5. Incidence of oestrus in samples of ewes drawn from a flock at weekly intervals and teased between late October and late January (Western Australia, Experiment 4).

□ ewes cycling spontaneously at teasing

▩ successfully teased ewes

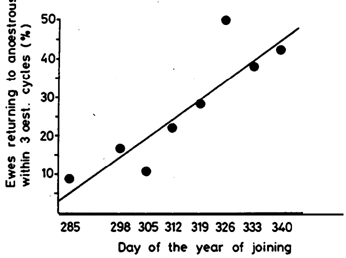

Fig. 6. The relationship between the date of joining and the percentage of successfully teased ewes returning to anoestrus within 3 oestrous cycles (51 days) of joining (Experiment 4)

$$y = -203.43 + 0.73x$$

$$R^2 = 0.79$$

entry of successfully teased ewes to anoestrus is apparently centred on or near the summer solstice. This result contrasts markedly with the ovarian activity of Ile-de-France ewes following teasing in the middle versus the end of their non-breeding season (Fig. 4c). No explanation for this difference can be offered at the moment. Experiment 3 could not be continued through until the start of the flock's spontaneous breeding season to give a complete picture, but it is clear that when Merino ewes are joined between late October and mid-December, successfully teased ewes which fail to conceive run the risk of returning to anoestrus rather than to the ram.

SUMMARY AND CONCLUSIONS

C.M. OLDHAM

Over half of the Merino ewes in Western Australia are joined out of season as are many flocks in eastern Australia and an increasing number of ewes in Europe. Thus, an increased understanding of the physiology of the endogenous mechanism which allows ewes to breed out of season is of fundamental importance.

In addition, the rapid repeatable ovulatory response of seasonally anovular ewes to teasing, coupled with the variable quality of the ram-induced CL and the return of many successfully teased ewes to seasonal anovulation makes it an ideal model for studies into the control of (i) ovulation, (ii) seasonal breeding and (iii) CL quality and function. Despite a large volume of work the mechanisms controlling ovulation rate are still unknown. At teasing there is a transient increase in ovulation rate which is ideal for intensive study.

Scaramuzzi and Baird (1976) and Legan *et al.* (1977) have proposed that a change in the sensitivity of tonic LH secretion to oestradiol controls seasonal breeding. The ram stimulus, then, must reverse the as yet unknown mechanism controlling the change in sensitivity. Following successful teasing, many ewes continue to cycle while others return to anovulation. Why? The answer may help to elucidate the mechanism which controls the sensitivity of LH to oestradiol.

Similar arguments support the use of this system for exploring CL function. Short-life-span CL are observed at puberty (Foster and Ryan 1979) after lactational anoestrus (Land 1971), at the onset of spontaneous ovulation after a period of anovulation (C.M. Oldham and Y. Cognie, unpublished) and at teasing. Why at all these times do some CL persist and function normally while others regress prematurely? What is the mechanism for luteolysis at the premature regression? Does progesterone priming ensure normal CL function? If so, how?

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