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Abstract

prostaglandin F2α(PGF) and gonadotropin-releasing hormone (GnRH) have provided new dimensions in resolving certain reproductive maladies. Effective when used properly, these hormones have the advantage of mimicking the physiological activity of natural hormones without the negative, overriding effects of synthetic products. Effective use of the hormones requires accurate diagnoses. Moreover, side effects are nil except when PGF is mistakenly administered to pregnant animals. The effect of PGF in humans must be recognized. Current research under way gives promise that GnRH may have beneficial effects in the early postpartum cow suffering from problems around the time of calving.; Dairy Day, 1986, Kansas State University, Manhattan, KS, 1986;

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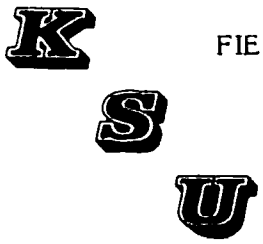

FIELD APPLICATION OF EXOGENOUS HORMONES - GONADOTROPINS AND PROSTAGLANDINS

E. P. Call

Summary

Prostaglandin $F_{2\alpha}$ (PGF) and gonadotropin-releasing hormone (GnRH) have provided new dimensions in resolving certain reproductive maladies. Effective when used properly, these hormones have the advantage of mimicking the physiological activity of natural hormones without the negative, overriding effects of synthetic products. Effective use of the hormones requires accurate diagnoses. Moreover, side effects are nil except when PGF is mistakenly administered to pregnant animals. The effect of PGF in humans must be recognized. Current research under way gives promise that GnRH may have beneficial effects in the early postpartum cow suffering from problems around the time of calving.

Introduction

Profitability in the dairy industry is dependent upon level of production (rolling herd average - RHA) and average calving interval. The nearer the average calving interval is to 365 days, the greater percentage of the time that cows are in the early part of lactation when feed is converted into milk most efficiently. Ideally, dairy cows should reproduce regularly without need of any treatment measures. However, the stress of high production under total confinement, often times with a wide ratio of cows per man unit, dictates the need of therapeutic measures to overcome reproductive inefficiency.

Two factors account for the majority of reproductive losses in a well-managed dairy herd, namely,

1. Days to first breeding (first service)
2. Cows not bred

Other disorders, such as repeat breeding, cystic follicles, uterine infections, and embryonic wastage, frequently receive more discussion, but in total, affect overall efficiency to a lesser degree than open cows, not yet bred.

A genetic antagonism exists between reproduction and production. In addition, it is a common belief among dairymen that higher producers are more difficult to settle. Table 1 illustrates the relationship among reproductive traits and production, as measured by rolling herd average (RHA) or yearly production per cow. While antagonism may be real, higher RHA herds overcome the detrimental effects. The only negative relationship noted is a small increase in services per conception. Most noteworthy are the average days open and the percent of cows open more than 120 days.

Table 1. Average reproductive characterization of 637 Kansas Holstein herds with 44,422 cows grouped by level of rolling herd average (RHA)

RHA Milk (lb)	Minimum[a] Calving Interval (days)	Days to First Breeding (days)	Open Cows[b] (%)	Open Cows[b] (days)	Open Cows[b] (%>120 d)	Serv/ Conception	Dry Period (days)	Dry Period (%>70 d)
11,373	402	85	38	133	35	1.7	82	42
14,386	398	82	31	109	30	1.8	70	32
16,262	400	80	27	87	21	1.9	65	24
18,361	396	76	29	78	16	2.0	63	22

Source: Call (1985).

[a]Assumes last reported service was successful.

[b]Cows not yet reported bred since calving.

Use of Prostaglandin $F_2\alpha$ (PGF)

Prostaglandin $F_2\alpha$ provides an ideal system for synchronizing cows with functional corpora lutea (CL). While introduced as an effective program for synchronizing groups of cattle, PGF is used most effectively in lactating dairy cows after rectal confirmation of a functional CL. Recent work at Kansas State University (Lucy et al., 1986) showed poor synchronization after the double injection scheme in lactating dairy cows, 50 to 60 days postpartum. However, field studies (Table 2 and 3) have demonstrated the value of PGF in cows with palpable CL both in situations of heat detection failure (not bred by 60 days) and open at pregnancy examination. Critical to the economic success of using PGF in the aforementioned situations is double breeding (72 and 96 hr) cows that are not observed in heat. On the average, cows treated in experiments noted in Table 2 and 3 were detected in heat about 50 percent of the time by the 17 dairy producers cooperating in the studies.

Table 2. Fertility of dairy cows with palpable corpus luteum after PGF treatment for unobserved estrus (Experiment 1)

Item	Control	PGF
First service conception, %	39	43
By estrus, %	39	45
By appointment (72 + 96 hr), %	—	40
Standing estrus, %	—	56
Total services/conception	1.99	1.88
Total conception rate, %	88	86

Source: Plunkett et al. (1983).

