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# CIDR-B for managed reproduction in beef cows and heifers

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## ABSTRACT

A controlled internal drug release device, containing progesterone (CIDR-B), was evaluated as an aid to reproductive management in beef cattle in 2 trials. In Trial 1, 223 animals, comprising 64 early calving cows, 61 late calving cows, 59 maiden cows and 39 15-month heifers (yearling heifers), were treated intravaginally with CIDR-B for either 12d (plus 10mg oestradiol benzoate; 12d CIDR-B + ODB) or for 15d (15d CIDR-B). CIDRs were reused for 5d in half the animals from 16d after initial use. In Trial 2, 145 animals, comprising 53 early calving cows, 43 late calving cows and 49 15 month heifers, were treated intravaginally with CIDR-B for either 14d (14d CIDR-B) or 21d (21d CIDR-B). At CIDR-B withdrawal, half of the animals received an intra-muscular injection of 400 IU PMSG.

In Trial 1, within 48h of CIDR-B withdrawal, 58% and 54% of the animals were mated in the 15d CIDR-B and 12d CIDR-B + ODB groups respectively. Within 96h, the incidence of mating was 87% and 76% respectively with the difference between treatments being more pronounced in cows (88% v 74%;  $P < 0.05$ ) than in yearling heifers (86% v 84%). In cows, pregnancy rate to mating over the first 4 days was 50% in the 15d CIDR-B group and 67% in the 12d CIDR-B + ODB group ( $P < 0.05$ ). In yearlings, there was an opposite tendency (71% v 44%;  $P > 0.1$ ). Final pregnancy rate was 92% with no treatment group differences. CIDR-B reuse did not alter conception rates to first or second service but did synchronise returns.

In Trial 2, within 4d of CIDR-B removal, 88% and 97% of the 14d CIDR-B and 21d CIDR-B groups had mated. In the 0 and 400 IU PMSG groups, 90% and 95% had mated. Pregnancy rate in treated animals to mating over the first 4 days following CIDR-B withdrawal were similar in the 14d CIDR-B and 21d CIDR-B groups (54% v 57%) and 0 and 400 IU PMSG groups (55% v 56%). However, pregnancy rate tended to be lower in yearling heifers compared to cows (46% v 57%;  $P > 0.1$ ). Final pregnancy rate tended to be higher in the 21d CIDR-B group than in the 14d CIDR-B group (89% v 82%;  $P > 0.1$ ). Fewer heifers were finally pregnant compared to early and late calving cows (74% v 85% v 95%).

In both trials, longer CIDR-B treatment intervals were associated with earlier and more synchronised matings. Acceptable pregnancy rates were achieved with CIDR-B treatment intervals of between 12d and 21d. These results indicate that CIDR-B treatment without supplementary hormones can produce acceptable synchrony and fertility in naturally mated suckling beef cows and yearling heifers.

**Keywords** CIDR-B; beef cattle; reproduction; yearling heifers; oestrous synchronisation; anoestrus; calving date; beef cow reproduction

## INTRODUCTION

For maximum profitability in a hill country beef breeding enterprise, all the cows should, commencing as 2-year-olds, calve once every 12 months and calving should be confined to a period of no more than 8 weeks. In reality, yearling heifer in-calf rates of 75%-85% and cow in-calf rates of 90-95% are achieved in well managed herds. Beef herds with poor reproductive performance are characterised by calving-calving intervals longer than 12 months because cows fail to conceive within 80-90d of calving (Montgomery, 1985). An extended postcalving anoestrus frequently

contributes to this poor reproductive performance. Procedures which induce and/or synchronise oestrus and ovulation in beef cattle may reduce the effects of anoestrus (Smith and Tervit, 1980). In particular, controlled internal drug release devices for bovine use (CIDR-B), which contain progesterone have been effective in this regard in dairy cattle (Macmillan and Day, 1987). Furthermore, their use in dairy heifer management for AI has also been demonstrated (Macmillan, K.L., pers comm.). Potential benefits to beef producers accruing from the use of CIDR-B technology could include reliable herd management for anoestrus in cows and yearlings,

facilitation of AI and facilitation of yearling heifer matings. Other potential benefits arising from oestrus induction/synchronisation include shorter and predictable mating/calving patterns, improved feeding management especially in late pregnancy/early lactation and less variable calf weights at weaning. There is no published information on CIDR-B use in beef cattle.

This paper describes the effectiveness of CIDR-B, as an aid to beef cow and heifer reproductive management, when used alone or in conjunction with supplementary hormones.

