Effect of an Injection of GnRH at Time of Insemination Following Detection in Standing Estrus on Beef Cow and Heifer Pregnancy Rates[1]

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Summary

An injection of GnRH at the initiation of standing estrus has been reported to increase pregnancy and circulating concentrations of progesterone in repeat breeder dairy cows, cows that have normal estrous cycles but will not conceive. The objective of this study was to determine the effect of administering an injection of GnRH at time of insemination on subsequent concentrations of progesterone and conception rates in beef cattle that have exhibited standing estrus. Eighty-two beef heifers at 2 locations were synchronized with the Select Synch-CIDR protocol (n = 42) or the 14-19 MGA protocol (n = 40) and AI was performed following detection in standing estrus by qualified personnel. At location 1, blood samples were collected on d 2, 4, 6, 10, 15, and 18 after insemination. Heifers that were pregnant had elevated concentrations of progesterone on day 18 compared to nonpregnant heifers. Among heifers, conception rates were 71% and 59% for GnRH treated and control, respectively, and were not different between treatments. Two hundred and thirty-six postpartum beef cows at 2 locations were synchronized with the Select Synch-CIDR protocol, and AI was performed following detection in standing estrus by qualified personnel. Among cows conception rates were 70% and 70% for GnRH treated and control, respectively and were not different between treatments. Overall conception rates were 70% and 67% for GnRH treated and control, respectively, and were not different between treatments. In summary, injection of GnRH at time of insemination did not influence subsequent concentrations of progesterone and had no influence on conception rates in beef cattle that had exhibited standing estrus.

Introduction

Previous research has indicated that an injection of GnRH at time of insemination following detection in standing estrus increased (Schels and Mostafawi, 1978; Nakao etal 1983) or had no effect on first service conception rates (Stevenson et al., 1984) among dairy cows. However, pregnancy rates among repeat breeder dairy cows have consistently been increased by an injection of GnRH at time of insemination {Mee et al., 1993; Stevenson et al., 1984). Progesterone during the subsequent estrous cycle is required for the survival of the embryo/fetus, and cows with elevated concentrations of progesterone earlier in the subsequent estrous cycle had embryos that were more advanced developmentally, and were capable of inhibiting the PGF_2 release on day 16 after insemination. However, results have been mixed on the effect of an injection of GnRH at time of insemination on circulating concentrations of progesterone during the subsequent estrous cycle. The previous studies have focused mainly on lactating dairy cows, and little is known about the influence of an injection of GnRH at time of insemination following detection in standing estrus among beef heifers and cows. The objective of this study was to evaluate the effect of administering an injection of GnRH at time of insemination in beef cows and heifers that had exhibited standing estrus on circulating concentrations of progesterone and first service conception rates.

Materials and Methods

Eighty-two beef heifers at two locations were synchronized, and artificial insemination (AI) was performed following detection in standing estrus by qualified personnel. At location 1, 42 heifers were synchronized with the Select Synch plus Controlled Internal Drug Releasing device (CIDR) protocol. On d 0 an injection of GnRH (100 μg as 2 mL of Ovasynch i.m.; IVX, St. Joseph, Missouri) and a CIDR was placed into

