PREGNANCY RATES IN BEEF CATTLE AFTER ADMINISTRATION OF GnRH AGONIST 11 TO 14 DAYS AFTER INSEMINATION

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Summary

Pregnancy rates were assessed in suckled beef cows (n = 145) and virgin beef heifers (n = 606) of mixed breeding following an injection of either 100 or 200 µg of a GnRH agonist given once on d 11-14 after estrus and insemination. In heifers, the 100 µg dose improved (P < .08) pregnancy rates, based on rectal palpation of the uterus, and at both doses, based on actual calving dates. There was no effect of either dose on pregnancy rates of suckled cows, based on palpation results, but actual calving showed a 21% increase (P < .08) in pregnancy rates in cows treated with 100 µg of the GnRH agonist.

(Key Words: GnRH Agonist, Pregnancy Rates, Suckled Cows, Heifers.)

Introduction

Several studies have indicated improved pregnancy rates in cattle treated during the postinsemination period with various potent gonadotropin-releasing hormone (GnRH) agonists (analogs that mimic the biological effects of the parent compound). GnRH is a naturally occurring decapeptide (protein) composed of amino acids and produced by the hypothalamus in the brain. Hypothalamic GnRH causes the release of the gonadotropins, luteinizing hormone (LH) and follicle-stimulating hormone (FSH), from the pituitary gland. Currently, two GnRH products are on the market: Cystorelin® (gonadorelin diacetate tetrahydrate), available from SANOFI Animal Health Inc., Overland Park, KS (formally known as CEVA Laboratories, Inc.); and Factrel® (gonadorelin hydrochloride) produced by Fort Dodge Laboratories, Fort Dodge, IA. These two GnRH products are similar to the naturally occurring GnRH and have nearly equal potency.

Several new GnRH agonists (currently available for experimental use) are more potent (2.5 to 10 times) in their ability to release LH and FSH. One of these agonists is fertirelin acetate (marketed outside the U.S. as Ovalyse®), available from The Upjohn Company, Kalamazoo, MI.

The objectives of our study were to determine the dose-pregnancy rate effect of fertirelin acetate in a multi-location field study, utilizing both virgin heifers and suckled beef cows.

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Experimental Procedures

Suckled cows (n = 162) at two locations and virgin heifers (n = 606) at five locations were inseminated at a synchronized estrus. Estrus was synchronized in heifers by feeding .5 mg melengestrol acetate (MGA) for 14 d and then injecting (i.m.) 25 mg Lutalyse® 17 d after the last daily feeding of MGA. Suckled cows were given one injection (i.m.) of Lutalyse to regress the corpus luteum and induce estrus in those cows that were cycling. Cows and heifers were inseminated 6-12 h after estrus was observed. Cows were of mixed breeding across locations, including purebred and crosses of Angus, Hereford, Simmental, and Salers.

Once heifers and cows were inseminated, they were allotted, based on inseminator and sire of breeding, into blocks and assigned randomly to receive (i.v.) either 100 or 200 µg of a GnRH analog agonist (fertirelin acetate in 4 ml of saline) or a control dose of 4 ml saline. Injections of the GnRH agonist were given once on d 11-14 after estrus (d 0 = estrus). Heifers and cows were exposed to clean-up bulls or re-inseminated after the initial artificial insemination and subsequent treatment. Pregnancy was verified by palpation of the uterus per rectum between 45 and 80 d after insemination and(or) by actual calving dates at two of five locations of heifers and at both locations of cows. Blood was collected from all females at treatment. Those with concentrations of progesterone in serum < 1 ng/ml were excluded from analyses, because we assumed that they were not in their luteal phase at the time of GnRH treatment.

Results and Discussion

Results for heifers at five locations are summarized in Table 1. There appeared to be a pregnancy rate response to the agonist in heifers at four of the locations (locations 1, 2, 4, and 5), based on palpation results. Based on actual calving dates at two locations, both doses of the GnRH agonist appeared to increase pregnancy rates. The 100 µg dose increased ($P < .08$) pregnancy rates beyond that of the control. However, based on fewer actual calvings, the effect of the GnRH agonist at both doses tended ($P < .11$) to improve fertility.

Results of the experiment for suckled cows at two locations are summarized in Table 2. There was no effect of either dose, based on the palpation results, but 100 µg of the GnRH agonist increased ($P < .08$) pregnancy rates, based on calving.

The difference in the results between pregnancy rates by palpation and those obtained by actual calvings can be accounted for by the difficulty in differentiating ages of fetuses that were 15 to 20 d apart. This difficulty mainly occurred when palpations were performed at d 70 to 80 after insemination, particularly at one location of heifers and at one location of cows, when differentiating between fetuses of 70-80 days of age and those of 50-60 days of age.

These results provide good preliminary evidence and that administering a GnRH agonist to virgin heifers and suckled cows during the luteal phase (d 11 to 14) after insemination increases pregnancy rates. Other work indicates that the mode of action is the ability of the GnRH agonist to luteinize ovarian follicles or in some way alter follicular function at this stage of the estrous cycle or pregnancy, thereby rendering follicles non-estrogenic and delaying the luteolytic process for several days, sufficient to increase the probability of pregnancy in some females.

Table 1. Pregnancy Rates (%) in Virgin Beef Heifers Based on Palpation of the Uterus (45 to 80 d) and Actual Calving Dates[1]

	Location					
Dose, µg	1	2	3	4	5	Total
			Pregnancy Rates - Palpation Data			
0	35/68	14/29	14/28	3/20	20/56	86/201
	(51.5)	(48.3)	(50.0)	(15.0)	(35.7)	(42.8)
100	33/66	17/27	12/25	13/21	25/58	100/197
	(50.0)	(63.0)	(48.0)	(61.9)	(43.1)	(50.8)[a]
200	41/67	18/30	14/27	9/23	18/56	100/203
	(61.2)	(60.0)	(51.9)	(39.1)	(32.2)	(49.3)
			Pregnancy Rates - Calving Data			
0		13/29		11/19		24/48
		(44.8)		(57.9)		(50.0)
100		18/27		13/20		31/47
		(66.7)		(65.0)		(66.0)[b]
200		19/30		15/22		34/52
		(63.3)		(68.2)		(65.4)[b]

[1]Injection of fertirelin acetate was given (i.m.) once on d 11-14 after estrus (d 0) and insemination.
[a]Different ($P < .08$) from control (0 µg) dose.
[b]Different ($P = .11$) from control (0 µg) dose.

Table 2. Pregnancy Rates (%) in Suckled Beef Cows Based on Palpation of the Uterus (45 to 80 d) and Actual Calving Dates[1]

	Location		
Dose, µg	1	2	Total
		Pregnancy Rates - Palpation Data	
0	21/29	15/22	36/51
	(72.4)	(68.2)	(70.6)
100	17/21	13/22	30/43
	(81.0)	(59.0)	(69.8)
200	20/25	14/26	34/51
	(80.0)	(53.8)	(66.7)
		Pregnancy Rates - Calving Data	
0	20/27	10/14	30/41
	(74.1)	(71.4)	(73.2)
100	18/21	14/15	32/36
	(85.7)	(93.3)	(88.9)[a]
200	17/22	14/16	31/38
	(77.3)	(87.5)	(81.6)

[1]Injection of fertirelin acetate was given (i.m.) once on d 11-14 after estrus (d 0) and insemination.
[a]Different ($P = .08$) from control (0 µg) dose.