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CONCEPTION AND PREGNANCY RATES IN DAIRY COWS AFTER VARIOUS PROGRAMMED BREEDING SYSTEMS

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Summary

Two experiments were conducted to measure conception and pregnancy rates in lactating dairy cows after various treatments followed by artificial insemination (AI) after detected estrus or at one fixed time. In Experiment 1, Holstein cows in one herd were assigned randomly to four treatments every 3 wk (27, 3-wk cluster groups): 1) Ovsynch33, 2) GnRH+$PGF_{2\alpha}$, 3) 2×$PGF_{2\alpha}$, and 4) 2×$PGF_{2\alpha}$+GnRH. In Experiment 2, Holstein cows in one herd were assigned randomly to two treatments every 3 wk (14, 3-wk cluster groups): 1) Ovsynch48 and 2) GnRH+$PGF_{2\alpha}$. In both experiments, frozen-thawed semen from multiple sires was used, one technician performed >95% of all inseminations, and pregnancy was diagnosed by palpation per rectum between 38 and 52 d after first insemination. Although actual conception rates resulting from inseminations after detected estrus were consistently greater, pregnancy rates of cows were superior after fixed-time inseminations because of poor rates of detected estrus in treatments that relied solely on observation of sexual behavior.

(**Key Words:** OvSynch, Synchronized Estrus, Conception and Pregnancy Rates.)

Introduction

Attempts to develop estrus-synchronization systems for lactating dairy cows and accommodate a fixed-time insemination have met with limited success since prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) was demonstrated to be effective in controlling the estrous cycle for programmed breeding. Conception rates following $PGF_{2\alpha}$ usually were best when inseminations were performed after observed signs of heat. Our early attempts to use fixed-time inseminations at first services in lactating dairy cows demonstrated that conception rates were less than desirable.

Follicular development must be controlled and synchronized with the regression of the corpus luteum after $PGF_{2\alpha}$ in order to reduce variation in the intervals to estrus. Precise control of follicular development with the regression of the corpus luteum should allow improved conception rates associated with one fixed-time insemination. Such a synchronized ovulation protocol (OvSynch) has been tested. A first injection of GnRH is administered 7 days before $PGF_{2\alpha}$, and a second injection of GnRH is given 36 to 48 hr after $PGF_{2\alpha}$ to ovulate the dominant follicle via GnRH-induced release of luteinizing hormone (LH). The objective of these experiments was to compare conception and pregnancy rates in lactating dairy cows after various programmed breeding systems used to synchronize estrus before first postpartum inseminations. Specifically, we wished to determine the: 1) effect of incorporating GnRH in a two $PGF_{2\alpha}$ injection scheme (administration of GnRH after the second $PGF_{2\alpha}$ injection), 2) actual pregnancy rates among systems that require or do not require detection of estrus, and 3) timing of second GnRH injection at either 33 or 48 h after $PGF_{2\alpha}$ in the OvSynch system.

Procedures

Experiment 1. Four treatments were used (Figure 1). Treatments A and B were similar. One injection of GnRH (100 µg of Cystorelin®) was given 7 days before one injection of $PGF_{2\alpha}$ (25 mg of Lutalyse®). In treatment A, cows received a second injection of GnRH 33 hr after $PGF_{2\alpha}$ and then one fixed-time insemination 18 hr later, whereas cows in treatment B were

inseminated according to the AM-PM rule at the detected estrus after $PGF_{2\alpha}$.

Treatments C and D were similar. All cows received two injections of $PGF_{2\alpha}$ 14 days apart. In treatment C, cows received one injection of GnRH 33 hr after $PGF_{2\alpha}$ and one fixed-time insemination 18 hr later. In the last treatment, cows were inseminated at the detected estrus after $PGF_{2\alpha}$ according to the AM-PM rule or in the absence of detected estrus, one fixed-time insemination was given at 80 hr (cows) after the second $PGF_{2\alpha}$ injection.

Treatments were applied randomly to lactating cows (minimum of 62 days in milk) before first services. Cow were grouped in 3-wk breeding clusters beginning in June, 1994, and the experiment continued until December, 1995. Conception rates were determined by palpation of the uterus and its contents between 38 and 52 days after insemination.

Experiment 2. Treatments A and B of Experiment 1 were repeated in lactating cows, except that the second injection of GnRH was administered 48 hr after $PGF_{2\alpha}$ (Figure 2). Lactating cows (minimum of 58 days in milk) before first services were grouped in 3-wk breeding clusters beginning in December, 1995 and ending in March, 1997. Conception rates were determined by palpation of the uterus and its contents between 38 and 52 days after insemination.