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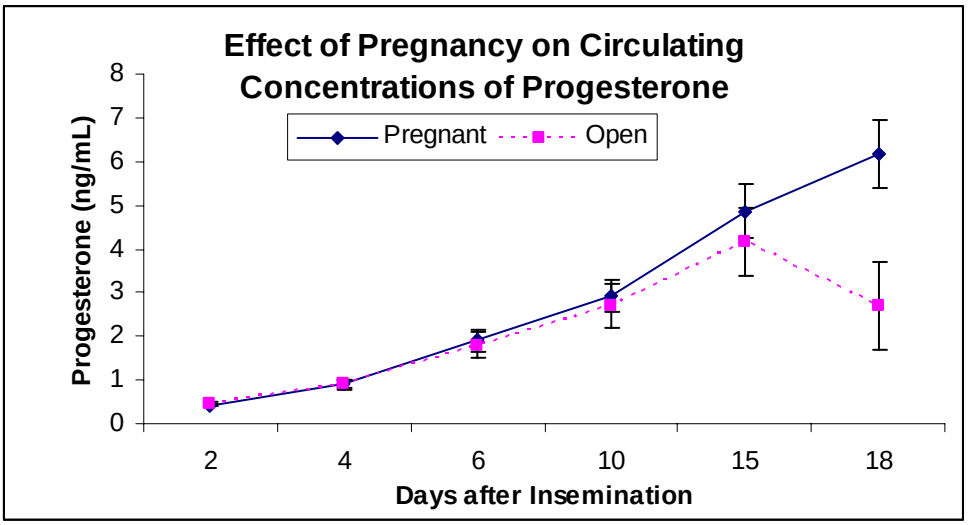
the vagina. On d 7 $PGF_{2\alpha}$ (25 mg as 5 mL of Prostamate i.m., IVX, St. Joseph, Missouri) was injected and the CIDR was removed. Thirty-three heifers were inseminated following detection in standing estrus during a 72 h estrus detection period. At location 2, 40 heifers were synchronized with the 14-19 MGA protocol [MGA was fed at 0.5 $mg \cdot hd^{-1} \cdot d^{-1}$ for 14 d, and 19 d after MGA withdrawal an injection of $PGF_{2\alpha}$ (25 mg as 5 mL of Prostamate) was administered]. Thirth-five heifers were inseminated following detection in standing estrus during the 72 h estrus detection period. Blood samples were collected from heifers at location 1 by venipuncture of the jugular vein into 10 mL Vacutainer tubes on d 2, 4, 6, 10, 15, and 18 after insemination. Serum was harvested and stored at -20°C until analyzed.

Two hundred and thirty-six postpartum beef cows at two locations were synchronized with the Select Synch plus CIDR protocol as previously described (location 2 n = 58 and location 3 n = 192) and AI was performed following detection in standing estrus by qualified personnel. At location 2, 52 cows were inseminated following detection in standing estrus during the estrus detection period, and at location 3, 175 cows were inseminated following detection in standing estrus during the estrus detection period.

Effects of treatment and pregnancy on circulating concentrations of progesterone were analyzed by analysis of variance for repeated measures in SAS by PROC MIXED. Effect of treatment on first-service conception rates and final pregnancy rates were determined by chi-square analysis in PROC FREQ of SAS.

Results and Discussion

Pregnancy significantly influenced subsequent concentrations of progesterone. Heifers that were pregnant had elevated concentrations of progesterone on d 18 of the subsequent estrous cycle compared to nonpregnant heifers (Figure 1; $P < 0.01$). There was a tendency for GnRH at time of insemination to influence circulating concentrations of progesterone during the subsequent estrous cycle (Figure 2; $P = 0.18$). Concentrations of progesterone tended to be greater in control heifers compared to GnRH treated heifers on d 6 ($P = 0.08$), 10 ($P = 0.068$), and 15 ($P = 0.106$).



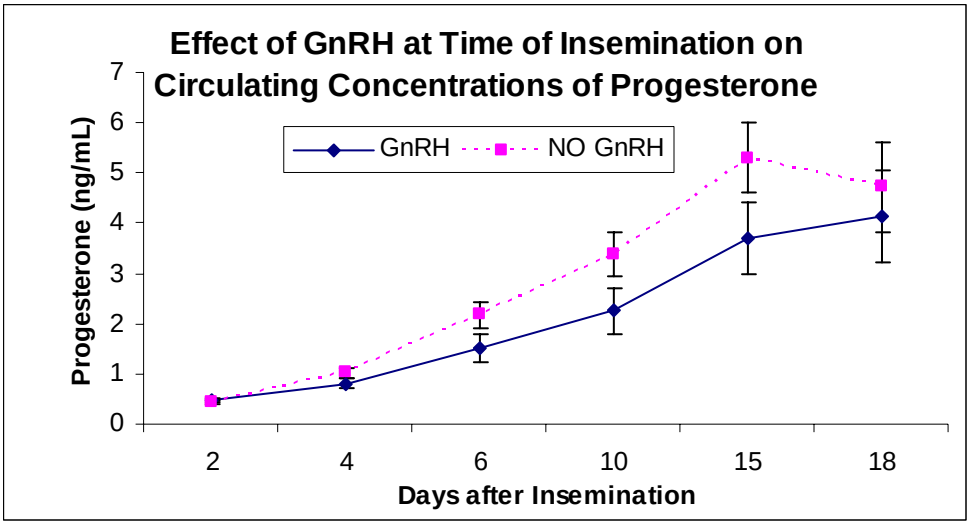


Figure 2. Effect of administering an injection of GnRH at time of insemination following detection in standing estrus on circulating concentrations of progesterone.

