Patterns of oestrus vary with different forms of synchrony

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ABSTRACT

The original objective of a trial conducted in 3 herds of Friesian heifers was to compare pregnancy rates obtained when each animal was synchronised and then inseminated at about 50 h after removal of a subcutaneous ear implant (Crestar™) or an intravaginal device (Genermate™). Because most of the heifers in the Crestar™ group were in oestrus before any of the herdmates treated with the Genermate™ system, the Crestar™ treated heifers were inseminated at either 28 h or 50 h after implant removal.

Over the 3 herds, 64% of 153 heifers treated with Crestar were in oestrus by 28 h after implant removal compared to 7% of their Genermate™ treated (n=155) herdmates ($P<0.01$). The average pregnancy rate to first insemination of 56.3% was similar for both synchrony treatments, and for the two insemination times in Crestar™ treated heifers.

The earlier onset of oestrus in heifers treated using the Crestar™ system was possibly associated either with persistent and dominant ovarian follicles, or to the injected oestradiol valerate producing behavioural symptoms of oestrus. Nonetheless, inseminating heifers with a shortened interval to oestrus at 28 h rather than 50 h after implant removal may avoid reductions in pregnancy rate which occur with inseminations made after the end of oestrus, or with heifers which ovulate a persistent dominant follicle.

Keywords: Dairy heifers; oestrous synchrony; oestradiol; ovarian follicle; behavioural oestrus.

INTRODUCTION

One advantage from synchronising oestrus is that most of the animals in a herd can be inseminated within a shortened period of time so that skilled or specialist labour can be used more effectively. The ultimate objective is to condense the occurrence of oestrus into such a short period that all of the animals in a herd can be inseminated within a period of 3 or 4 h. Once the precision in synchrony approaches this objective, then animals may not need to be checked for oestrus; they are simply inseminated at a prescribed time i.e. set-time inseminating. The inherent risk with this practice is that some animals may have completed the behavioural sequence of oestrus at least 12 h before the appointed insemination time while others are still in pro-oestrus (Macmillan & Peterson, 1993). These animals will have less chance of conceiving to these pre- and post-oestrus inseminations (Macmillan & Watson, 1975).

The most commonly recommended procedure with heifers synchronised using treatment regimens based on a progestagen and an oestradiol is to inseminate them from 48 to 52 h after the end of the treatment, achieved by removing an intravaginal device (Genermate™; Cliff *et al.*, 1995) or a subcutaneous implant (Crestar™ , or Syncromate B™ ; Kesler *et al.*, 1995). This is because less than 10% of animals should be in oestrus within the first 24 h and at least 90% should commence oestrus from 24 to 48 h after device/implant removal. If more than 10% are in oestrus within 24 h, then the synchrony treatment may not have maintained normal patterns of ovarian follicle development. Under these circumstances, dominant follicles continue to grow and produce increasing amounts of oestradiol, resulting in a shortened interval to a precisely synchronised oestrus which has reduced fertility (Sanchez *et al.*, 1993; Macmillan & Peterson, 1993). An additional complication with synchrony treatments incorporating an injection of 5 mg oestradiol valerate (ODV) is that plasma concentrations of oestradiol are elevated throughout the treatment period and will produce precocious oestrus in ovariectomised animals (Kinder *et al.*, 1993; Larson & Kesler, 1995).

The following experiment was designed initially to compare pregnancy rates obtained by synchronising dairy heifers with either Genermate™ or Crestar™ for 10 days and then inseminating them about 50 h after device or implant removal. This simple design was complicated when many of the animals treated with Crestar™ in the first herd had completed oestrus within 24 h of implant removal. It was modified so that animals in the Crestar™ group which showed an early onset of oestrus could be inseminated at 28 h.

MATERIALS AND METHODS

Three herds of heifers containing 308 Friesian animals aged 15 months were synchronised with Genermate™ (Livestock Improvement Corporation, NZ; LIC) or Crestar™ (Intervet, Belgium) systems. In the former case, an Eazi Breed CIDR™ device (InterAg, NZ) with a CIDIROL™ capsule (InterAg) was inserted into the vagina of a heifer for 10 days. The device contained 1.9 g progesterone and the capsule 10 mg oestradiol benzoate (ODB). Either 2.5 ml Lutalyse™ (Upjohn, NZ) or 1.0 ml Estrumate (Pitman Moore, NZ) was injected on the sixth day to ensure luteolysis

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had occurred at least 4 days before device removal (Cliff *et al.*, 1995). The Crestar™ system involved the subcutaneous insertion of a silicon ear implant containing 3 mg of the potent progestagen norgestomet for 10 days, as well as an intramuscular injection of 6 mg norgestomet and 5 mg ODV. Device or implant removal was between 1000 and 1200 h in each herd. Every animal was tailpainted at treatment initiation and each paint strip was sprayed with an aerosol at device or implant removal, with the handling procedures taking 1.5 to 2.5 h in each herd.

