THE USE OF OESTRADIOL BENZOATE AND PROGESTERONE TO SYNCHRONISE OESTRUS IN DAIRY CATTLE

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GENERAL ABSTRACT

Current oestrus synchronisation regimes for cattle are based on synchronising the end of the progestational phase of the oestrous cycle so that ovulation occurs simultaneously in treated animals. The end of the progestational phase can be synchronised through inducing premature luteolysis using prostaglandin $F_{2\alpha}$ and its analogues or by artificially extending dioestrus using exogenous progesterone treatment. The time taken for subsequent follicular maturation and ovulation tends to be inconsistent between animals, which contributes to the poor fertility obtained following fixed-time insemination after oestrus synchronisation treatments. The variable rate of follicular development occurring after a synchronous decline in plasma progesterone levels is a major limiting factor in achieving a degree of synchrony of oestrus and ovulation which would allow for fixed-time insemination.

Controlling the time of ovulation using exogenous oestrogen to induce a pre-ovulatory LH surge is a potential method by which the variability in timing of ovulation may be reduced. Alternatively, re-setting follicular wave patterns in different animals at the commencement of synchrony treatments using exogenous oestrogen, so that follicular wave emergence is synchronised, is another method by which the variability in timing of ovulation could be reduced.

A clinical trial was conducted involving 750 dairy heifers in 13 herds to determine the effects of 0.5 mg oestradiol benzoate administered intramuscularly 24 hours after removal of progesterone-containing intravaginal devices (CIDR-B) on the occurrence and timing of oestrus, synchronised pregnancy rate and synchronised conception rate in dairy heifers. Within each herd heifers were randomly allocated to one of two oestrus synchronisation treatments. All heifers received a CIDR-B progesterone-containing intravaginal device with an attached 10 mg oestradiol benzoate capsule for 12 days. Twenty-four hours after CIDR-B removal one group received an intramuscular injection of 0.5 mg oestradiol benzoate and the other group received an intramuscular injection of a placebo. Heifers were inseminated to detected oestrus 48 and 72 hours after device

removal. Administration of oestradiol benzoate 24 hours after removal of CIDR-B devices significantly increased the number of heifers exhibiting oestrus within the observation period (96.1 % vs 90.5%, $p<0.01$). It also altered the onset of oestrus so that significantly more heifers were in oestrus (86.6% vs 72.3%, $p<0.01$) and conceived (47.1 % vs 37.5%, $p<0.05$) by 48 hours after device removal. The overall synchronised conception rate and synchronised pregnancy rate were unaffected by treatment.

The effects of the same oestrus synchronisation treatment, on the time to oestrus, ovulation, and peak LH concentration were examined in dairy heifers. Treatment with oestradiol benzoate tended to reduce the time from device removal to LH peak in randomly cycling heifers (median time to LH peak 40.1 hr vs 63.9 hr, $p=0.07$), but treatment with oestradiol had no significant effect on the time to LH peak, standing oestrus or ovulation in heifers synchronised during late dioestrus.

The effects of oestradiol benzoate on the dominant follicle and corpus luteum of cows treated with progesterone (CIDR-B) at different stages of the oestrous cycle were investigated. Treatment with oestradiol benzoate on day 3 of the oestrous cycle caused atresia of the dominant follicle present at CIDR-B insertion and resulted in the early emergence of the subsequent follicular wave. Treatment with oestradiol benzoate on days 6, 9, 12 and 15 of the oestrous cycle had no effect on follicular characteristics or the emergence of the subsequent follicular wave. Treatment with oestradiol benzoate had no effect on the day of onset of regression of the corpus luteum regardless of the stage of the oestrous cycle at CIDR-B insertion.

The effectiveness of re-using CIDR-B devices to synchronise returns to oestrus in non-pregnant dairy heifers was examined. After an initial CIDR-B synchronisation programme in dairy heifers, the used CIDR-B devices were re-inserted 14 or 16 days after first insemination, for a period of 5 days. Re-insertion of used CIDR-B devices significantly increased the number of non-pregnant heifers detected in oestrus and inseminated by 48 hours after device removal (45.2% vs 27.3%, $p<0.05$, in herds where CIDR's were re-inserted on day 14; 48.8% vs 13.6%, $p<0.05$, in herds where CIDR's

were re-inserted on day 16). Re-insertion at 14 or 16 days after first insemination was equally effective in increasing visible returns to service. Conception rate was unaffected by CIDR-B treatment.

In conclusion, intramuscular administration of oestradiol benzoate 24 hours after the removal of CIDR-B progesterone-containing intravaginal devices increases the number of heifers exhibiting oestrus at an earlier time after device removal. The administration of oestradiol benzoate appears to reduce the variability in timing of LH peaks typically occurring in a herd of synchronised heifers due to different stages of follicular development being present at the time of CIDR-B removal. Treatment with oestradiol benzoate at the start of CIDR-B treatment appears to have no significant effect on synchronising follicular wave emergence in different animals other than those in early metoestrus. Administration of oestradiol benzoate after treatment with exogenous progesterone therefore appears to offer the most potential in controlling the time of oestrus and ovulation and allowing for fixed-time insemination.

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Hanlon, D.W.; Wichtel, J.J.; Williamson, N.B.; Steffert, I.J.; Craigie, A.L.; Pfeiffer, D.U. The effect of oestradiol benzoate on ovarian dynamics in dairy cows treated with progesterone. *Animal Reproduction Science*.

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