Among heifers, first service conception rates at location 1 were 63% (10/16) and 65% (11/17) for GnRH treated and control, respectively, and there was no difference between treatments (*P* = 0.89). At location 2, first service conception rates were 78% (14/18) and 53% (9/17) for GnRH treated and control, respectively, and there was no difference between treatments (*P* = 0.12). When locations were combined there was no difference (*P* = 0.31) between GnRH treated and control heifers in first service conception rates [71% (24/34) and 59% (24/34), respectively; Figure 3].

Among cows, first service conception rates at location 2 were 61% (17/28) and 58% (14/24) for GnRH treated and control, respectively, and there was no difference between treatments (*P* = 0.86). At location 3, first service conception rates were 74% (59/80) and 73% (69/95) for GnRH treated and control, respectively, and there was no difference between treatments (*P* = 0.87). When locations were combined there was no difference (*P* = 0.92) between GnRH treated and control cows in first service conception rates [70% (76/108) and 70% (83/119), respectively; Figure 3].

When heifers and cows were combined, overall first service conception rates were 70% (100/142) and 67% (103/153) for GnRH treated and control animals, respectively, with no difference detected between treatments (*P* = 0.57; Figure 3).

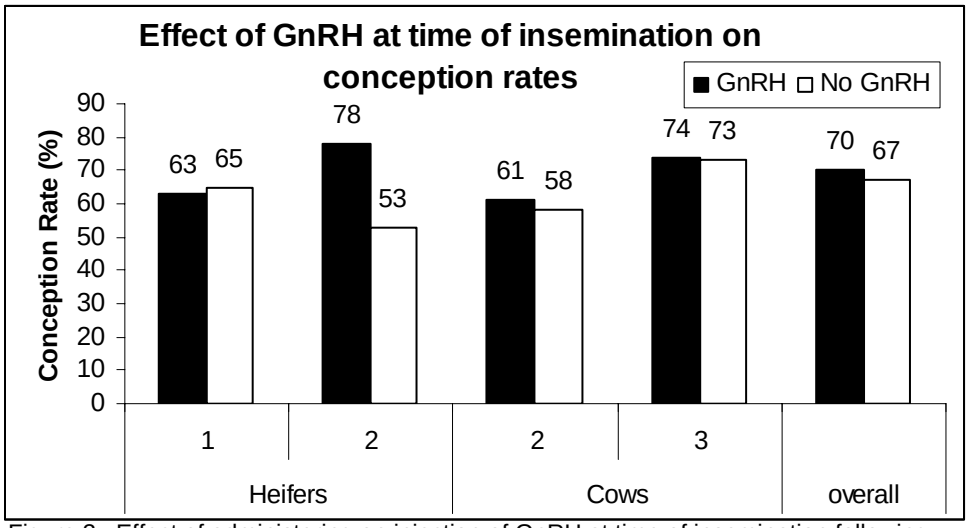


Figure 3. Effect of administering an injection of GnRH at time of insemination following detection in standing estrus on conception rates.

There was no improvement in first service conception rates among heifers or cows by administering an injection of GnRH at time of insemination in the present study. Standing estrus is induced by estradiol acting upon the hypothalamus in the absence of progesterone. Secretion of estradiol by the ovulatory follicle is thought to be responsible for priming the pituitary to release LH. The initiation of standing estrus, the peak in plasma estradiol, and the release of the ovulatory surge of LH all occur at approximately the same time. Pituitary responsiveness to GnRH is greatest near estrus but before the spontaneous surge has been initiated. Thus, administration of exogenous GnRH at estrus and prior to the spontaneous LH surge should result in an LH surge of greater magnitude, but administration of GnRH at time of insemination (approximately 12 h after the initiation of standing estrus) may not result in a greater surge of LH.

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