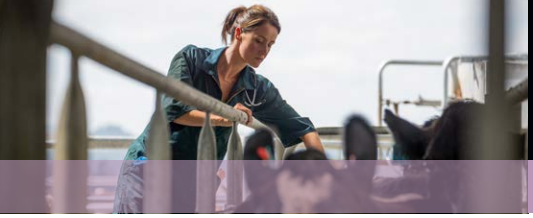

EVALUATION OF PROSTAGLANDIN DOSE IN NZ CYCLING COWS

Objective

To investigate the reproductive outcomes of cycling dairy cows treated with a single increased dose of Cyclase in 'Why Wait' synchrony programs.

Background

Prostaglandin (cloprostenol, $PGF_{2\alpha}$) is administered to cycling cows to induce luteolysis and regression of the corpus luteum (CL) from the previous ovulation, and thus advance the next oestrus so that cows can be inseminated earlier. The commonly used Why Wait program typically advances the first insemination of cows by 7 days on average and is a popular synchrony tool used in New Zealand cycling cows.

The traditional single 500µg dose of cloprostenol used in synchrony and non-cycler treatment programs was established in the 1970s by administering prostaglandin to cycling beef cows or dairy heifers, as single or multiple doses and with or without other reproductive treatments[1,2,3,4]. Efficacy was determined by measuring the success of behavioural oestrus and subsequent pregnancy. Many animals were not lactating dairy cattle so the resultant dose recommendations may not be directly applicable to modern lactating dairy cows in New Zealand.

Failure of luteolysis following GPG (ovsynch) synchrony programs in dairy cows in the USA has been shown to range between 5 – 30%, and is higher in multiparous compared to primiparous cows. Incomplete luteolysis and persistence of a corpus luteum will result in higher circulating levels of progesterone close to the time of artificial insemination (AI), which leads to reduced fertility[5].

More recent overseas studies showed a higher cloprostenol dose, or repeat doses administered 24 hours apart, improved luteolysis and subsequently increased pregnancy rates in cattle synchrony programs[6,7,8,9]. In some of these studies the ovarian structures were also examined, and the additional cloprostenol administered was shown to increase luteolysis.

A 2017 New Zealand study[6] treating non-cycling cows with a DIB-Synch Plus eCG program with 3mL Cyclase (750µg cloprostenol) showed pregnancy rates increased by 3%. This supported the results of Giordano[7] where 4 week in-calf rates were significantly increased when administering a dose of 750µg cloprostenol on day 7 of a synchrony program to cows of unknown cyclicity status.

Materials and methods

The study was undertaken in 16 New Zealand dairy herds, enrolling lactating mixed-age cows detected in oestrus in the two weeks prior to the planned start of mating (PSM).

Cows were body condition scored (BCS) then randomly assigned to treatment groups, at the time of enrolment. Cows cycling 7 to 14 days prior to planned start of mating (PSM) were treated with Cyclase two days prior to PSM for the herd. Cows cycling during the week prior to PSM were treated with Cyclase 5 days after PSM, which is typical for a NZ 'Why Wait' program.

At each of the two 'treatment weeks' equivalent numbers of Group 1 cows were treated with 2mL Cyclase (500µg cloprostenol) and Group 2 cows were treated with 4mL Cyclase (1,000µg cloprostenol). No other treatments were administered.

From the PSM any cows detected in oestrus were submitted for AI at the next opportunity. Ultrasound pregnancy testing was undertaken at the appropriate time to determine pregnancy status and the date of conception. Cow information (age, breed, calving date) was extracted from electronic herd records.

Results

Data from 2,694 cows was analysed to assess the effect of treatment group on 7-day submission rate, pregnancy rate (one-week, four-week, six-week and final in-calf rates), and days from Cyclase treatment to conception. Other variables were included in the analysis such as farm, cow age, breed, BCS and the interval between calving and treatment.

The two treatment groups had very similar age, breed, days calved and body condition score (Table 1).

