FEEDING MELENGESTEROL ACETATE (MGA) IN ADVANCE OF ESTRUS SYNCHRONIZATION OF VIRGIN BEEF HEIFERS

B. T. Gray and T. T. Marston

Summary

The objective of this experiment was to determine if a 7-day feeding of melengesterol acetate (MGA) about 2 months before the breeding season would have an effect on puberty onset, response to estrous synchronization, and fertility. "Progesterone priming" with MGA increased the number of heifers that began cycling before estrous synchronization. This did not increase the percentage of heifers that were observed in standing heat after estrous synchronization, however, regardless of whether standard MGA/PGF or Select Synch protocol was used. The conception rates and overall pregnancy rates were similar between treatments. Many factors affect the reproductive performance of replacement heifers; slight decreases in the age of puberty onset seem to have little effect.

Introduction

Cow/calf producers and operations that develop replacement heifers realize that reproductive rates are extremely important to their operations. Heifers that reach puberty several months before the breeding season are more likely to respond to estrous synchronization, to have improved AI conception rates, and to have greater pregnancy rates at the end of a controlled breeding season. Often heifers will have a shortened estrous cycle before their first fertile heat. This "short cycle" seems to have a "progesterone priming" effect on the reproductive system. MGA is a relatively inexpensive, easy-to-use, oral progestin. The objective of this experiment was to determine if a 7-day feeding of MGA about 2 months before the breeding season would have an effect on puberty, response to estrous synchronization, and fertility.

Procedures

A 2-year experiment was conducted at four locations in Kansas with spring-born, virgin beef heifers (n = 347; average weight = 742 lb; average age = 418 days) in 2002 and 2003. Purebred and crossbred heifers were studied depending on location. Heifers were assigned randomly to treatments applied before estrous synchronization and, within each of these groups, heifers were randomly assigned to an estrous-synchronization protocol. Treatments consisted of heifers being fed either 0 (n = 170; control) or 0.5 mg per heifer daily of melengesterol acetate (n = 177; MGA) for 7 consecutive days, beginning 65 days before estrus-synchronization protocols of feeding 0.5 mg per heifer daily of MGA (n=174) for 14 consecutive days, followed 19 days later with an injection of 25 mg of $PGF_{2\alpha}$ (Lutalyse®, Pharmacia Animal Health, Kalamazoo, MI) (MGA+PGF) or of injecting 100 μg of GnRH (n=173, Factrel®, Fort Dodge), followed 7 days later with a 25-mg injection of $PGF_{2\alpha}$ (SELECT SYNCH). Therefore, four different treatments were studied: control/MGA+PGF, control/SELECT SYNCH, MGA/MGA+PGF, and MGA/SELECT SYNCH (Figure 1). After estrous synchronization, heifers were observed for estrus two or more times daily and were artificially inseminated approximately 12 hours after visually confirmed standing heat. Trained technicians (n = 11) were used for the various 6- to 7-day breeding period, depending on location. Heifers were placed with bulls 4 to 6 days after the AI breeding period (see Table 1 for length of natural breeding season at each location) or continued to be observed for estrus and artificially inseminated for the rest of the breeding season. Transrectal ultrasonography (Aloka 500V or 210 ultrasound scanner, Corometrics Medical Systems, Wallingford, CT: equipped with a 5.0 MHz linear array transducer) was used between 30 and 45 days after AI to determine whether heifers conceived to AI. Rectal palpation was performed to verify pregnancy in the fall after the breeding season. Blood samples were collected from 188 heifers (3 locations) at 10-day intervals before the start of control/MGA feeding and estrous synchronization to classify the pubertal status of heifers.

Results and Discussion

Progesterone concentrations indicated that 66% of the heifers (125/188) had achieved puberty before the start of the experiment. Therefore, the pre-estrus synchronization part of treatments could only influence the pubertal status of about one-third of the heifers sampled.

The 7-day feeding of MGA increased the percentage of pubertal heifers before the commencement of estrous synchronization (Table 2). Table 3 lists the reproductive responses of heifers that had not reached puberty until after the start of the experiment. For only those heifers that achieved puberty after the beginning of the trial, the 7-day feeding of MGA induced more heifers into puberty before estrous synchronization, but it did not affect the number of heifers observed in standing heat with either estrous-synchronization protocol or the number that conceived to AI, and did not affect final pregnancy rates. Treatments that used the MGA+PGF estrous synchronization protocol had greater pregnancy rates than SELECT SYNCH in this trial.

The reproductive-response data collected from all locations are listed in Table 4. No differences were noted between treatments for percentage of heifers observed in standing heat or conceiving to AI or for final pregnancy rates.

Reducing the age of puberty by “progesterone priming” the bovine reproductive system with melengesterol acetate seemed to have little effect on reproductive performance of virgin beef heifers. To improve the development of replacement heifers, it seems that producers should focus on genetics, nutritional programs, achieving target weights, reproductive-tract scoring, estrous synchronization, and male fertility.