## MATERIALS AND METHODS

### Trial 1

Two hundred and twenty three beef cattle, comprising 3 herds of 64 early calving cows (mean date 1 September), 61 late calving cows (mean date 1 October), 59 maiden cows and 39 15-month heifers, were allocated to one of 4 groups in a 2x2 factorial design. A CIDR-B was inserted into the vagina of all cattle and withdrawn on a common date either 15d (15d CIDR-B) or 12d (12d CIDR-B + ODB) later. In the latter case, the CIDR had a gelatin capsule containing 10mg oestradiol benzoate (ODB) inserted into its grooved surface to initiate luteolysis. The elastomer coating of the CIDR-B contained 1.9g of micronised USP grade progesterone at a concentration of 10% within the elastomer. There was a 7d interval in CIDR-B removal dates between each of the 3 herds.

The CIDR-B were washed in warm water containing Savlon antiseptic and air dried after initial removal. Half of the 15d CIDRs and half of the 12d CIDRs were reused in the cattle for 5d from 16d after the end of initial use.

### Trial 2

Each of 96 lactating beef cows and 49 yearling heifers was allocated to one of 4 groups in a 2x2 factorial design. Half of the animals received a CIDR-B for 14d and the remainder a CIDR-B for 21d (14d CIDR-B *v* 21d CIDR-B). CIDR-B withdrawal was on a common date when half of

the animals in each CIDR group were given a single intramuscular injection of 400 IU PMSG (0 *v* 400 IU PMSG). There were 3 herds of cattle: 53 early calving cows (mean calving date = 2 Sept), 43 late calving cows (mean calving date 12 Sept) and 49 yearling heifers. Each cow from the early and late calving herd was randomly allocated to one of 2 batches with CIDR-B removal 14 days apart. The timing of CIDR-B removal for heifers was midway between these 2 batches.

### Mating and Conception

Each batch was divided into mating groups of 25-30 animals at CIDR-B removal, and each group joined for 4d with 3 young bulls with acceptable semen tests. The herds (Trial 1) and batches (Trial 2) were then reformed and run with 2 bulls until the end of joining either 28d (maiden cows, all yearling heifers) or 50d later (lactating cows). Tail paint removal and chin ball harness marks were used to indicate mating. Pregnancy was assessed by rectal palpation after the end of joining.

### Analysis

Data were analysed following logit transformation.

## RESULTS

### Mating

TABLE 1 Proportion of treated animals mated within 96h of CIDR-B removal (%) Trial 1. (Number of animals in parentheses).

	15d CIDR	12d CIDR + ODB
Yearling heifers (39)	86	84
Maiden cows (59)	93	79
Early calving (63)	84	73
Late calving (62)	86	69
Total (223)	87	76

### Trial 1

Within 30h of CIDR removal, 6 animals (5%) in the 15d CIDR-B group were mated compared to 1

animal (1%) in the 12d CIDR-B + ODB group. Twenty four hours later, the respective incidence of matings were 58% v 54%. Within 4d of CIDR-B removal, 87% and 76% ( $\chi^2 = 5.1 P < 0.005$ ) were mated (Table 1). There were more cows mated within 4d in the 15d CIDR-B group than in the 12d CIDR-B + ODB group (88% v 74%  $\chi^2 = 6.4 P < 0.05$ ). In yearling heifers, by contrast, there was little difference between treatments (86% v 84%).

CIDR-B reuse did not alter return to service rates but tended to synchronise returns.

**TABLE 2** Proportion of treated cows mating up to 4 days after CIDR-B removal (%) Trial 2.

Day	CIDR		PMSG	
	14d	21d	0	400 IU
1	4	5	4	5
2	60	* 76	65	71
3	83	90	83	89
4	88	93	88	93

**Trial 2**

Earlier matings occurred in cows and yearling heifers in the 21d CIDR-B group compared to the 14d CIDR-B group (Tables 2, 3). The inclusion of 400 IU PMSG advanced the time of mating in yearling heifers, but not in cows (Tables 2, 3).

**TABLE 3** Proportion of treated yearling heifers mated up to 4 days after CIDR-B removal (%) Trial 2.

Day	CIDR		PMSG	
	14d	21d	0	400 IU
1	13	20	16	17
2	63	71	52	* 82
3	64	79	57	87
4	100	100	100	100

More yearling heifers than cows were mated within 24h of CIDR-B withdrawal (17% v 5%  $\chi^2 = 4.9 P < 0.05$ ). All yearlings had mated within 4d of CIDR-B withdrawal compared to 91% of cows ( $\chi^2 = 3.90 P < 0.05$ ).

**Conception**

**Trial 1**

The conception rate to first matings was 50% for cows in the 15d CIDR-B group compared to 67% in the 12d CIDR-B + ODB group ( $\chi^2 = 4.9 P < 0.05$ ) (Table 4). By contrast, in yearling heifers the tendency was for more conceptions in the 15d CIDR-B group compared to the 12d CIDR-B + ODB group (71% v 44%  $\chi^2 = 2.6 P > 0.1$ ).

CIDR-B reuse did not alter conception rates to first matings (56% v 60%) or second matings (59% v 52%).

