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ADMINISTERING A GnRH AGONIST (RECEPTAL) AFTER INSEMINATION FAILS TO IMPROVE PREGNANCY RATES AT FIRST SERVICE

J. S. Stevenson, I. Rettmer, and R. E. Stewart

Summary

Two experiments were performed to determine the influence of administering a highly potent agonist of gonadotropin-releasing hormone (Receptal) on various reproductive characteristics in dairy cows. In Experiment 1, lactating Holstein cows were treated with either saline (n = 51) or 8 µg of Receptal (n = 50) on d 11 to 14 after estrus (d 0) and first service. Peak concentrations of LH, FSH, and progesterone, but not estradiol-17β, in blood serum were increased during 6 to 12 h after injection of Receptal. Pregnancy rates were unaffected by treatment. Concentrations of progesterone in blood serum were increased in nonpregnant and pregnant cows after injection of Receptal. Return to estrus in Receptal-treated cows increased by $2.5 \pm .8$ days compared to controls. The number of follicles >10 mm in diameter, assessed by transrectal ultrasonography, were reduced and follicular development was altered after Receptal. In Experiment 2, various doses of Receptal were tested in eight dairy herds, including 1,013 inseminations at first service. Cows were given a single injection of either saline or 4, 8, or 12 µg of Receptal on days 11 to 14 after first service. Pregnancy rates were not improved consistently in all herds and failed to increase across all herds. We concluded that administering a potent GnRH agonist altered number and distribution of ovarian follicles, increased cycle length, and increased concentrations of progesterone, without a consistent increase in fertility.

(Key Words: GnRH Agonist, Pregnancy Rates, Hormones, Cattle.)

Procedures

In Experiment 1, lactating dairy cows (n = 101) were assigned to receive either a single injection of saline or 8 µg of Receptal (a GnRH agonist also known as buserelin acetate; Hoechst-Roussel Agri-Vet Company, Somerville, NJ) on days 11 to 14 after first service. Blood was collected daily from estrus and insemination until 10 days after treatment injection and during 12 hr after the injection of either saline or Receptal (10 to 16 cows/group). Hormones were measured by radioimmunoassay. Both ovaries were scanned by ultrasonography (10 cows/group) for 10 consecutive days beginning the day of injection. Number and diameter of follicles and luteal structures (corpus luteum) were measured and recorded.

In Experiment 2, a double-blinded, dose-pregnancy rate response procedure was used in eight dairy herds. Dairy cows were observed for estrus and inseminated at the first eligible heat after 50 days postpartum. Upon insemination, cows were assigned randomly to receive a single injection containing either saline or 4, 8, or 12 µg of Receptal. One herd was located in Chino, California, five herds in the upper San Joaquin valley of central California, one herd in northern California, and one herd in northeastern Kansas. Pregnancy status after first service and treatment injections was confirmed by return to estrus and/or by palpation of the uterus and its contents 40 or more days after insemination.

Results and Discussion

In Experiment 1, pregnancy rates at first service were unaffected by injections of Receptal (19/51 or 37%) or saline (17/50 or 34%). However, in cows not conceiving at first service, the duration of the estrous cycle was increased ($P < .05$) by $2.5 \pm .8$ d after treatment with Receptal. Peak concentrations of LH, FSH, and progesterone, but not estradiol-17 β , in blood serum were increased during 6 to 12 hr after injection of Receptal (Table 1).

Concentrations of progesterone were increased for 3 days in nonpregnant cows and for 12 days in pregnant cows beginning 2 to 3 days after injection of Receptal compared to controls of similar pregnancy status (Figure 1).

Using daily transrectal ultrasonography, we determined that number of ovarian follicles during 10 days after Receptal was reduced, specifically those with antral diameters of

greater than or equal to 10 mm. The dominant follicle in both groups began to decrease in diameter on the day following treatment, but the first new dominant follicle began to increase in diameter $2.3 \pm .7$ days later in Receptal-treated cows compared to controls, accounting for the increase in cycle duration (Table 2). Four of 10 cows given Receptal had induced corpora lutea compared to none of 10 controls.

In Experiment 2, pregnancy rates were improved in one herd (Herd A) at all doses of Receptal, but inconsistent responses were observed in the remaining herds at various doses (Table 3). A greater proportion of cows given Receptal returned to estrus after 24 days compared to controls. We concluded that administering a potent GnRH agonist altered number and distribution of ovarian follicles, increased cycle duration, and increased concentrations of progesterone, without a consistent increase in pregnancy rates.

Table 1. Peak Concentration and Interval to Peak for LH, FSH, Progesterone, and Estradiol-17 β in Blood Serum during 12 h after a Single Injection of Saline or Receptal on Days 11 to 14 after Estrus (10 Cows/Treatment)

Hormone	Peak concentration ¹		Interval to peak	
	Saline	8 μ g	Saline	8 μ g
	-----ng/mL-----		-----min-----	
LH	.6 \pm .9	12.6 \pm .9 ^a	355 \pm 43	172 \pm 45 ^a
FSH	1.0 \pm .2	1.7 \pm .2 ^b	161 \pm 22	180 \pm 23
P ₄ ²	6.7 \pm 1.1	12.1 \pm 1.1 ^a	8.8 \pm .9	5.3 \pm .9 ^b
E ₂ ^{2,3}	7.0 \pm 1.5	10.1 \pm 1.5	2.6 \pm .9	5.5 \pm .9 ^c

^aDifferent ($P < .001$) from saline.

