Ovarian Response of Angus Cows to PMS Treatments for Two Consecutive Years[1]

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Story in Brief

Ovarian response to PMS in 11 Angus cows that had not previously been injected with PMS was compared to the response in 10 Angus cows that had received a single injection of 2000 IU PMS the previous year. Both groups were given 1500 IU PMS on day five plus 2000 IU PMS on day 17 of the estrous cycle. Eleven control Angus cows were injected with saline.

Only five cows in each of the PMS groups were observed in heat following the day 17 PMS injection compared to nine of 11 control cows. The interval from the second PMS injection to the onset of heat was 1.8 days longer in the cows that had been previously injected with PMS. However, the major difference between the two PMS treated groups was in degree of superovulatory response. Average ovulation rates were 5.5 for the cows never previously treated compared to 2.3 for the cows that had previously received PMS. Eight of the 10 cows previously injected with PMS were not superovulated, having only a single or no ovulation compared to four of the 11 cows that were receiving PMS for the first time.

Although the differences were not statistically significant, the trends observed in these data suggest that PMS injections one year may adversely affect the superovulatory response of cows to subsequent PMS injections.

Introduction

Research conducted at the Oklahoma Agricultural Experiment Station since 1968 has demonstrated that it is possible to greatly increase the incidence of multiple births in beef cows by means of hormone injections. Approximately one cow in every four treated with a sequence of two injections of pregnant mare serum (PMS) have responded with a multiple birth.

It was recognized at the outset that the hormonal induction of multiple births would be accompanied by a number of problems of varying severity. Several of these problems have been the subject of previous reports, and this paper is another in this series.

Research conducted over 30 years ago with both laboratory animals and large farm animals, including the cow, suggested that animals develop a

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refractoriness to PMS as a result of receiving a series of injections repeated over a short period of time. Animals thus made refractory would no longer respond to PMS by superovulation. However, generally such refractoriness developed only after several injections of a fairly large dose of PMS given over a short period of time. Although there was no research to support such, it was not believed that a cow might develop a refractoriness to treatments one year that would persist to affect the response to treatments a year later.

The response observed in certain cows during studies of the past two years have suggested that some degree of refractoriness has been established and does persist.

The purpose of this experiment was to compare the response to a sequence of two PMS injections in cows that had never previously been injected with PMS to those that had.

Materials and Methods

This experiment utilized 32 lactating Angus cows that were observed in heat between May 15 and June 20. The cows were maintained on native grass pastures at the Southwest Livestock and Forage Research Station, El Reno. Twenty-two of the cows had never been previously treated with PMS, and the remaining 10 cows had received a single injection of 2000 IU PMS the previous year.

Starting in mid-May, the herd was checked twice daily for the occurrence of heat. Heat detection was aided by the use of vasectomized bulls wearing chin ball markers. As the cows that had not previously been injected with PMS were detected in heat, they were alternately assigned to either Treatment I or II. All cows that had been previously treated with PMS were assigned to Treatment III.

The three treatments used in this experiment were: Treatment I - no previous PMS - saline injections on day 5 and day 17 of the cycle designating day of heat as 0; Treatment II - no previous PMS - 1500 IU PMS on day 5 plus 2000 IU PMS on day 17; Treatment III - previous PMS - 1500 IU PMS on day 5 and 2000 IU PMS on day 17. All injections were made subcutaneously in the shoulder region. The cows were checked for the occurrence of heat following the PMS injections on day 5, but estrus was not observed. Following the day-17 injection, all cows were fitted with a K-Mar heat detector patch and placed in a lot with a fertile bull equipped with a chin ball marker to aid in detection of heat following treatment.

The PMS used in this study was a lipolyzed product that had been obtained in bulk from Argentina in 1973 and standardized to a potency of 200 IU/mg. It had been stored continuously in a freezer at -10°C. Just prior to use, it was assayed for potency in 21 day female rats against the World Health Organization Standard PMS preparation. For purposes of injection, the PMS

was dissolved in sterile saline so five ml would contain the quantity required per injection.

Ovulation rates were determined in Treatments II and III by means of a high lumbar laparotomy performed seven to fourteen days after breeding. The ovulation rates of the cows in Treatment I were determined by means of rectal palpations carried out seven to 14 days after breeding. Blood samples were collected at several times during the study, and the plasma stored in a freezer for later analysis of estradiol and progesterone.

Results and Discussion

The response of the cows to the sequence of two PMS injections is presented in Table 1. There were too few cows in each group for any of the differences observed in ovarian response to be statistically significant. Therefore, the results being reported must be considered as trends that may or may not represent real differences between the treatments. Ovarian hormone production after PMS will be evaluated in these cows to determine whether treatment with PMS the previous year influenced estradiol production by the follicles and progesterone production by the corpora lutea.

Fewer cows were observed in heat following the PMS injection on day 17 than were observed in heat following saline injection. This could be a reflection of poor heat detection, but this seems doubtful since heat was detected in nine of the 11 cows of Treatment I. Previous treatment had no apparent effect on

Table 1. Reproductive performance of cows following a sequence of two PMS injections

	Treatment		
	I	II	III
	Saline treated	PMS treated	
Item	No previous PMS	No previous PMS	Previous PMS
No. Cows	11	11	10
No. observed in heat following second injection	9	5	5
Interval - last injection to heat (days)	5.4	5.4	7.2
Ovulation rate	0.9	5.5	2.3
Ovulation range	0 - 1	0 - 28	0 - 12
No. cows with			
0 ovulation	1	1	1
1 ovulation	10	3	7
2 ovulations	0	2	0
3 ovulations	0	1	0
4 ovulations	0	1	1
5+ ovulations	0	3	1

estrual response to PMS since five cows were observed in heat in each of the two PMS groups (Treatments II and III). There was a suggestion that cows in Treatment III had a 1.8 day longer estrous cycle than did those of either Treatment I or II.

The superovulatory response of cows to PMS appeared to be influenced by PMS treatment the previous year. This is reflected in the differences in average ovulation rates for the cows in each PMS treatment group. The cows in Treatment II (not previously treated with PMS) averaged 5.5 ovulations compared to 2.3 ovulations per cow in Treatment III. The difference in response is very evident when the ovulatory response of individual cows is studied. Eight of the 10 cows that had been previously treated with PMS failed to superovulate and had only a single ovulation or no ovulation. This compares to four of 11 cows that had never been previously treated with PMS (Treatment II). Thus, there is the possibility that the PMS treatment in 1975 induced a refractoriness to future PMS injections that had a detrimental effect on the response of the cows to the injections given in 1976.

These results suggest the need for additional research with enough cows to determine the real effect of PMS injections repeated at yearly intervals. Certainly, if the trends observed in this study are real, this refractoriness must be taken into account in any practical use of hormone injections to induce multiple births in beef cow herds.