With any treatment protocol, success is never 100 percent. However, acceptance of a protocol is based upon average economic benefits gained. In the data presented in Table 2, PGF-treated cows settled 22 days earlier than control cows. In cows open at pregnancy exam (Table 3), the PGF-treated cows had a 17-day advantage over controls. Considering all costs and a $3.00 per day loss for each day open after 85 days, the treatment program is cost-effective, even though 12 to 18 % of the treated cows were culled open.

Table 3. Fertility of dairy cows open at pregnancy examination with palpable corpus luteum after PGF treatment (Experiment 2)

Item	Control	PGF
First service conception, %	52	44
By estrus, %	52	32
By appointment (72 + 96 hr), %	--	54
Standing estrus, %	—	44
Total services/conception	1.73	1.63
Total conception rate, %	84	81

Source: Plunkett et al. (1983).

While not well documented, the use of PGF has been reported to be effective in the following disorders:

1. Retained placenta
2. Metritis
3. Pyometra
4. Mummified fetus
5. Illicit matings with palpable CL prior to 90 days (preferably at 8 to 10 days)
6. Repeat breeders - 8 to 10 days after a non-mated repeat estrus
7. Cystic follicles - 8 to 10 days after administration of GnRH (Cystorelin®)

Use of Gonadotropin-Releasing Hormone (GnRH)

GnRH (Cystorelin®) is labeled as a treatment for cystic follicles. Cystic follicles are classified as "thin walled" cysts (TWC) and luteal cysts (LFC). While LFC may respond directly to PGF, differential distinction rectally is difficult. The preferred protocol is to administer GnRH (2 cc im) at diagnosis followed by PGF 8 to 10 days later. If the cow is on the breeding list, she should be serviced at the estrus following PGF. If there is no estrus by 72 hr after PGF, she should be double bred at 72 and 96 hr.

GnRH is an effective treatment for repeat breeders (3rd service). Stevenson et al. (1984) have shown that GnRH (im) immediately after breeding (artificial insemination - AI) had a significant effect (improved conception) on cows returning for the third service. A non-significant improvement was noted on second service, with no improvement on first service. A multi-herd experiment at Wisconsin showed even more dramatic results on third-service cows. The combined data are presented in Table 4.

Fernandez et al. (1977) demonstrated that cows receiving GnRH 14 days after calving underwent significantly faster uterine involution, but this did not result in any practical benefits such as reduced days open or improved conception rate. More recent data from the K-State dairy herd indicated an improvement in days open postpartum and services per conception when GnRH (day 10 to 14) or PGF (day 20 to 24) were administered to "abnormal" cows, but not to "normal" cows (Table 5). Cows with any puerperal problems were classified as "abnormal". Supporting the K-State work is a Cornell report, which showed similar beneficial results from injecting GnRH 2 to 3 weeks after calving (Table 6).

Adopting the routine use of GnRH treatment of cows postpartum awaits more definitive results from a large herd experiment now underway.

Table 4. Effect of treating repeat-breeder cows (3rd service) with gonadotropin releasing hormone (GnRH) at time of insemination[1]

Treatment	Pregnant[2]		
	Cows	No.	%
GnRH	261	176	67.4
Saline	255	124	48.6

[1]Combined data: Kansas State University and University of Wisconsin.

[2]Diagnosed by rectal palpation

Table 5. Reproductive measures of cows after treatment with gonadotropin-releasing hormone (GnRH) and/or prostaglandin (PGF) in the postpartum period

Item	GnRH	PGF	GnRH-PGF	Control
First service conception, %	40	42	38	29
Normal cows	42	48	44	35
Abnormal cows	31	21	29	13
Days from calving to conception	88*	86*	96	115
Normal cows	92	83	82	97
Abnormal cows	85*	90*	109	133
Services per conception	1.7*	1.8*	2.1*	2.3
Normal cows	1.7*	1.6*	1.7*	2.2
Abnormal cows	1.7*	1.9*	2.4	2.4

Source: Benmrad and Stevenson (1985).

*Significant improvement compared with control cows ($P<.05$).

Table 6. Results of treating cows with gonadotropin-releasing hormone (GnRH) 2 to 3 weeks after calving

Characteristic	Normal Cows		Abnormal Cows	
	GnRH	Control	GnRH	Control
Cycles prior to conception	3.6	3.1	2.9	4.3
Services per conception	2.0	1.9	1.5	2.6
Pregnant by 85 days (%)	47	56	50	0
Days open	94	102	87	121

Source: Foote et al. (1985)

Read More About It

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