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Advancement of breeding in non-lactating adult red deer hinds

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ABSTRACT

Teaser stags and progesterone-PMS treatments were used to advance the breeding season in non-lactating adult red deer hinds. In Experiment 1, 2 vasectomised stags were run with 39 hinds for 15 d prior to joining with entire stags. More teased hinds (20/39) calved early (11-20 November) than a group of non-teased hinds (5/42). In other experiments, laparoscopy revealed that progesterone + PMS treated hinds ovulated in mid February. Although calves were born as early as 10 October, indicating stags could successfully fertilise a hind in mid February, such treatment did not result in many hinds calving in October. It seems that the stag is sub-fertile in February. Calving dates of contiguous control hinds show that a large proportion were mated 18 to 25 d after the induced oestrus in treated hinds indicating red deer stags can have *an* effect similar to the 'ram effect'. Some hinds calving to the induced oestrus produced twins.

Keywords Red deer; advanced breeding; CIDR; PMS; twinning; 'stag effect'; social facilitation; calving period

INTRODUCTION

Red deer are seasonal breeders, calving in late spring—early summer (Fletcher, 1974). On deer farms that have good pasture growth in spring, earlier calving would provide better utilisation of pasture growth. Early born hind calves may possibly be grown well enough for mating in their first autumn. Early born stag calves may possibly be grown to a suitable slaughter weight before their first winter.

Details of the normal calving period of adult deer hinds recorded in some groups at Invermay are shown in Table 1. In 1981-83 the median calving dates were 5, 3 and 4 December when stags were introduced to the hinds on 31 March, 30 March and 7 April respectively. Deer farmers have reported the odd calf born in late October and as late as April. Fletcher (1974) in a survey of zoos showed that red deer in the Northern Hemisphere calve at a similar time of the year irrespective of latitude (41°—57°).

Methods have been developed to advance the breeding season of sheep by priming anoestrous ewes with progesterone either with or without an injection of PMS and using the 'ram effect' (Boland and Gordon, 1973; Knight, 1985). The introduction of rams into a flock of anoestrous ewes can stimulate ewes to have 'silent' heats with oestrus occurring over a double peak on days 17 to 19 and 24 to 26 post joining (Eyal, 1958). The second peak is due to a proportion of the ewes having a short cycle, and another silent heat followed by a cycle of normal length.

Four experiments were carried out to determine whether the introduction of stags to non-lactating adult hinds has an effect similar to the 'ram effect' and whether oestrus could be induced earlier than normal in adult hinds using progesterone +PMS treatments.

TABLE 1 Calving period of adult red deer hinds at Invermay.

Year	No. of births	Date stag joined + 233 d [a]	Calving Dates: Median	Mean + s.d.	Range
1974	45	24 Nov	15 Dec	16 Dec + 6	4 Dec—29 Dec[b]
1975	14	9 Nov	7 Dec	8 Dec + 5	2 Dec—20 Dec
1976	19	25 Nov	13 Dec	13 Dec + 9	2 Dec—14 Feb
1984	36	10 Nov	26 Nov	26 Nov + 6	15 Nov—12 Dec

[a] Gestation period (Kelly and Moore, 1977).
[b] From data recorded by Kelly.

MATERIALS AND METHODS

Experiment 1

This experiment investigated whether teased hinds would calve earlier than non-teased hinds. All hinds were isolated at least 250 m away from stags from January 1984. After weaning on 5 March, 39 hinds were run with 2 vasectomised stags for 15 d from 7 March 1984. Another group of 42 hinds was isolated from stags by at least 250 m over the same period after weaning. On 22 March the vasectomised stags were removed and the teased and non-teased hind groups were each divided into 2 groups and adult stags introduced for single sire mating. If the teaser stags had an effect similar to the 'ram effect' then more calves would be born to teased hinds a gestation length (233 d) plus 18 to 25 days after introduction on 7 March of the vasectomised stags i.e. 13 to 20 November. Over the subsequent calving perod the birth dates of calves were recorded, calves tagged and identified to their dams to determine hind calving dates.

Experiment 2

Two groups of dry hinds were treated with progesterone +PMS to determine whether they would be successfully mated in either mid February or early March and calve earlier than normal. Ten hinds had Controlled Internal Drug Release Devices (Alex Harvey Industries, Hamilton) containing 12% progesterone inserted into their vaginas for 15 d from 1 February 1984. AT CIDR withdrawal on 16 February, the hinds were injected i.m. with 500 i.u. PMS (Folligon Intervet) and split into 2 replicate groups of 5 treated hinds each joined by 5 control dry hinds (contiguous controls) and a stag. A further 10 hinds had CIDRs inserted on 16 February and were injected with 500 i.u. PMS at CIDR withdrawal on 2 March. These hinds were joined 5 each to the established mating groups on 2 March. Birth dates of calves were recorded and calves identified to their dams to determine hind calving dates.

