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Post-mating progesterone supplementation in ewes and hoggets

W.H. McMILLAN

Whatawhata Hill Country Research Station
Ministry of Agriculture and Fisheries, Hamilton

ABSTRACT

Treatment with progesterone impregnated controlled internal drug releasers (CIDR) in early pregnancy can increase ewe reproductive performance. Return mating patterns, pregnancy rates and multiple pregnancies were evaluated in supplemented ewes and hoggets. Supplementation was over the 5 d from day 7 to 9 until day 12 to 14 post-mating. Supplementation had no effect on the pattern and incidence of return matings in ewes. In contrast, supplemented hoggets tended to return later with less returning (18% v 35%). Supplementation had no effect on ewe pregnancy rate although more supplemented hoggets lambed to first service (79% v 56%, $P < 0.05$). Supplementation increased multiple pregnancies resulting in 23% more foetuses in ewes and 40% more in hoggets. The progesterone supplemented sheep may be a useful experimental model for studies in reproductive wastage.

Keywords Post-mating progesterone supplementation; mating; pregnancy; embryo mortality.

INTRODUCTION

Progesterone supplementation in early pregnancy can increase pregnancy rate in adult ewes mating at the first synchronised oestrus (Peterson *et al.*, 1984). However, a response does not always occur. According to Australian work, improvements in pregnancy rate only occur in ewes fed a high level of post-mating nutrition (Parr *et al.*, 1986). Furthermore, improved pregnancy rates may be a feature of supplementation following a synchronisation treatment since no effect was reported for treatments after the second oestrus following synchronisation (Smith *et al.*, 1985).

Ewes supplemented with progesterone tended to have more foetuses per pregnancy when fed either low (+19%) or medium (+15%) but not high levels of post-mating nutrition (Parr *et al.*, 1986). Apparent improvements in multiple births have also been reported following intrauterine artificial insemination and post-insemination progesterone treatment (+15%, Davis *et al.*, 1986).

Collectively, these results demonstrate the potential for more pregnancies and more foetuses per pregnancy following progesterone supplementation. In addition, the post-mating utilisation of controlled internal drug releasers (CIDR) offers the prospect of synchronising return matings in ewes. The technique also warrants investigation in immature ewes since hoggets characteristically experience high levels of post-fertilisation failure (Quirke, 1981).

The aims of this study were to determine, in both adult and immature ewes, the return to service pattern, pregnancy rate and multiple pregnancy rate following post-mating progesterone supplementation using CIDRs.

MATERIALS AND METHODS

Adult Cheviot ewes were joined in 10 single sire

mating groups over 3 d following CIDR removal in late April. Half of the mated ewes in each sire group received a CIDR-type G containing 12% progesterone for 5 d from days 7 to 9 until day 12 to 14 post-mating (day of mating = day 0). The ewes were then rejoined with their respective sires for 6 d and return matings recorded.

Hoggets of the Texel, Finn and Finn x Coopworth genotypes were joined in single sire groups for 3 d following CIDR removal and a pregnant mares' serum gonadotrophin (PMSG) injection in early May. Half of the mated hoggets within each genotype and sire group were treated with CIDRs for 5 d and remated as outlined for Cheviot ewes.

The pregnancy status of ewes and hoggets was determined using real-time ultrasound scanning. Data were analysed by standard statistical procedures following a logit transformation.

RESULT AND DISCUSSION

One hundred and forty (97%) of the Cheviot ewes and 74 (95%) of the hoggets mated over the 3 d following first CIDR removal indicating an excellent synchronisation.

Progesterone supplementation had no effect on the pattern and overall incidence of return matings in ewes (Table 1).

This finding is consistent with earlier work where the incidence of returns was similar in treated and control ewes (Smith *et al.*, 1985). In contrast, there was a tendency for fewer and later (by up to 1 d) returns in treated hoggets. These results do not support the practice of using CIDRs to reduce the variation in return-to-service intervals in sheep. By contrast, there is considerable synchronisation of return heats in cattle (Macmillan *et al.*, 1987). This may reflect the larger variation in return intervals in

TABLE 1 Mating pattern following progesterone supplementation in ewes and hoggets (%).

	Days since end of supplementation				Overall
	2	3	4	5-6	
Ewes					
Supplemented	1	5	7	13	27
Control	2	4	7	16	30
Hoggets					
Supplemented	0	3	10	5	18
Control	3	11	21	0	35

cattle compared to sheep, and therefore the greater potential to resynchronise.

Progesterone supplementation tended to improve first service pregnancy rates in ewes. The improvement in hoggets was considerable (Table 2).

This is the first demonstration that the high level of post-mating wastage in hoggets can largely be overcome by progesterone supplementation. Although post-mating feeding levels were not monitored in this study, they were considered to be consistent with that needed for liveweight maintenance. This may explain the lack of an improvement in mature ewe fertility since post-mating CIDRs compensate for the lower progesterone and fertility apparent only in ewes fed high levels of post-mating nutrition (Parr *et al.*, 1986). Furthermore, the result in hoggets raises the possibility that CIDRs can reduce reproductive wastage when post-mating nutrition is only adequate for liveweight maintenance. This may indicate that peripheral progesterone levels are inadequate in immature compared to mature ewes, although this was not found in Romney ewes (Smith *et al.*, 1976). Alternatively, progesterone levels in hoggets may be independent of post-mating feeding level.

The incidence of multiple pregnancies was increased in ewes (25% first service, 19% overall) and hoggets (24% first service, 33% overall) (Table

2). These responses are generally larger than the 15 to 20% reported in other studies (Davis *et al.*, 1986; Parr *et al.*, 1986). The mechanism by which post-mating progesterone increased multiple pregnancies is not clear. What is likely is that post-fertilisation loss was reduced in multiple ovulators. Furthermore, increased multiple pregnancies, rather than more pregnancies, may be a more consistent feature in supplemented ewes. The response may be unrelated to nutritional effects on progesterone levels. Therefore, supplemented ewes and hoggets may be useful experimental models for studies on post-fertilisation loss in sheep.

In summary, these results demonstrate that post-mating progesterone supplementation using CIDRs cannot be recommended as a technique to synchronise rematings in ewes and hoggets. Fewer treated hoggets returned to service and more were pregnant. Return and pregnancy rates in ewes were unaffected by supplementation. Increases in multiple pregnancies were consistent in both supplemented ewes and hoggets. The net effect of supplementation was 23% more foetuses in ewes and 40% more in hoggets. Progesterone supplemented sheep may be a useful experimental model for studies in reproductive wastage.

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TABLE 2 Pregnancy status (%) following progesterone supplementation in mated ewes and hoggets.

Treatment	All joinings		Multiple pregnancies	
	Pregnant to first mating $\left(\frac{NP'}{NJ}\right)^1$	Total pregnant $\left(\frac{NP}{NJ}\right)^1$	Pregnant to first mating $\left(\frac{NPM'}{NP'}\right)^1$	Total pregnant $\left(\frac{NPM}{NP}\right)^1$
Ewes				
Supplemented	66	91	62	54
Control	62	87	37	35
Significance	NS	NS	*	*
Hoggets				
Supplemented	79	92	68	67
Control	56	85	44	34
Significance	*	NS	NS	*

¹ NJ Number joined; NP Number pregnant; NP' Number pregnant to first mating; NPM Number pregnant with multiples; NPM' Number pregnant with multiples to first mating.

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