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THE INDUCTION OF BEHAVIOURAL OESTRUS IN PREGNANT CORRIEDALE EWES BY INJECTIONS OF PROGESTERONE AND OESTRADIOL

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The experiment described in this paper initially aimed at developing a simple inexpensive method of pregnancy diagnosis for sheep. We considered that, if oestrus could be induced in the non-pregnant ewes in a flock (which may be in anoestrus) and this oestrus detected by the use of harnessed rams (Radford, Watson & Wood, 1960), a method of pregnancy diagnosis could be developed.

Diamond & Young (1963) present evidence from a number of species that pregnancy prevents the virilizing effect of a range of exogenous steroid substances. Lindsay & Francis (1969) and Fels (unpublished data) have shown that ovariectomized ewes do not respond to oestrogen while under the influence of exogenous progesterone. Thus, endogenous progesterone could be expected to prevent oestrous responses in pregnant ewes.

One hundred and fifty-eight 18-month-old Corriedale ewes were mated with six Corriedale rams under paddock conditions for 8 weeks beginning 1st March. Seventy-eight days after the start of mating, the ewes were randomly divided into four treatment groups. Individual ewes were identified by numbered ear tags.

The treatments were:

Treatment A: 7 × 20-mg doses of progesterone at 2-day intervals over 14 days and 100 μg of oestradiol 48 hr after the last dose of progesterone.

Treatment B: 4 × 20-mg doses of progesterone at 2-day intervals over 8 days and 100 μg of oestradiol 48 hr after the last dose of progesterone.

Treatment C: 1 × 20-mg dose of progesterone and 100 μg of oestradiol 48 hr later.

Treatment D: 1 × 100-μg dose of oestradiol.

Doses were given by intramuscular injection in 2 ml peanut oil. The treatments were so timed that all groups received oestradiol on the same day.

Following the oestradiol injections, eight vasectomized rams fitted with 'sire-sine' harnesses and crayons were run with the experimental ewes for 6 days. The ear-tag numbers of ewes marked by the ram were then recorded for comparison with the lambing performance of individual ewes recorded at parturition.

The number of ewes which showed oestrus increased with increasing periods of progesterone priming (Table 1). The oestrous response was not confined to those ewes which were not pregnant. Eighteen ewes failed to lamb, of which only three were detected as being in oestrus. More surprising, however, is the fact that twenty-one ewes which lambed had shown oestrus. The only pregnant ewes to show behavioural oestrus were in the groups which received progesterone for 8 or 14 days ($P<0{\cdot}001$).

TABLE 1

BEHAVIOURAL OESTROUS RESPONSES OF A BREEDING FLOCK TO AN INJECTION OF 100 μG OESTRADIOL FOLLOWING THREE PROGESTERONE PRIMING TREATMENTS

Response	*Period of daily priming with 10 mg progesterone (days)*			
	14 (*Group A*)	8 (*Group B*)	2 (*Group C*)	*Nil* (*Group D*)
Marked by ram and failed to lamb	2	0	1	0
Marked by ram and lambed	12	9	0	0
Not marked by ram and failed to lamb	1	6	1	7
Not marked by ram and lambed	24	25	38	32
Total ewes	39	40	40	39

Comparison of ratios of pregnant ewes which exhibited oestrus to total pregnant ewes:
A versus B $\chi^2 = 0{\cdot}23$; d.f. = 1; N.S.
(A+B) versus (C+D) $\chi^2 = 21{\cdot}70$; d.f. = 1; $P<0{\cdot}001$.

The need for progesterone in order to induce oestrus in a proportion of pregnant ewes is curious. The endogenous output of progesterone alone, estimated at 7·5 to 15 mg/day by Alexander & Williams (1966), would appear to be sufficient to prime the ewe (Robinson, Moore & Binet, 1956) for a sensitive response to oestrogen. For this reason, it is unlikely that the injected progesterone creates a hypersensitive animal in which the injected oestrogen can overcome the anti-oestrogenic reaction of circulating progesterone and induce oestrus. It is more likely that, as a consequence of continuous injection of progesterone, endogenous output falls. When injections cease, the circulating levels of natural progesterone are then lower than normal, permitting a dose of 100 μg oestradiol to induce oestrus in a proportion of ewes. Recent evidence that exogenous progesterone reduced the function (Woody, Ginther & Pope, 1967; Lewis, Taylor & Inskeep, 1968) and weight (Ginther, 1968) of the corpus luteum supports this suggestion. There appear to be no data in the literature on the effect of exogenous progesterone on placental progesterone output.

The phenomenon of pregnant ewes displaying spontaneous behavioural oestrus has not been observed in these or other ewes of the experimental station flock. Moreover, the magnitude and nature of the hormone régimes necessary to induce it artificially suggest that the likelihood of spontaneous oestrus is small. This is in contrast to the Western and Rambouillet ewes of Williams, Garrigus, Norton & Nalbandov (1956), of which 22% and 62%, respectively, showed oestrus during pregnancy. No adequate explanation can be given for this except on the basis of genetic differences.

Neither is it possible to explain adequately the failure of the six ewes which did not lamb in Group B to respond to 100 μg of oestradiol following 8 days' progesterone priming. Pregnancy may have terminated as a result of the treatment but this is unlikely in the absence of a similar result in Group A, which was similarly treated, except for a longer period of progesterone priming.

Because of the variability of the results, the method is unreliable as a diagnosis of pregnancy.

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