

New Zealand Society of Animal Production online archive

This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website www.nzsap.org.nz

[View All Proceedings](#)

[Next Conference](#)

[Join NZSAP](#)

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](http://creativecommons.org/licenses/by-nc-nd/4.0/).



You are free to:

Share— copy and redistribute the material in any medium or format

Under the following terms:

Attribution — You must give [appropriate credit](#), provide a link to the license, and [indicate if changes were made](#). You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for [commercial purposes](#).

NoDerivatives — If you [remix, transform, or build upon](#) the material, you may not distribute the modified material.

<http://creativecommons.org.nz/licences/licences-explained/>

Reproductive performance of synchronised lactating dairy cows

Z.Z. XU, J.R. BURTON, L.J. BURTON AND K.L. MACMILLAN¹

Livestock Improvement Corporation Ltd, Private Bag 3016, Hamilton, New Zealand.

ABSTRACT

The objective of this trial was to evaluate the reproductive performance of lactating dairy cows following oestrous synchronisation with a combination of progesterone, oestradiol and prostaglandin. Cycling cows in 11 herds were randomly divided, with restriction to age, calving date, condition score and breed, into synchronised (n=1349) and control (n=1332) groups. Those in the synchronised group were each treated with an EAZI-BREED™ CIDR® device and a CIDIROL® capsule for 8 days, with an injection of an analogue of prostaglandin F_{2α} 2 days prior to CIDR removal. Control cows were left untreated. Compared to the control cows, those in the synchronised group had a lower conception rate to the first round of AB (52.9% vs. 64.3%), a lower conception rate to all AB matings (53.2% vs. 63.9%), an increased number of AB services per pregnancy to AB (2.0 vs. 1.6), and an increased percentage of empty cows (7.3% vs. 5.1%). There was no difference between synchronised and control groups in the percentage of cows pregnant to AB (81.8% vs. 85.5%) or in the mean day of conception (20 vs. 21 days). The oestrous synchronisation regime tested in this study caused a reduction in fertility. This negated some of the potential gains from using such a treatment programme.

Keywords: Oestrous synchronisation, conception rate, fertility, lactating dairy cows.

INTRODUCTION

Reproductive performance of dairy cows affects dairy production efficiency by influencing milk yield per day of herd life, number of replacements produced per cow and culling practices (Esslemont & Peeler, 1993). A high reproductive performance is especially important for seasonal dairy herds, like the majority of herds in New Zealand, where mating and calving are restricted to a limited period of the year. The ability to synchronise onset of oestrus, and hence the time of breeding and calving, offers potential economic and management benefits to dairy farmers by increasing the usage of proven bulls, advancing the mean calving date and reducing the percentage of empty cows at the end of the mating season. Recent research effort in New Zealand aims to develop synchronisation programmes that are suitable for lactating dairy cows (Macmillan & Peterson, 1993). The present study was conducted to evaluate one synchronisation programme that involved a combination of progesterone, oestradiol and prostaglandin F_{2α}.

MATERIALS AND METHODS

Animals and treatments

The experiment was conducted using 2681 cycling cows in 11 herds throughout New Zealand (Table 1). Cycling cows were identified either by oestrous detection using the tailpaint technique (Macmillan *et al.*, 1988), or by rectal palpation for the presence of a palpable corpus luteum (CL) on the ovary on Day -11 (Day 0 = the planned AB start date). The cycling cows in each herd were randomly divided into control and synchronised groups balanced for age, date of calving, condition score, and breed.

On Day -10, cows in the synchronised group were each treated with a new EAZI-BREED™ CIDR® cattle device

containing 1.9 g of progesterone and a CIDIROL® capsule containing 10 mg oestradiol benzoate (InterAg, Hamilton, New Zealand). On Day -4 (i.e. 6 Days after CIDR device insertion), cows in the synchronised group were injected intramuscularly with 2 ml of a prostaglandin F_{2α} agonist (Estrumate, Smith Kline Beecham, New Zealand) to induce luteolysis. CIDR devices were removed on Day -2 (8 days after insertion). Control cows were left untreated.

