THE EFFECT OF PROGESTAGEN TREATMENTS AND PMSG ON REPRODUCTIVE ACTIVITY OF FIRST-CALVING BEEF COWS

G.J. SAWYER*

SUMMARY

Two hundred and seventeen first-calving cows including Angus x Friesian crossbreds, Wokalup multibreds and Herefords were left untreated or treated with PRID coils for 12 days (Experiment 1), at approximately 60 days after calving. In a second experiment treated cows received Syncro-Mate-B for nine days with 650 IU of PMSG at implant removal at a similar time after calving. The treatments increased the proportion of cows with observed or palpable cyclical ovarian activity by 20% (Experiment 1) and 50% (Experiment 2). Significantly more PRID treated cows conceived compared to controls, but in both experiments the subsequent calving date and calving distribution of treated cows was not affected.

INTRODUCTION

Reproductive performance is a major determinant of profit from a beef suckler enterprise and because early and lifetime productivity are positively associated (Morris 1980) benefits accrue from high fertility in young breeding cattle. First-calving cows often show persistent anoestrus because of the effects of suckling and energy deficiency whilst lactating in an environment where pasture quantity and quality varies seasonally. A reliable method to induce oestrus and ovulation in first-calving cows post-partum would facilitate early rebreeding, which would be an advantage if the mating period is restricted or if the calving pattern must match nutrition available from pasture.

Progestagens have commonly been used to synchronise oestrus and ovulation in cyclic cows (Roche 1976; Roche et al. 1981) and injections of progesterone with or without oestrogen have induced oestrus and ovulation in non-cyclic cows (Foote and Hunter 1964; Saiduddin et al. 1968; Brown et al. 1972). Intravaginal administration of progesterone (PRID) or norgestomet (Syncro-Mate-B) in an ear implant are convenient methods of dispensing progestagens, with the added advantage that they may stimulate cows in anoestrus to commence ovarian activity (Hoagland and Barnes 1984). Few reports have dealt specifically with the effects of these methods in lactating first-calved beef cows. This study investigated the return to reproductive activity of first-calving cows using three breed types of differing lactational abilities, their response to progestagen treatment and their subsequent calving rate and distribution.

MATERIALS AND METHODS

Two hundred and seventeen first-calving cows including Angus x Friesian crossbreds (n = 134), Herefords (n = 38) and Wokalup multibreds (n = 45) which are a composite breed (Carrick and Robertson 1980), were used in two experiments conducted in autumn-winter of two years, Animals grazed annual pastures consisting of Trifolium subterraneum, Lolium spp and volunteer annual species on Wokalup Research Station and a private property near Donnybrook, in the high rainfall zone of Western Australia, They were stocked at 0.9 breeding cows per hectare and were fed supplementary meadow hay, immediately they calved, at approximately 5 kg/head/day during the months of April, May and June. Animals which had not calved, had suffered

* W.A. Department of Agriculture, PO Box 1231, Bunbury, W.A.. 6230.
calving paralysis or had borne a still born calf (n=15) were not included in the experiments.

All first-calving cows were run with harnessed and hormone-treated steers to monitor cyclical oestrous activity (Sawyer et al. 1986), or were palpated rectally to determine structures (follicles, corpus luteum) prior to treatment. In Experiment 1, animals were allocated within paddock groups on the basis of calving date (Table 1) and observed cyclical activity to two groups: Controls (n = 76) left untreated; and treated with PRID coils (n = 79), (Bomac Laboratories, Australia) inserted at the start of joining for 12 days. All cows inserted with PRIDs were checked four days later and there were no losses. In Experiment 2 animals were allocated as in Experiment 1: Controls (n = 29) left untreated; and treated (n = 33) with an intramuscular injection of 5 mg oestradiol valerate and 3 mg norgestomet given at the same time as a norgestomet ear implant (Syncro-Mate-B - Intervet Australia Ltd, Sydney, Australia) at the beginning of joining. The implant was left in place for nine days and 650 IU of PMSG (Pregnescol serum gonadotrophin, Livestock Laboratories Pty Ltd, Australia) was injected at implant removal.

Cows were joined in early July to fertile, libido-tested bulls (6% rate) wearing chinball harnesses and mating activity was recorded daily for the first week after PRID or implant removal and thereafter twice weekly. In both experiments, between eight and 12 days after PRID coil or Syncro-Mate-B implant removal, the reproductive tracts of all cows were palpated to determine palpable ovarian structures. Animals were weighed and scored for condition (0-5 point scale, East of Scotland College of Agriculture system) at four week intervals (Table 1). The date of second calving was subsequently recorded.

Discrete data were organised into contingency tables and analysed by Chi-Squared test. Analysis of variance and Student's t test were used on live weight, condition score and the interval from calving to oestrus or conception, the calving distributions of control and treated first-calvers were compared by the Kolmogorov-Smirnov two-sample test.

