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Effect of prior ram-ewe contact on the ability of rams to stimulate early oestrus

T. W. KNIGHT, M. RIDLAND AND A. J. LITHERLAND

AgResearch Grasslands, Private Bag 11008, Palmerston North, New Zealand.

ABSTRACT

Ram-ewe contact when ewes are in anoestrus may reduce the ram's ability to stimulate oestrous activity in ewes. Conversely, oestrus ewes increase the ram's ability to stimulate ewes, possibly by increasing plasma testosterone concentration (T). On 25 November, 400 Romney ewes and 12 Dorset teasers were each randomised into 2 groups. One group of ewes and rams were joined while the others were isolated from the opposite sex. On 14 January (day 0) half of each group of ewes was joined for 35 days with either rams which had been previously exposed or not exposed to ewes, and mating marks were recorded each week. In a second experiment, 16 Romney rams were introduced (day 0) to oestrus or non-oestrus ewes and bled on days -1, 0, 2 and 5, and the blood plasma analysed for T. Rams not previously exposed to ewes stimulated more ewes to exhibit oestrus by day 35 than rams previously exposed to ewes (46% vs. 30%; $P < 0.01$). Ewes previously exposed and those not exposed to rams responded similarly to ram stimulation, and by day 35 there was no difference in percentage of ewes mated. Both oestrus and anoestrus ewes increased T in rams on day 0. On day 2, T had returned to day -1 levels for rams with anoestrus ewes but increased further in rams with oestrus ewes (0.67 vs. 2.34 ng/ml; $P < 0.05$).

Keywords: Rams; ewes; early oestrus

INTRODUCTION

Merino ewes in continuous contact with rams have ovarian activity similar to that of isolated ewes (Riches and Watson, 1954). A similar phenomenon has been observed in Romney ewes joined with rams in November (Knight *et al.*, 1992). This could result from either the anoestrous ewes becoming refractory to stimulation by rams or the rams losing their ability to stimulate oestrous activity in ewes through the continuous contact with anoestrous ewes. Oestrous ewes, however, enhances the ram's ability to stimulate anoestrous ewes (Knight 1985) and this could be due to oestrous ewes increasing testosterone secretion in the rams (Schanbacher *et al.*, 1987). If this was the explanation for the ram's increased ability to stimulate ewes then it would be expected that oestrous and anoestrous ewes would have different effects on testosterone secretion in rams.

This paper presents data on the effect ewe-ram contact in the preceding anoestrous period has on onset of oestrous early in the following breeding season. In addition, the effects of oestrous and anoestrous ewes on the ram's mean T is described

MATERIALS AND METHODS

Experiment 1

Four hundred mature Romney ewes and 12 mature vasectomised Poll Dorset rams were each randomised into 2 groups on 25 November. One group of ewes and rams were joined while the other groups were isolated by at least 500m from the opposite sex. Seven weeks later, on 14 January (day 0), half of each group of ewes was joined for 35 days with either rams which had been previously ex-

posed or not exposed to ewes. Rams were fitted with harnesses, and crayons were changed each 2 weeks. Mating marks were recorded each week in the paddock over the first 7 weeks and after day 0 the four groups of ewes and rams were brought into yards each week and marked ewes were identified.

Experiment 2

Sixteen, 2-year-old, Romney rams were fitted with venous jugular catheters and then randomised into 2 groups on 13 December. The next day (day 0) they were introduced to either anoestrous ($n=8$) ewes or ewes ($n=8$) which had been induced into oestrous using progesterone and oestradiol. Treatment groups were penned in buildings which were 2 km from each other and isolated from other oestrous ewes. Eight blood samples were collected at 20 minute intervals on days -1, 0, 2 and 5. Blood sampling on day 0 started 2 hours after the introduction of ewes, and ewes were removed after the blood sampling on day 2. The T was analysed by radioimmunoassay ("Coat-a-Count", Diagnostic Products Corporation, Los Angeles, USA, 1991). The intra- and inter-assay coefficient of variations were 8% and 12% respectively with a sensitivity of 0.04 ng/ml.

Statistical analysis

In Experiment 1, the number of ewes exhibiting oestrus each week was analysed using Chi square analysis (SAS, 1987) and cumulative percentage of ewes marked was analysed using the Kolmogorov-Smirnov test (Sokal and Rohlf, 1981). The comparisons were between rams previously exposed and not exposed to ewes, and between ewes previously exposed and not exposed to rams. In Experiment 2, the mean T concentration on each day was analysed using repeated measures analysis (SAS, 1987).

RESULTS

Experiment 1

The mean weight of the ewes on 25 November was 50 ± 7 kg and there were no differences between groups. No ewes were mated before 14 January in the group joined with rams. It was noted when mating marks were being checked over the first 7 weeks, that rams and ewes were located in different parts of the paddock.

After 14 January (day 0), rams not previously exposed to ewes stimulated more ($P < 0.001$) ewes to exhibit oestrus for the first time over days 21 to 35 than rams previously exposed to ewes (Figure 1). By day 35 these rams had mated more ewes than rams previously exposed to ewes (46% vs. 30%; $P < 0.01$). Similar percentages of ewes previously exposed and not exposed to rams were mated for the first time over days 21 to 35 (Figure 2). However, more of the ewes previously exposed to rams than ewes not exposed to rams were mated up to day 21 (16% vs. 4%; $P < 0.01$). This difference had reduced by day 35, when there was no significant difference in the cumulative percentage of ewes mated between ewes previously exposed and not exposed to rams (42% vs. 34%).