Animals in each herd were checked visually for symptoms of behavioural oestrus 8, 22, 28 and 48 h after treatment termination as well as by monitoring tailpaint and raddle (Macmillan *et al.*, 1988). At 22 h, 56% (18 of 32) of heifers in Herd 1 which had received the Crestar™ treatment had completed oestrus (n=12), or were still in oestrus (n=6) compared to none of 28 herdmates treated with the Genermate™ system. Because of the obvious major treatment difference in synchrony patterns, and because a high incidence of oestrus within 24 h of treatment termination is commonly associated with lower pregnancy rates (Mihm *et al.*, 1994), the decision was made to inseminate every heifer which was obviously in oestrus and with a paint score <4 at 28 h (Macmillan *et al.*, 1988). The single qualification was that if less than 10% of animals in a treatment group within a herd was in oestrus by 28 h, they would not be inseminated until the originally nominated time of 50 h after device or implant removal. Each insemination was performed by a professional inseminator employed by the LIC using deep frozen semen nominated by the herd owner, but from sires identified as having high non-return rates.

Fifteen or 16 days after insemination, CIDR™ devices or Crestar™ implants were inserted or implanted for 5 days to resynchronise oestrus in non-pregnant animals so as to have a second insemination on detection of oestrus at 48, 72 or 96 h after device or implant removal (Cliff *et al.*, 1995). Bulls joined each herd of heifers at 120 h. Each animal was subsequently pregnancy tested by rectal palpation of uterine contents, first at around 40 days after first inseminations, and then at a similar period after the bulls had been removed from a herd.

The only animals not included in the analyses were those which were found to have an abnormal reproductive tract (n=3) or to have lost the device (n=4) or implant (n=8) during the synchrony treatment. Chi-square statistics compared synchrony patterns and pregnancy rates to first insemination for treatment, time of insemination within treatment and herd.

RESULTS

More of the heifers synchronised with Crestar™ were detected in oestrus and inseminated at 28 h after implant removal (64% vs 7%; P<0.01; Table 1) with this percentage being higher in Herd 1 than in Herds 2 or 3 (P<0.05; Table 1). By 50 h, an overall average of 93.5% of heifers had been or were still in oestrus, and this figure was not affected by treatment (95% vs 91.5% : Genermate™ vs Crestar™; P>0.20), or herd (91% to 98%; P>0.20). The 6.5% not diagnosed in oestrus included animals with a prolonged pro-oestrus and others which ovulated without behavioural symptoms sufficient to cause significant removal of raddle or paint. The average pregnancy rate to first insemination was 56.3%. It was similar for both synchrony treatments (54.3% vs 58.8% : Genermate™ vs Crestar™; P>0.20; Table 1) and for both insemination times in Crestar™ treated heifers (57.7% vs 60.7% : 28 h vs 50 h; P>0.20). Pregnancy rates for individual herds ranged from 47.6% (Herd 3) to 72.3% (Herd 2; P<0.05; Table 1).

TABLE 1: Number of heifers in three herds synchronised using CrestarTM(C) or GenermateTM(G) systems with percentages in oestrus at 28 hours after implant or device removal or conceiving to first inseminations.

Herd No	Nos. treated		% in oestrus at 28 h:		% preg. to 1st insem.:	
	C	G	C	G	C	G
1	31	32	97	3	51.6	53.6
2	50	51	54	8	78.0	66.7
3	72	72	56	8	48.6	46.6
Total	153	155	64	7	58.8	54.3

DISCUSSION

The early onset of oestrus after implant removal in such high proportions of heifers treated with Crestar™ was unexpected. In a previous comparative trial, 11% of 107 heifers treated in the same way were detected in oestrus at 24 h (K.L. Macmillan, unpublished). The stage of the oestrous cycle when a treatment similar to Crestar™ was commenced has been shown to influence the pattern of synchrony. If luteolysis occurs spontaneously within 3 or 4 days of inserting a norgestomet implant, then the maturing ovarian follicle associated with the luteolytic sequence will rapidly develop and grow to become an oestrogenically active, persistent dominant follicle (Sanchez *et al.*, 1993; Mihm *et al.*, 1994). This follicle will ovulate an oocyte which can be successfully fertilised, but does not continue to develop normally (Wishart, 1977).

This sequence has been frequently regarded as a reason why a shortened interval to oestrus with a synchrony treatment will be associated with a lower pregnancy rate. Since the injection of 5 mg ODV as used in the Crestar™ system has been shown to produce elevated concentrations of plasma oestradiol for more than the 10 day period of implant insertion, the ODV may contribute to an earlier onset of oestrus in entire as well as in ovariectomised animals. This effect of ODV may also be associated with an altered timing in the ovulatory surge of LH relative to the time of implant removal (Kojima *et al.*, 1992).

The results of this experiment indicate that further trials should be completed to establish the relationships contributing to the early onset of oestrus in some heifers treated with norgestomet and ODV. They should establish whether this early onset is also associated with a modified sequence in the timing of the LH surge and ovulation. If

the ovaries of those animals with the shortened interval to oestrus also contained a persistent dominant follicle, then previous conclusions about the lower fertility derived from inseminating these animals after they have gone out of oestrus may need to be re-examined.

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