^bDifferent ($P < .01$) from saline.

^cDifferent ($P < .05$) from saline.

¹Highest concentration during 12 h after treatment.

²Interval to peak in hours.

³Concentration in pg/mL.

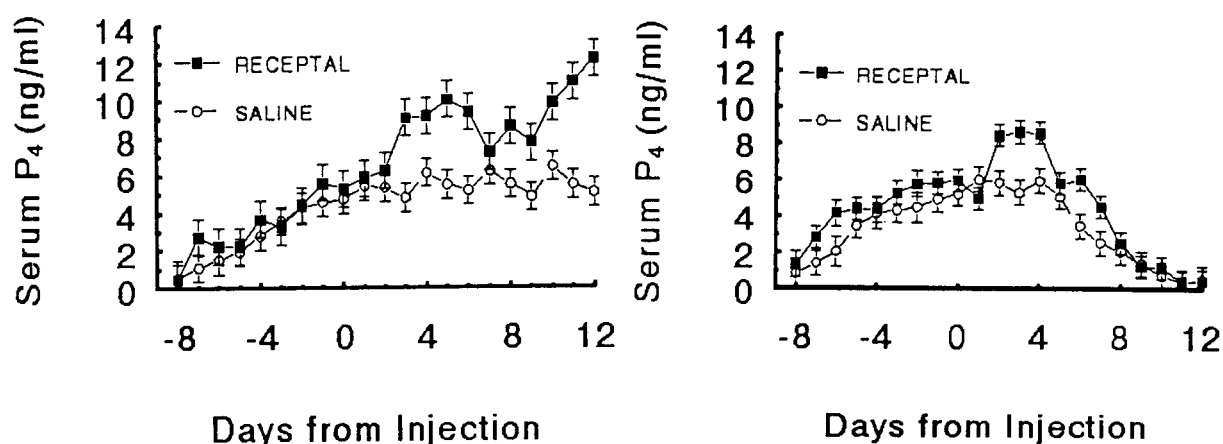


Figure 1. Concentrations of progesterone in serum of 11 pregnant (left; seven saline and four Receptal) and 20 nonpregnant (right; nine saline and 11 Receptal) cows after a 8- μ g injection of Receptal (GnRH agonist) or saline.

Table 2. Number of Follicular Waves, and Diameter and Characteristics of Dominant Follicles during 10 d after an Injection of Saline or Receptal on Days 11 to 14 after Estrus¹

Item	Saline	8 μ g	P
No. of cows	10	10	
Antral diameter of dominant follicle ² , mm	10.9 \pm 1.0	13.7 \pm 1.2	.11
Regression of dominant follicle ³ , d	13.2 \pm .4	13.1 \pm .4	.94
Appearance of first new dominant follicle ⁴ , d	14.4 \pm .7	16.7 \pm .7	.04
Antral diameter of first new dominant follicles, mm	12.2 \pm .8	11.4 \pm .8	.48
Regression of first new dominant follicle ⁶ , d	19.4 \pm 1.1	21.7 \pm 1.1	.17
No. of follicular waves ⁷	1.6 \pm .2	1.2 \pm .2	.24

¹Based on transrectal ultrasonography during 10 d after treatment on d 11 to 14 of the cycle (estrus = d 0).

²Peak diameter of the largest follicle on either ovary on the day of treatment with saline or Receptal.

³Day of estrous cycle when the dominant follicle first identified on the day of treatment began to regress in size.

⁴Day of estrous cycle when the first new dominant follicle began to increase in diameter after treatment.

⁵Peak diameter of the first new dominant follicle after treatment.

⁶Day of estrous cycle when the first dominant follicle first identified after treatment began to regress in size.

⁷Number of follicular waves after treatment.

Table 3. First-Service Pregnancy Rates after a Single Injection of Saline or Receptal on Days 11 to 13 after Estrus and AI

Herd	n	Saline	Dose of Receptal, μg			Dose χ^2
			4	8	12	by herd
----- % -----						
A	192	48.0	70.2	69.2	60.5	.08
B	44	50.0	45.4	45.4	50.0	.99
C	101	37.2	—	30.3	41.2	.71
D	140	35.9	51.7	35.0	43.7	.48
E	179	54.3	54.6	60.0	50.0	.82
F	119	51.6	44.4	58.1	60.0	.64
G	188	57.1	50.0	52.2	35.6	.19
H	50	30.8	38.5	15.4	54.6	.23
	Mean ^a	46.7	53.9	50.2	49.1	
	n	291	219	271	232	

^aHerd effect ($\chi^2 = 21.2$; $P = .001$) and dose effect ($\chi^2 = 1.1$; $P = .775$).