Cows were inseminated on a daily basis after being detected in oestrus using the tailpaint-raddle detection system throughout the AB period. On Day 16 (i.e. 16 days after the start of AB), any cow in either the control or synchronised group that had not been inseminated was examined by a veterinarian for presence of CL. Every anoestrous cow, irrespective of its original group, was treated with a new CIDR device and a CIDIROL capsule. The remaining cows in the synchronised group that had a palpable CL on the ovary, but had not been detected in oestrus and therefore had not been inseminated, were injected with prostaglandin, while those in the control group were left untreated. Synchronised cows that were inseminated during days 0 to 11 each had a previously used CIDR device inserted on Day 16 to resynchronise their returns to service. All CIDR devices were removed on Day 21, with the anoestrous animals being also treated with 400 IU eCG (Pregnecol, Pastoral Consultancy NZ Ltd, New Zealand) at the time of CIDR removal. The same retreatment and resynchronization regime from Days 16 to 21 was repeated during Days 39 to 44. Natural mating started on Day 49 and dates of natural matings were recorded. Pregnancy status was diagnosed by rectal palpation 42 days from the end of AB and natural mating, respectively.

Statistical analysis

Binomial and multinomial data, such as conception rate, pregnancy rate, empty rate and number of inseminations per

¹Dairying Research Corporation Ltd, Private Bag 3123, Hamilton, New Zealand.

pregnancy, were analysed using the CATMOD procedure of SAS (SAS Institute Inc., 1989). All remaining analyses were performed using the GLM procedure of SAS.

RESULTS

The number of cows, conception rate to the first round of AB matings, conception rate to all AB matings, percentage of cows pregnant to AB (pregnancy rate to AB), empty rate, number of AB services per pregnancy to AB, and mean day of conception from the start of AB for cows diagnosed as pregnant to either AB or natural mating are listed in Table 1. The conception rates of synchronised cows to both the first round and all AB matings were significantly ($P < 0.001$) lower than those of control cows. This resulted in a significant ($P < 0.001$) increase in the number of inseminations required to achieve a successful pregnancy in the synchronised cows as compared to the control cows. However, the pregnancy rate to AB did not differ ($P > 0.05$) between synchronised and control cows. The oestrous synchronisation treatment advanced the mean date of conception by about 1 day relative to the control cows ($P > 0.05$).

DISCUSSIONS

Progestogens have been successfully used for synchronising oestrus in cattle and other species for decades (Jöchle, 1993). However, fertility of cows to the synchronised oestrous cycle following long (>10 days) progestogen treatment is reduced as compared to that of unsynchronised control cows (Odde, 1990; Jöchle, 1993; Macmillan & Peterson, 1993). It has recently been shown that the reduction in fertility after prolonged progestogen treatment may be due to persistence of the dominant follicle in the absence of a functional CL (Stock & Fortune, 1993; Savio *et al.*, 1993). This has prompted the suggestion that a synchronisation programme that combines a shorter (< 10 days) period of progestogen treatment and an injection of a luteolytic dose of prostaglandin shortly

prior to or at the time of termination of the progestogen treatment should overcome the fertility problem. While some studies have reported satisfactory fertility after such synchronisation treatments especially in heifers (Jöchle, 1993; Macmillan & Peterson, 1993), the effect of oestrous synchronisation on fertility of lactating dairy cows has not been critically evaluated. The present study clearly demonstrated that the oestrous synchronisation programme used in this trial was associated with a 10% reduction in conception rate. The reasons for this reduction in fertility are not known and could partly be due to persistence of the dominant follicle in cows that were in the late stages of their cycles when the synchronisation treatment was initiated. Despite this reduction in conception rate, the pregnancy rate at the end of the AB period was only 3.7% lower for the synchronised group than for the control group. The reduction in fertility of synchronised cows was compensated for by more mating opportunities within the 7-week AB period compared to control cows.

In conclusion, the present study showed that the oestrous synchronisation regime tested in this study was associated with a reduction in fertility. This negated potential gains from using this treatment, which was designed to increase the percentage of cows pregnant to AB, reduce the number of empty cows, eliminate induction and to advance and concentrate calving in lactating dairy cows. The management benefits of using oestrous synchronisation have not been analysed in the present study.

ACKNOWLEDGMENTS

This trial was a collaborative project jointly funded by Livestock Improvement Corporation Ltd, Dairy Research Corporation Ltd, InterAg and the Large Herds Association. The participating herd owners and their attending veterinarians are gratefully acknowledged for their tremendous support and cooperation which were essential for the successful completion of this trial.