Experiment 3

Hinds were treated with progesterone +PMS in February and laparoscoped to determine ovulation rate. Two 12% CIDRs tied end to end were inserted into 16 weaned or dry hinds on 2 February 1985 and withdrawn on 14 February. All hinds were given 400 i.u. PMS (Folligon) i.m. at CIDR withdrawal and 48 hours later divided into 2 groups each joined with a stag which had coloured grease applied in the groin region to record mounting of hinds. The hinds were laparoscoped on 27 February to record number of ovulations.

Experiment 4

The objective of this experiment was to investigate whether 2 CIDRs and/or time of stag introduction after CIDR withdrawal would increase the number of calves born early to the induced cycle. Eight single sire mating groups were established; 4 groups were joined with stags 24 hours after CIDR withdrawal and 4 groups 48 hours after CIDR withdrawal. Each group had 8 hinds, 3 of which had been treated with 1 CIDR, 3 with 2 CIDRs and 2 were untreated (contiguous controls). Hinds were weaned prior to CIDR insertion.

CIDRs were inserted on 16 February 1985 and withdrawn on 28 February. At CIDR withdrawal the hinds were injected i.m. with 400 i.u. PMS (Folligon). The stags had coloured grease applied to the inside of their forelegs and groin to record which hinds were mounted. Birth dates of calves were recorded and calves tagged for identification to their dams to determine hind calving dates.

RESULTS

Experiment 1

The calving data for non-teased and teased hinds are shown in Table 2. Mean calving dates were not significantly different ($P<0.05$) but 20 teased and only 5 non-teased hinds calved before 20 November.

TABLE 2 Calving data for non-teased and teased hinds (Experiment 1)..

Treatment	n	Mean date*	Range	No. calving
Non-teased	42	26 Nov	15 Nov-12 Dec	37
Teased	39	21 Nov	11 Nov-5 Dec	37

*Least significant difference at 5% level = 6.5 days.

Experiment 2

Calving dates of hinds are shown in Fig. 1. One early treated hind calved on 10 October (probably to the induced oestrus) and another slipped her calf on 19 October. Four of the later treated hinds calved on 22 to 24 October to mating at the induced oestrus and control hinds started calving 267 days after joining on 16 February. Seven of the 10 control hinds calved between 9 and 16 November, indicating they were mated 18 to 25 d after the later treated hinds had an induced oestrus.

Experiment 3

Grease marks were recorded on 8 of the 16 hinds at the induced oestrus about 17, 18 February. Laparoscopy of the hinds on 27 February revealed 13 of the 15 hinds had ovulated. Seven hinds had 1 corpus luteum, 4 had 2 and 2 had 3 or more. One hind could not be examined as the ovaries were obscured by a full bladder. Twelve of the 16 hinds calved; 1 hind calved to the induced oestrus on 12 October, another to a cycle later on 29 October and 8 hinds calved between 19 and 22 November, 21 to 24 d after the second calf was born. The last 2 calves were born on 27 November and 13 December.

Experiment 4

Grease marks were recorded on 17 hinds at the induced oestrus. Of these, 6 hinds had been treated with 1 CIDR and 11 with 2 CIDRs. Of the marked hinds 7 had been joined 24 h after CIDR withdrawal and 10 at 48 h, but 1 of the 4 stags joined at 24 h showed no interest in herding the hinds and did not mark any hinds.

Of the 48 treated hinds, 6 calved to the induced oestrus (Table 3) presenting 4 sets of twins and 2 singles. The singles and 2 sets of twins survived, 3 twins were found dead and the other twin was found in a moribund state but survived through hand rearing. Calving spread for treatment groups and contiguous controls is shown in Fig. 2. There were no significant differences in mean calving date between control and treated hinds, although the variance was much greater ($P<0.01$) for treated hinds than for controls. Six of 8 contiguous controls joined at 24 h calved to an oestrus 18 to 25 d (11 to 18 November) after the induced oestrus in treated hinds. Contiguous control hinds joined at 48 h had a later synchronised calving (n=8, 14 to 22 November). Calving percentage (94%) was the same for treated (45/48) and control hinds (15/16).

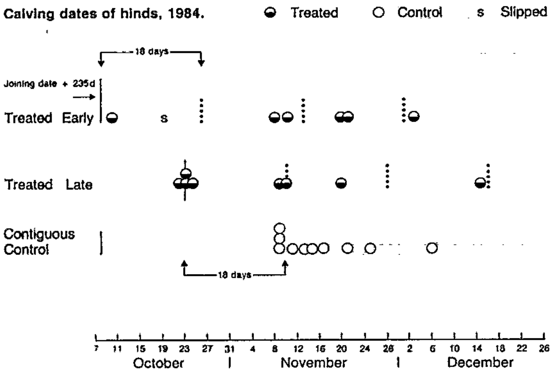

FIG. 1 Calving dates of hinds, 1984 (Experiment 2). Numbers calving; early treated 7/10, late treated 8/10 and contiguous controls 10/10. Contiguous control hinds were joined at the same time as the early treated hinds. Arrowed line shows date of joining (=date of CIDR withdrawal) plus 235 d (=gestation period + 2 d) i.e. date hinds expected to calve from mating at the induced oestrus. Dotted lines show subsequent 18 d (cycle length) periods.