Why Wait Cyclase dose		2mL	4mL
Total n included in analysis		1,341	1,353
Age group	2 year	357	336
	3 year	203	226
	4-8 year	674	692
	>8 year	107	99
Average age (years)		4.6	4.5
Breed	Friesian	526	500
	Crossbred	789	823
	Jersey	26	30
Interval calving to treatment (mean days)		77	77
BCS group	≤3.5	196	198
	4.0	734	755
	≥ 4.5	410	398
BCS (mean; 1-10 scale)		4.1	4.1

Table 1. Descriptive statistics for treatment groups

Results for one-week, four-week, six-week and final in-calf rates are presented in Table 2. The higher dose of cloprostenol significantly increased the proportion pregnant compared to the traditional dose at one and four weeks after treatment.

Cyclase dose	2mL	4mL	p value
1 week	0.41 (0.013)	0.46 (0.013)	0.007*
4 week	0.65 (0.013)	0.69 (0.013)	0.035*
6 week	0.72 (0.012)	0.75 (0.012)	0.076
final	0.85 (0.010)	0.86 (0.009)	0.324

Table 2. Proportion pregnant (sem) for the treatment groups.

The submission rate (cows submitted within 7 days of injection) was significantly higher for the 4mL Cyclase treatment group compared to the 2mL treatment group (78.6% vs 75.1%, p=0.03).

The mean number of days from injection to conception was also shorter for the 4mL Cyclase treatment group (18.2 days vs 20.0 days, sed 0.80, p=0.03).

Overall, there was a positive effect of body condition score (in favour of higher BCS), and a positive effect of longer weeks calved at time of treatment on pregnancy rate. There was no significant treatment by farm, age, or treatment week (1 or 2) interaction, although pregnancy outcomes differed by farm due to other factors. (Table 3).

P values (sequential)	1 week	4 week	6 week	final
Farm	0.009*	0.006*	<.001*	<.001*
Age	0.019*	<.001*	<.001*	0.006*
Breed	0.424	0.283	0.294	0.126
BCS	0.080	0.017*	0.029*	0.005*
Weeks calved at PSM	<.001*	<.001*	<.001*	<.001*

Table 3. Generalised linear regression outcomes for variables on pregnancy rates
**Statistical significance is declared at p ≤0.05*

Discussion

This study showed earlier conception and higher in- calf rates for the 4mL Cyclase dose compared to the traditional 2mL dose.

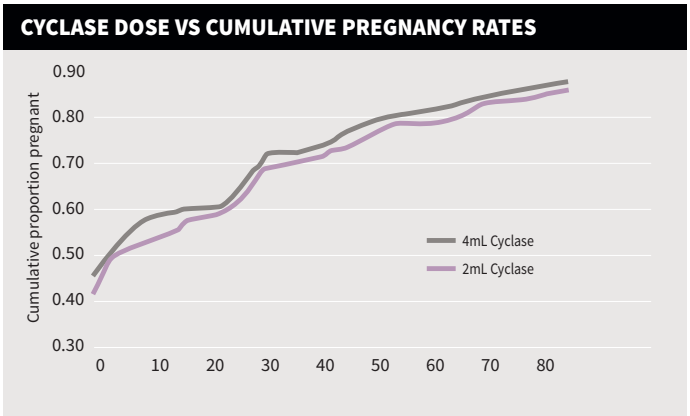

Figure 3. Cumulative pregnancy by treatment group

An economic analysis shows that the additional cost of a higher dose of cloprostenol administered to Why Wait cows is far outweighed by the earlier conception date, as shown in Table 4.

Partial budget	Description	Value
Additional 2mL Cyclase	$5.00 x 100 cows	$ - 500
2 days earlier pregnant	2 days x 1.6kgMS x $6.75/kgMS = $21.60/cow x 100 cows	$2,160
Net farmer financial benefit		$1,660 per 100 cows

Table 4. Partial budget analysis (for treatment of 100 cycling cows with extra Cyclase

This study is the first investigation of the cloprostenol dose in cycling, lactating dairy cows farmed under New Zealand management systems. It seems likely the mechanism for higher pregnancy rates is via increased luteolysis in cows treated with more cloprostenol, however, further research is required to confirm this physiological mechanism.

Conclusion

Treatment of cycling cows in Why Wait programs using 4mL Cyclase (1,000µg of cloprostenol) resulted in higher submission rate, earlier conception and higher pregnancy rates compared with the traditional 500µg dose. The administration of a higher Cyclase dose for cycling cow synchrony programs is practical and of high net benefit to farmers, and could easily be routinely implemented by veterinarians on NZ dairy farms.

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Study conducted under approval 14587 of the Ruakura Animal Ethics Committee.