FIGURE 1: Percentage ewes mated for the first time (histogram) and cumulative percentage of ewes mated (lines) each week for rams exposed and not exposed to ewes in Experiment 1

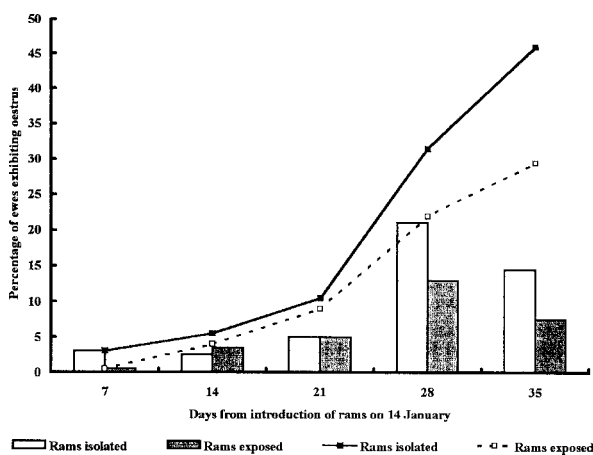
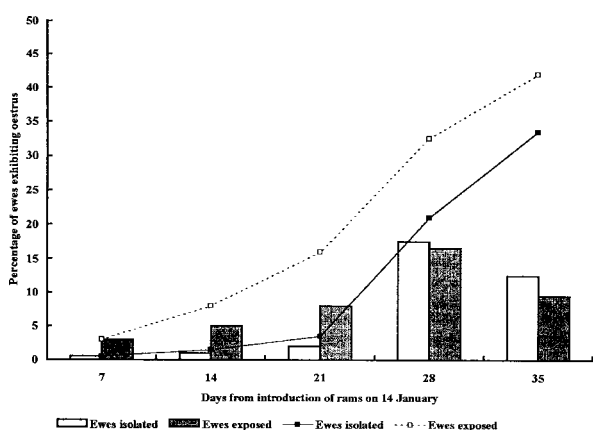


FIGURE 2: Percentage ewes mated for the first time (histogram) and cumulative percentage of ewes mated (lines) each week for ewes exposed and not exposed to rams in Experiment 1



Experiment 2

Introduction of oestrous and anoestrous ewes on day 0 increased ($P < 0.05$) T compared to concentrations on day -1 (Table 1). Whereas T continued to increase on day 2 in the rams with oestrous ewes, it decreased to day -1 levels in rams with anoestrous ewes ($P < 0.05$). On day 5 after the ewes had been removed, T in rams with oestrous ewes declined to pre-stimulation levels whereas in rams which had been with anoestrous ewes there was a small increase, similar to the T increase on day 0.

TABLE 1: Mean plasma testosterone concentration (ng/ml) in rams exposed to either anoestrous or oestrous ewes in December in Experiment 2.

| | Days from introduction of ewes | | | |
|-----------------|--------------------------------|------|------------|-----------|
| | -1 | 0 | 2 | 5 |
| Anoestrous ewes | 0.72 | 1.88 | 0.67 | 1.64 |
| Oestrous ewes | 0.66 | 1.44 | 2.34 | 0.51 |
| Significance | NS | NS | $P < 0.05$ | $P < 0.1$ |

DISCUSSION

Ram-ewe contact when ewes were in deep anoestrous (late-November), subsequently reduced the ram's ability to stimulate oestrous activity in ewes. This contrasts with the effect of oestrous ewes which increase the ram's ability to stimulate anoestrous ewes (Knight 1985). This reduced ability of rams to stimulate anoestrous ewes would explain the results of Knight *et al.* (1992) who found that Romney ewes and rams joined in November and December had slower oestrus onset than those joined in January. In Experiment 1, there was no decrease in the ewes ability to respond to stimulation by rams as suggested by Knight *et al.* (1992). This slow onset of oestrus for Romney ewes joined in November and December compared to those joined in January was observed at Wanganui but not Hawkes Bay, even though the ewes and rams originated from the same flock (Knight *et al.*, 1992). The Hawkes Bay is a traditional early lambing area and presence of oestrous ewes, either in the flock or surrounding flocks, may overcome the inhibitory effect anoestrous ewes have on rams.

Separation of ewes and rams for 17-34 days has been given as a prerequisite for a good teaser ram response in ewes (Oldham 1980). In contrast in Experiment 1, continuous ram contact had no effect on the teasing response in January. During the first ewe-ram exposure rams tended to separate from the ewes and may have only come together each week when the flock was rounded up to record mating marks. Despite this, the increased proportion of ewes mated in the first 21 days in ewes with prior ram contact suggests that the rams must still have stimulated some ewes to ovulate.

Increased T in rams joined with ewes in the non-breeding season was likely to be due to the release of GnRH from the hypothalamus which stimulates LH release, which in turn stimulates testosterone secretion (Schanbacher *et al.*, 1987). The increased T was transient which suggests that the increased ability of rams to stimu-

late anoestrus ewes after contact with oestrous ewes (Knight 1985) may also be transient. The small short lived increase in T in rams exposed to anoestrous ewes may not stimulate rams adequately. The T response to oestrous and/or anoestrous ewes may have been different had the rams been exposed to anoestrous ewes for 7 weeks before the experiment.

CONCLUSIONS

The optimum mating policy for this flock of Romney ewes, where an early but compact mating was required, would be to join teaser rams with ewes in mid-January and replace the teasers with entire rams 3 weeks later. Based on data from Experiment 1, this would result in 45-50% of the ewes being mated in 2 weeks. If the main concern was with early mating then the best policy could be to join the ewes with a small number of rams in early-December and put more rams into the flock every 1-2 weeks until mid-January to overcome the refractoriness of the rams induced by continuous contact with anoestrous ewes.

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