Results and Discussion

Experiment 1. Estrus-detection, conception, and pregnancy rates achieved in each of four treatments are summarized in Table 1. The proportion of cows detected in heat during 96 hr after $PGF_{2\alpha}$ was less ($P<.01$) in treatments A and C in which GnRH was administered after $PGF_{2\alpha}$ to induce ovulation of the follicle. This GnRH injection caused estrogen secretion by the preovulatory follicle to cease and, therefore, prevented further mounting and standing activity in most cows. Conception rates (proportion of cows detected in estrus and inseminated that became pregnant) were not significantly different among treatments; however, conception rates tended to be greater in those treatments (B and D) in which AI was administered after detected estrus. In treatment B, cows not detected in estrus after the initial synchronization were inseminated at their next nonsynchronized estrus, and 8 of 22 (36.4%) conceived. In treatment D, 24 of 46 (52.2%) cows inseminated at estrus conceived, and 8 of 55 (14.6%) conceived in the absence of detected estrus when inseminated at 80 hr after the second of two $PGF_{2\alpha}$ injections.

Pregnancy rates (proportion of cows assigned to treatment that became pregnant) were more uniform among treatments. The similar pregnancy rates, despite lower actual conception after fixed-time inseminations, resulted from rather poor heat-detection rates in treatment B. Treatment D, similar to the Targeted Breeding® system, produced the greatest pregnancy rates.

Experiment 2. Heat-detection, conception, and pregnancy rates in Experiment 2 are illustrated in Table 2. Heat-detection rates were less ($P<.01$) in the Ovsynch48 treatment compared to treatment B in which a second GnRH injection was not administered after $PGF_{2\alpha}$. These rates were quite similar to those observed in Experiment 1. Conception rates tended to be lower in the Ovsynch treatment, but the reverse was true for pregnancy rates. This reversal was due to the rather poor heat response in treatment B.

As long as poor heat-detection rates occur after various programmed-breeding treatments, pregnancy rates (the number of pregnancies achieved per unit of time) always will be superior with a treatment that utilizes a fixed-time insemination. Treatment D in Experiment 1 and Ovsynch48 in Experiment 2 produced the most pregnancies per unit of time.

Conclusions

Actual conception rates tended to be less after fixed-timed inseminations, whereas conception rates tended to be greatest when inseminations occurred after detected estrus. Pregnancy rates tended to be less when programmed breeding systems depended partly or wholly on detection of behavioral estrus, whereas they were greatest after fixed-time inseminations. Conception (pregnancy) rates are probably maximized after OvSynch when the second GnRH injection is given closer to 48 h after PGF_2. Fixed-time inseminations with a two-injection PGF_2 system may achieve acceptable conception (pregnancy) rates if GnRH is given closer to 48 h after the second PGF_2 injection (before fixed-time insemination), but this needs to be tested.

Recommendations

The recommended use of the OvSynch protocol is to administer GnRH on Monday, followed by PGF_2 on the following Monday at milking time (5 PM), administer the second GnRH injection at 5 PM on Wednesday (48 hr later), and inseminate cows the next morning (Thursday) between 8 and 10 AM (Figure 2). If you do not want to use the timed insemination, give GnRH (Monday), follow it with PGF_2 in 7 days (Monday), and watch for heat. For inseminations with this system, follow the AM-PM rule when heat is detected. Do not use the Ovsynch protocol in replacement heifers, because results are inferior to what can be achieved with a PGF_2 protocol.

