MANIPULATING BREEDING IN RED AND FALLOW DEER

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INTRODUCTION

Developments in reproductive technology have enabled breeding, particularly reproductive seasonality, twinning and artificial insemination, to be manipulated in farmed red and fallow deer. These technologies are aimed at bettering the alignment of farm seasonal pasture production with stock energy requirements, increasing reproductive rate and increasing the numbers of genetically superior stock.

SEASONALITY

Early work involved providing females with gonadotrophic stimulation in the form of PMSG or GnRH, following a period of progesterone pretreatment, up to 6 weeks prior to the breeding season (eg Adam et al. 1985; Asher and Macmillan 1986; Fisher et al. 1989a). However, whilst these treatments resulted in the induction of oestrus and ovulation, fertility has only been acceptable (about 60% calving to the induced oestrus) when the hinds were mated to seasonally advanced (melatonin treated) males (P F Fennessy, G H Moore and R P Littlejohn, unpublished data). More recently, the use of melatonin has become widely established in the manipulation of seasonality in a number of species. One type of inplant being Regulin (Youngs Animal Health NZ Ltd, Upper Hutt, New Zealand). Melatonin given in late spring or early summer advances several aspects of seasonal physiology in both red and fallow deer. These include neck muscle hypertrophy, rutting behaviour, coat growth and subsequent antler casting and velvet antler growth in males and mating and parturition and coat growth in females (Adam and Atkinson 1984; Webster and Barrell 1985; Asher et al. 1988a; Fisher et al. 1988; Webster, 1989). The effects of some of these treatments on mean calving and fawning dates are summarized in Table 1.

Table 1 Mean date of calving or fawning in control and melatonin-treated (Regulin) red and fallow females bred to similarly treated males

		Mean date of calving or fawning	
		Control	Melatonin
Fallow does[1]	Pubertal	16 December	20 October
	Adults	12 December	23 October
Red hinds	Pubertal[2]	24 November	13 November
	Adults[3]	21 November	14 November

[1] Asher et al. (1988a), [2] Fisher et al. (1988), [3] M W Fisher and P F Fennessy, unpublished data

The earlier melatonin is administered to both red hinds and stags in spring the earlier is the mean date of calving (Table 2) although the response is curvilinear and may be limited by a requirement for sufficient exposure to a long photoperiod immediately prior to exogenous melatonin (Fisher et al. 1989b). While most treatments have been administered in excess of 90 days it appears that approximately 60 days of treatment may be sufficient, providing it is given at an appropriate time of the year (November), at least in pubertal red hinds (M W Fisher, L M Meikle and P F Fennessy, unpublished data).

Table 2 Effect of time of the year melatonin (Regulin) is administered to both pubertal red deer hinds and 2 year old stags on the mean calving date (G W Asher, unpublished data)

Group	Mean calving date	Advancement
Untreated	11 December	
		} 20 days
Melatonin 30 December	21 November	
		} 18 days
Melatonin 17 November	3 November	
		} 10 days
Melatonin 2 October	24 October	

The effects of treating both sexes have also been examined (Table 3) and it is interesting that treating the stag alone can advance the mean date of calving although the greatest advancement occurred when both stags and hinds were treated.

Table 3 The effects of treating adult red deer stags and/or hinds with melatonin (Regulin) on the mean date of calving (M W Fisher and P F Fennessy unpublished data)

Group	Mean calving date
Both sexes untreated	4 December
Hinds alone treated	23 November
Stags alone treated	21 November
Both sexes treated	14 November

Thus, the Regulin implants are a practical and effective means of advancing the breeding season and subsequently the calving season in both red and fallow deer. Consequently, for every day a red deer calf was born earlier, it was 0.2-0.4 kg heavier at weaning (Adam and Moir 1987; Fennessy 1987). However, some melatonin treatments have been shown to delay pubertal development in red hinds (Adam et al. 1989) and result in the failure of some fallow does to lactate at parturition (Asher et al. 1988a) indicating administration may be inappropriate at certain stages of reproductive development. Thus, at present Regulin is recommended for use in stags and bucks and yearling hinds and does only.

TWINNING

Red and fallow deer very rarely produce twins. In fallow deer at least, the high incidence of low birth weights and the consequent increase in perinatal mortality likely to be associated with multiple births, means that hormonally induced twinning is not a practical means of increasing reproductive rate. However, in some situations the red hind may be suited to producing twin calves. There are a variety of technologies, mainly developed in the ewe, with the potential for inducing multiple ovulations in deer. However, to date the successful induction of twin births has been limited to hinds treated with PMSG following a period of pretreatment with intravaginal progesterone, and mated to seasonally-advanced (melatonin-treated) stags prior to the onset of the normal breeding season (Moore 1987; P F Fennessy, G H Moore and R P Littlejohn, unpublished data). Although twin calves have a lower birthweight and a higher incidence of perinatal mortality, increased production can result (Table 4).

Table 4 Calving results, birthweights and subsequent live weights of single and twin red deer calves

	Single	Twin
Hinds calving to induced oestrus	39	19
Birthweight (kg)	8.9	6.2
Live weight (kg) at 12 weeks	41.2	34.1
at 20 weeks	58.9	49.1

Theoretically, a 50% twinning rate (assuming 5% and 20% perinatal mortality in singles and twins respectively) increases biological efficiency (meat produced/food consumed) by about 12% according to the calculations of Fennessy and Thompson (1989) based on a computer model of food intake and growth in red deer.

The general failure to induce twin births despite inducing twin ovulations during the breeding season (M W Fisher and P F Fennessy, unpublished data) raises the possibility of some sort of embryo reduction mechanism operating in the hind during the breeding season.

ARTIFICIAL INSEMINATION

While a number of studies have reported the birth of deer following artificial insemination (eg Krzywinski and Jaczewski 1978; Haigh 1984; Haigh et al. 1984; Magyer et al. 1989) only two, Asher et al. (1988b) working with fallow deer and P F Fennessy, C G Mackintosh and G H Shackell (unpublished data) with red deer, have included sufficient numbers to enable a critical evaluation of the technique. Both groups obtained semen by electroejaculation from anaesthetized bucks or stags and have inseminated intravaginally at fixed times at a synchronised (intravaginal progesterone with a single injection of PMSG at withdrawal in red deer) oestrus. Conception rates of up to 65% in fallow and 60% in reds have been attained. In fallow deer, fresh semen gave similar conception and fawning rates to frozen-thawed semen. The effect of timing of insemination, investigated in red deer, is summarised in Table 5.

Table 5 The timing of a single intravaginal insemination and pregnancy rate in red deer

Time of insemination (hours after progesterone withdrawal/PMSG administration)	Pregnancy rate (%)
36	38
44	44
52	44
60	38
68	6

In red hinds at least, a double intravaginal insemination (at 44 and 68 hours after progesterone withdrawal) resulted in higher overall pregnancy rates than a single insemination at any time (53% for double compared with 34% for single). In addition, laparoscopic intrauterine insemination (necessitating the hinds and does to be anaesthetized) has resulted in similar conception rates in both red (56%) and fallow (47%) deer.

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