Table 1. Description of Heifers and Management Used

	Location				
Item	A	B	C	D	E
No. heifers	52	79	88	57	71
Breed type	Purebred	Xbred	Xbred	Purebred	Pure & Xbred
Length of breeding season, days	120	76	48	114	66
Average age, days	433 ± 20	403 ± 15	418 ± 12	417 ± 18	421 ± 16
Average weight, lb	711 ± 61	727 ± 63	750 ± 54	705 ± 73	813 ± 69

Table 2. The Effect of 7-day MGA Feeding on the Percentage of Previously Prepubertal Beef Heifers that Attained Puberty Between the MGA Feeding Period and the Start of Estrous Synchronization

	Pre-estrus Synchronization MGA Feeding [a]		
Location	Control	MGA	P-value
	-------------- % (no./no.) ---------------		
A	25 (3/12)	56 (5/9)	0.16
B	25 (1/4)	100 (6/6)	0.04
C	37 (7/19)	69 (9/13)	0.10
Overall	31 (11/35)	75 (21/28)	0.004

[a]Control = no MGA fed before estrous synchronization; MGA = MGA was fed for 7 consecutive days about 2 months before estrous synchronization.

Table 3. Treatment Responses of Only Those Heifers that Reached Puberty After the Initial 7-day MGA Feeding Period

Response	Control/ MGA+PGF	Control/ SELECT SYNCH	MGA/ MGA+PGF	MGA/ SELECT SYNCH
	---------------------------- % (no./no.) ----------------------------			
Observed in standing heat	82 (14/17)	78 (14/18)	88 (14/16)	83 (10/12)
Pregnant to AI	64 (9/14)	35 (5/14)	50 (7/14)	60 (6/10)
Final pregnancy rate	76 (13/17)	50 (9/18)	69 (11/16)	67 (8/12)

Table 4. Reproductive Responses of Heifers to Treatments

Item	Control/ MGA+PGF	Control/ SELECT SYNCH	MGA/ MGA+PGF	MGA/ SELECT SYNCH	P-value
No. heifers	80	90	94	83	
	--------------------- % (no./no.) ---------------------				
Observed standing heat	81 (65/80)	80 (72/90)	86 (81/94)	75 (62/83)	0.21
Pregnant to AI	56 (36/65)	43 (31/72)	60 (49/81)	51 (32/62)	0.75
Final pregnancy rate	74 (58/79)	66 (59/90)	76 (71/94)	65 (54/83)	0.81

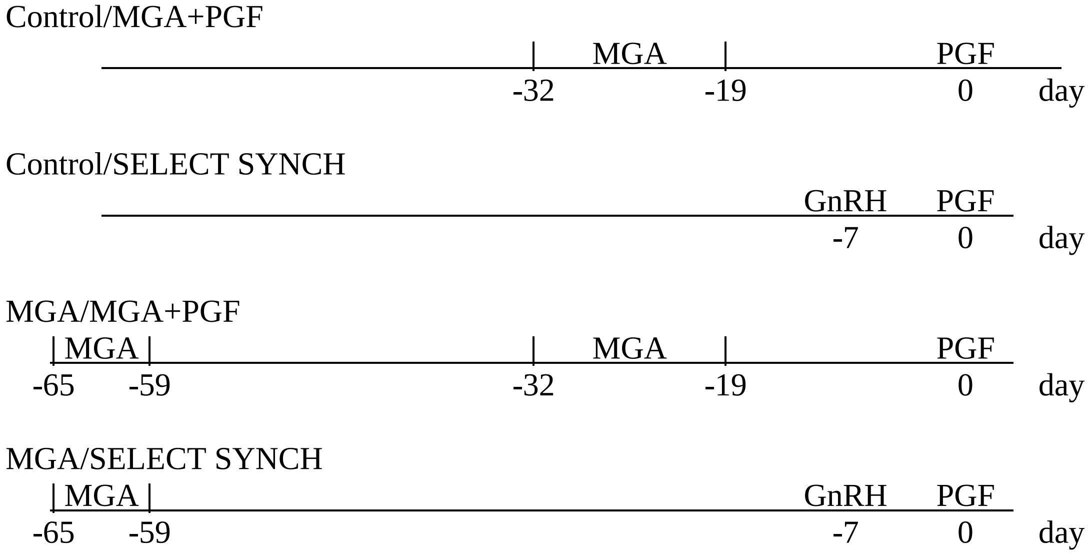

Figure 1. Experimental Design of Treatments Applied Before and During Estrous Synchronization (control/MGA+PGF, control/SELECT SYNCH, MGA/MGA+PGF, and MGA/SELECT SYNCH; top to bottom). Melengestrol acetate (MGA; 0.5 mg per heifer daily) was administered for 7 days during the MGA period and 14 days during estrus synchronization. Gonadotropin-releasing hormone (GnRH; 100 μg) and prostaglandin $F_{2\alpha}$ (PGF; 25 mg) were injected on days -7 and 0, respectively.