### Table 1 Live weight, condition, days since calving at allocation and weight change during joining in all first-calving cows

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Experiment 1</th>
<th>Experiment 2</th>
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<tbody>
<tr>
<td></td>
<td>Controls</td>
<td>Treated</td>
</tr>
<tr>
<td></td>
<td>Mean s.e.</td>
<td>Mean s.e.</td>
</tr>
<tr>
<td>Number of cows</td>
<td>76</td>
<td>79</td>
</tr>
<tr>
<td>Weight† (kg)</td>
<td>383 ± 4.0</td>
<td>381 ± 4.6</td>
</tr>
<tr>
<td>Condition score</td>
<td>2.0 ± 0.05</td>
<td>2.0 ± 0.05</td>
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<tr>
<td>weight gain during joining (kg/day)</td>
<td>0.6 ± 0.04</td>
<td>0.5 ± 0.03</td>
</tr>
<tr>
<td>Days since calving at allocation (days)</td>
<td>59 ± 2.0</td>
<td>50 ± 1.9</td>
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† At beginning of joining  Condition score, 0-5 scale

### RESULTS

Less cows had shown cyclical oestrus or ovarian activity at the time of allocation to treatment in Experiment 2 compared to Experiment 1; the 50% increase in activity in progestagen plus PMSG treated animals of Experiment 2 was significant (P<0.005, Table 2) and the 20% increase in Experiment 1 was not. The trends observed in the timing of second conception and the interval from calving to second conception were different in the two experiments, but not significant in either case (Table 2).
In both years more cows treated with either PRID coils or Syncro-Mate-B calved for a second time compared to controls. This effect was statistically significant (P<0.005, Table 2) only in Experiment 1. Fifty percent of Syncro-Mate-B treated cows calved in the first three weeks of the subsequent season compared to 20% of controls in Experiment 2. However, the trends for a later date of calving in Experiment 1 and an earlier date of calving after treatment in Experiment 2 were not statistically significant (P>0.1, Kolmogorov-Smirnov test).

Response to treatment did not differ with breed, live weight (range 284 - 496 kg) or the rate of weight gain in either experiment. Within treatment groups, response in terms of an increase in cyclical ovarian activity or a reduction in the time from first calving to second conception, was not significantly affected by the time after calving at which treatment was imposed, or whether cows were already cycling before treatment.

Table 2 Cyclical ovarian activity before and after treatment, calving to conception interval and subsequent calving percentage for all cows

<table>
<thead>
<tr>
<th>Measurement/Observation</th>
<th>Activity at allocation (%)</th>
<th>Activity after treatment (%)</th>
<th>Day of year for second conception (±s.e.)</th>
<th>Calving to second conception (days±s.e.)</th>
<th>Percentage subsequently calved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1 Controls 59 (45/76) 74 (56/65) 198±3 84±3 63%</td>
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<tr>
<td>Experiment 1 Treated 58 (46/79) 60 (63/79) 203±3 91±3 90%</td>
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<tr>
<td>Significance n.s. n.s. n.s. n.s. 0.006</td>
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<tr>
<td>Experiment 2 Controls 38 (11/29) 55 (16/29) 203±4 92±6 93%</td>
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<tr>
<td>Experiment 2 Treated 42 (14/33) 91 (30/33) 197±3 84±4 94%</td>
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<td>Significance n.s. 0.005 n.s. n.s. n.s.</td>
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DISCUSSION

In both experiments cyclical ovarian activity increased in response to progestagen treatment, though no significantly in Experiment 1. This increase was most pronounced when 650 IU of PMSG was administered after Syncro-Mate-B implant removal. Though this resulted in 50% of cows calved in the first three weeks of the subsequent calving period compared to 20% in controls, the average calving to conception interval and the subsequent calving distribution were not significantly affected.

Our work was marked by generally high levels of fertility which resulted in an average time of conception of three to four weeks after joining commenced. In addition the calving to second conception interval was uniform as indicated by the standard error of the mean (Table 2) in both control and treated first-calvers. These results are similar to those of Peters (1982) where there was no overall effect of PRID treatment on the mean calving interval in 436 suckling beef cows.

Unlike most previous work we commenced treatment at the start of joining with the aim of testing the ability of progestagen treatment to enhance fertility in the post-partum period and not simply synchronise animals already cycling. The focus was on late calving animals which could fail to conceive in a restricted joining period.

Other work has shown an apparent advancement of the average date of conception because treated cattle were synchronised, while untreated cattle cycled randomly, and were mated, over the next 21 days. Because of the
comparatively high cyclical activity of cows in Experiment 1 the progestagen treatment controlled, more than induced, oestrus and ovulation similar to the first year of Peters' (1982) work. In the current work PRID treatment did produce a significantly higher calving rate in Experiment 1, but this response could not be explained in terms of the time after calving when treatment was imposed or whether cows were cycling before treatment. In Experiment 2 the first-calfers were 0.5 units worse in condition and 60% had no ovarian activity when palpated. Syncro-Mate-B and PMSG treatment more than doubled cyclical ovarian activity to 91% which was similar in proportion (19% to 41%) to work reported by Munro and Moore (1985) with suckled beef cows. This encouraging response may be due to the progestagen treatment allowing accumulation of pituitary gonadotrophins or to an increase in pituitary responsiveness to endogenous GnRH (Smith et al. 1983; Hoagland and Barnes 1984).

No measures of fertility or a response to treatment were influenced by live weight, condition or their rates of change at initiation of treatment. This is not surprising considering that 70% of cows were above target weights for these breeds for conception after first calving (Sawyer and Barker unpublished) and they all gained weight during joining. However, the low level of cyclical ovarian activity approximately 60 days post-partum in all Angus x Friesian cows of Experiment 2 may be due to the stress of a higher milk producing ability in this breed type especially when condition during joining is low (0.5 units of condition poorer than those of Experiment 1).

In conclusion though few tangible benefits from progestagen treatment after first calving could be demonstrated overall in these herds, the results of Experiment 2 show that there may be a role for strategic use to induce oestrus and ovulation in selected animals, especially those in poorer condition. In a batch mating situation, a program which uses harnessed oestrogen-treated steers (Sawyer et al. 1986) to assess which animals are cycling, and then treatment with a progestagen plus PMSG on anoestrous first-calfers, could generate improved conception rates overall in young breeders, and subsequently in lifetime production. Strategic use should ensure that the benefits would far exceed costs of treatment.

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REFERENCES