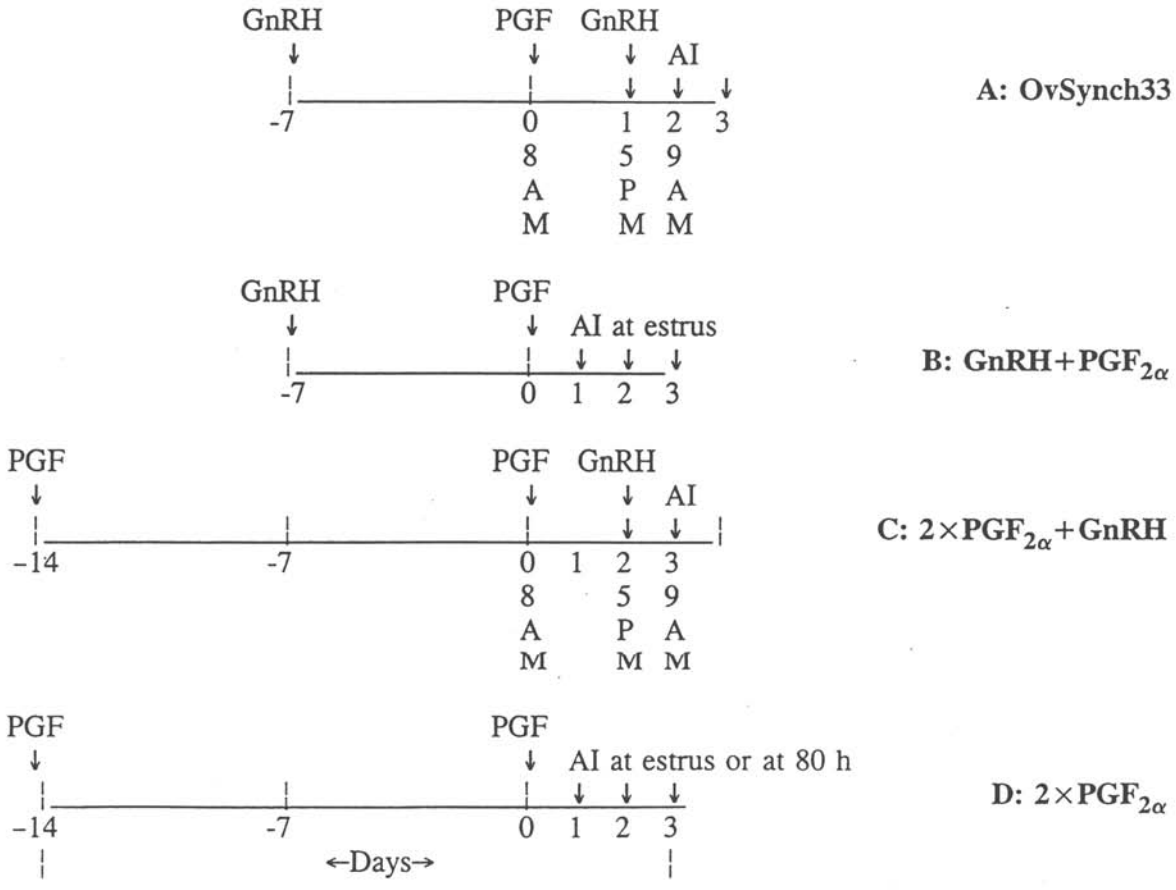

Figure 1. Treatment Protocols for Experiment 1.

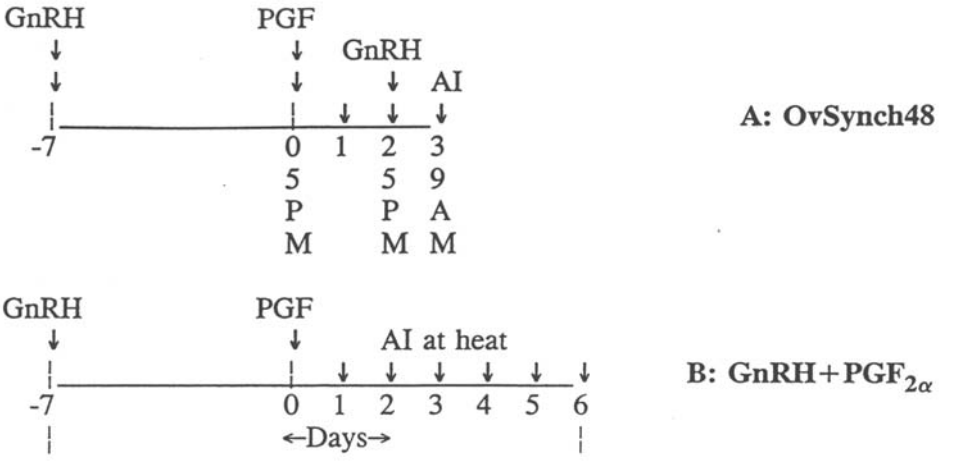

Figure 2. Treatment Protocols for Experiment 2.

Table 1. Results of Experiment 1 with Four Programmed Breeding Systems

Item	OvSynch33	GnRH +PGF[1]	2xPGF +GnRH	2xPGF[2]
No. of cows	68	74	64	101
Detection rate, %	7.4[a]	71.6[b]	6.2[a]	53.5[c]
Conception rate, %	22.1	35.8	25.0	31.7
Pregnancy rate, %	22.1	25.7	25.0	31.7

[1]Conception of 22 cows inseminated at next estrus = 8/22 (36.4%).
[2]Cows inseminated at estrus = 24/46 (52.2%). Cows inseminated at 80 h = 8/55 (14.6%)
[a,b,c](P < .O1).

Table 2. Results of Experiment 2 with Two Programmed Breeding Systems

Item	OvSynch48	GnRH+PGF
No. of cows	112	107
Detection rate, %	16.1[a]	62.6[b]
Conception rate, %	34.8	43.9
Pregnancy rate, %	34.8	27.4

[a,b](*P*<.01).