TABLE 1: Conception rate to the first round of AB (CR-1), conception rate to all AB matings (CR-AB), pregnancy rate to AB (PR-AB), empty rate (ER), number of AB services per pregnancy to AB (AI/Preg) and mean day of conception from the start of AB (MDOC) for synchronised (S) and control (C) cows in individual herds

	No of cows		CR-1		CR-AB		PR-AB		ER		AI/Preg		MDOC	
	S	C	S	C	S	C	S	C	S	C	S	C	S	C
Herd 1	70	66	61.4	78.8	61.6	74.4	87.1	87.9	1.4	0.0	1.8	1.4	18.7	20.5
Herd 2	51	49	56.9	65.3	52.6	66.7	78.4	85.7	7.8	0.0	1.9	1.5	17.5	22.6
Herd 3	81	81	51.9	61.7	53.9	62.5	85.2	80.2	3.7	8.6	2.0	1.7	20.2	20.8
Herd 4	46	46	47.8	60.9	53.4	56.3	84.8	78.3	8.7	6.5	2.0	1.8	15.6	22.8
Herd 5	58	53	58.6	69.8	59.3	65.7	87.9	86.8	1.7	3.8	1.8	1.5	19.1	21.2
Herd 6	222	217	52.7	69.6	52.3	67.7	82.4	90.8	8.1	2.8	2.0	1.5	19.3	20.4
Herd 7	224	222	52.2	65.6	52.0	63.2	79.5	86.0	12.1	7.2	2.0	1.6	18.5	18.9
Herd 8	148	156	53.4	65.6	52.7	67.5	80.4	85.3	8.8	7.1	2.0	1.5	19.3	19.7
Herd 9	172	164	51.7	62.8	52.5	63.0	77.9	84.1	5.8	4.9	2.1	1.8	23.3	21.4
Herd 10	129	136	51.2	47.8	51.0	51.4	82.2	81.6	5.4	6.6	2.0	2.0	22.5	26.1
Herd 11	148	142	51.4	64.1	53.0	65.2	83.1	85.9	6.8	4.2	1.9	1.6	20.2	22.0
Overall	1349	1332	52.9	64.3	53.2	63.9	81.8	85.5	7.3	5.1	2.0	1.6	19.9	21.2
S-C	NA		-11.4 ***		-10.7 ***		-3.7		2.2 *		0.3 ***		-1.3	

* $P < 0.05$; *** $P < 0.001$ between synchronised and control cows

REFERENCES

- Esslemont, R.J.; Peeler, E.J. 1993. The scope for raising margins in dairy herds by improving fertility and health. *British Veterinary Journal* **149**: 537-547.
- Jöchle, W. 1993. Forty years of control of the oestrous cycle in ruminants: progress made, unresolved problems and the potential impact of sperm encapsulation technology. *Reproduction, Fertility and Development* **5**: 587-594.
- Macmillan, K.L.; Taufan, V.K.; Barnes, D.R.; Day, A.M.; Henry, E. 1988. Detecting estrus in synchronized heifers using tailpaint and an aerosol raddle. *Theriogenology* **30**: 1099-1114.
- Macmillan, K.L.; Peterson, A.J. 1993. A new intravaginal progesterone releasing device for cattle (CIDR-B) for oestrous synchronisation, increasing pregnancy rates and the treatment of postpartum anoestrus. *Animal Reproduction Science* **33**: 1-25.
- Odde, K.G. 1990. A review of synchronization of estrus in postpartum cattle. *Journal of Animal Science* **68**: 817-830.
- SAS Institute Inc. 1989. SAS/STAT User's Guide, Version 6, Fourth Edition. Cary, NC: SAS Institute Inc., 846 pp.
- Savio, J.D.; Thatcher, W.W.; Morris, G.R.; Entwistle, K.; Drost, M.; Mattiacci, M.R. 1993. Effects of induction of low plasma progesterone concentrations with a progesterone-releasing intravaginal device on follicular turnover and fertility in cattle. *Journal of Reproduction and Fertility* **98**: 77-84.
- Stock, A.E.; Fortune, J.E. 1993. Ovarian follicular dominance in cattle: Relationship between prolonged growth of the ovulatory follicle and endocrine parameters. *Endocrinology* **132**: 1108-1114.