**TABLE 4** Proportion of animals conceiving to first mating (%) Trial 1.

	15d CIDR	12D CIDR + ODB
Yearling heifers	71	44
Maiden cows	45	62
Early calving	47	63
Late calving	57	76
Total	54	63

Final pregnancy rate was similar in the 15d CIDR-B group and 12d CIDR-B + ODB group (91% v 92%). Yearling heifers had the lowest final pregnancy rate (82%) followed by maiden cows (86%), early calving cows (95%) and late calving cows (98%). The mean intervals from CIDR removal to conception were 10,12, 13 and 11d respectively for these 4 classes of cattle.

**Trial 2**

Pregnancy rates to matings over the first 4d were similar in the 14d CIDR-B group and 21d CIDR-B group (54% v 57%). Treatment with 400 IU PMSG did not alter conception rate to these matings (55% v 56%). Yearling heifers tended to have lower conception rates to matings within 4d compared to early and late calving cows (46% v 57% v 60%).

Final pregnancy rate tended to be lower in the 14d CIDR-B group compared to the 21d CIDR-B group (82% v 89%). PMSG treatment did not alter final pregnancy rate (85% v 87%). Fewer

yearling heifers were finally pregnant compared to early and late calving cows (74% v 85% v 95%).

## DISCUSSION

All CIDR-B treatments produced acceptable synchrony and fertility in cows and yearling heifers in both trials. Those treatment intervals of  $\geq 14$ d did not need luteolytic or gonadotrophic supplementation. The results indicate that it is possible to use one standard treatment for yearling heifers, maiden cows and lactating cows from about 4 weeks after calving. This simplicity is likely to confer logistical as well as financial benefit to beef producers.

The precision of synchrony of oestrus is unacceptable for fixed time artificial insemination (AI). However, artificial insemination or natural mating over 4d is clearly feasible. With natural mating over 4d, 40%-50% of treated yearling heifers and 50%-60% of treated cows would be pregnant.

PRIDs (progesterone intravaginal device) produce lower pregnancy rates to AI when inserted for  $< 14$ d (Smith and Tervit, 1980). Although shorter treatment durations of 7-12d overcome this, oestrogen or prostaglandin must be included as a luteolytic agent (Smith and McGowan, 1982; Hansel, 1985). CIDR-B and PRIDs are both effective in overcoming anoestrus.

The average post-partum interval at CIDR-B withdrawal in the early and late calving cows was 77d and 55d in Trial 1. These intervals are almost identical to the expected mean calving to first oestrus intervals for these 2 herds (Smeaton *et al.*, 1986). Thus, about half of the cows were probably induced to cycle following CIDR-B treatment. An outcome of CIDR-B treatment in these early calving cows in Trial 1 was to maintain an annual calving intervals since it took a total of 90d from calving to conception (77d to CIDR-B removal plus 13d to mean conception). By contrast, in the late calving herd, the outcome was a mean calving to conception interval of 66d (55d + 11d). Thus, the subsequent mean calving date in the late calving herd was advanced by about 3 weeks, and most cows (98%) were pregnant. These 2

outcomes would have been unlikely in the late calving herd without CIDR-B. An earlier CIDR-B treatment for early calving cows may have produced a similar advancement in mean calving date.

This ability of CIDR-B treatment to overcome anoestrus as well as synchronise oestrus may have benefits for beef producers where calving dates of all or part of a herd may need to be advanced. For example, herds with a prolonged calving spread may benefit from a controlled breeding program using CIDR-B to advance and/or condense calving as a means of improving overall herd reproductive rates. Similarly, low conditioned lactating 2-year-old cows may benefit from treatment with CIDR-B to ensure earlier than expected oestrus and conception. Multiple suckled cows, which characteristically have extended intervals from calving to first oestrus, may only reliably achieve an annual calving if treated with CIDR-B. The logistics and management of yearling heifer mating and calving may be facilitated by a controlled breeding program using CIDR-B. In yearling heifers, the achievement of 40-50% pregnancy rates within 4d of the planned start of mating would generate a longer lactation as well as a longer interval from calving to the planned start of subsequent mating. This could increase the chances of mating and conception within 3 weeks of commencing the subsequent mating program.

The management, particularly feeding management, of a CIDR-B treated herd is likely to be made easier since stage of pregnancy is less variable and more accurately known. Other benefits of controlled breeding could be the earlier identification and disposal of non-pregnant animals.

In summary, these findings demonstrate that acceptable pregnancy rates can be achieved, under a system of natural mating, in beef yearling heifers, maiden cows and lactating cows using CIDR-B treatments. Treatment intervals of 14d-21d are recommended and no supplementary hormone is needed. CIDR-B treatments may have an important role in managing yearling heifer matings; advancing mean herd calving dates and

inducing early oestrus and conception in previously anoestrous beef females.

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