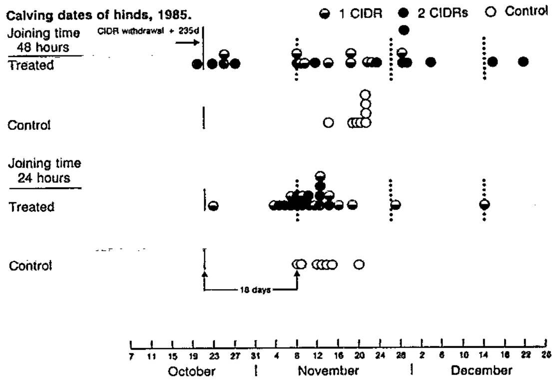

FIG. 2 Calving dates of hinds, 1985 (Experiment 4). Numbers calving; 48 h join 22/24, contiguous controls 8/8, 24 h join 23/24, contiguous controls 7/8. ◒ hinds treated with 1 CIDR, ● 2 CIDRs, O contiguous controls. Arrowed line shows date of CIDR withdrawal plus 235 d (=gestation length + 2 d) i.e. date hinds expected to calve from mating at the induced oestrus. Dotted lines show subsequent 18 d (cycle length) periods.

TABLE 3 Calving data for treated hinds and contiguous controls (Experiment 4).

Treatment		Numbers		Calving		
No. of CIDRs	Joining time (h)[a]	Joined	Calved	Mean±SD	First[b] cycle	Twin [c] sets
0	24	8	7	13 Nov±4	0	0
	48	8	8	20 Nov±3	0	0
1	24	12	11	14 Nov±13	1	1
	48	12	10	15 Nov±10	1	0
2	24	12	12	9 Nov±3	0	0
	48	12	12	17 Nov±22	4	3

a Joining time—hours after CIDR withdrawal
b Hinds calving to the first (CIDR + PMS induced) cycle
c All twins apparently were born to mating at the first cycle.

DISCUSSION

Results of Experiment 1 provide evidence of a 'stag effect' although variation in gestation length (233± 2.9; mean ±sd, n=49; Moore and Cowie unpubl.) confounds accurate determination of mating date from calving records. Therefore it is not possible to ascertain whether red hinds have short cycles following an attempted induction of oestrus as has been reported for sheep, (Eyal, 1958).

A calving to a mid-February mating in Experiment 2 indicates that ovulation was successfully induced in at least 1 hind and that at least some red stags can successfully mate treated hinds as early as mid-February. CIDR + PMS treatment was not successful in inducing a large proportion of the hinds to calve early to the induced oestrus, either because the treatment was inadequate or the stags were incapable of mating more than a few hinds at this time of the year. The onset of calving in the contiguous controls can be related to breeding a cycle later than the induced cycle of the later treated hinds, providing further evidence of a 'stag effect' with 'social facilitation'. Social facilitation is defined as the enhancement of the 'stag effect' by stimulating the stag with oestrous hinds.

Experiment 3 showed red hinds can be induced to ovulate as early as mid February but it would appear that stags may be subfertile or disinclined to mate at this time. Lincoln *et al.*, (1984) have shown that the sexual season of red stags can be advanced by a month using melatonin treatment. Therefore melatonin treated stags are being used in further research on mating CIDR + PMS treated hinds.

Experiment 4 showed that CIDR + PMS treatment can result in a high proportion of twinning, if hinds calve to the induced oestrus. The number of mounting marks recorded on hinds (17) compared to the number of successful calving to that mating (6) is evidence that stag fertility may be a limiting factor for breeding to calve in mid October. The high proportion of hinds joined at 24 h that calved to mating a cycle after the induced oestrus is evidence that CIDR + PMS treatment can induce cyclic ovarian activity i.e. the hinds did not revert to anoestrus following the CIDR + PMS induced cycle when administered as early as late February-early March.

The calving period for the contiguous controls joined at 24 h is further evidence of a 'stag' or 'social facilitation effect' on contiguous hinds although later joining (48 h) appears to have delayed or missed the effect possibly because the control hinds were not close enough to the stags with oestrous hinds soon enough or for long enough.

The mean calving date and short spread for the contiguous controls indicate a satisfactory advancement of the breeding season by several weeks compared to the average calving data shown in Table 1.

CONCLUSION

Results presented show evidence of a 'stag effect' similar to the 'ram effect' with social facilitation. Research on the 'ram effect' (Knight, 1985) showed that more effective teasing can be obtained by integrating ram introduction to anoestrous ewes with prior or concurrent exposure of the rams to a small proportion of oestrous ewes. Deer farmers wanting to ensure the 'stag effect' operates to advance breeding should ensure stags become stimulated by inducing oestrus in a small proportion of the hinds.

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