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EFFECT OF SHORT TERM CALF REMOVAL ON CONCEPTION RATES IN POSTPARTUM SUCKLED BEEF COWS SYNCHRONIZED WITH PROSTAGLANDIN $F_2 \alpha$ AND BRED AT ONE TIMED INSEMINATION

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ABSTRACT

This study examines the effect of a 60-hour calf removal period on the Prostaglandin $F_2 \alpha$ ($PGF_2 \alpha$) synchronized conception rates of beef cows. Fifty-two Hereford-Angus cross cows averaging 131 days postpartum were synchronized with two 25 milligram injections of $PFG_2 \alpha$. The cows were artificially inseminated (AI) at a predetermined 80 hours post injection two. This trial contained four treatment pens, two treatments with replication. In two of the pens the calves were removed from their mothers for a 60-hour period following the second $PGF_2 \alpha$ injection. In the other two pens, the calves were allowed to suckle their mothers during this same 60-hour period. Cleanup bulls were allowed to serve the cows for a 50 day breeding season beginning 12 days after the AI. The 60-hour calf removal period had no effect ($P > .05$) on adjusted 205 day calf weights. No difference ($P > .05$) between calf removal treatment was observed in percent conception rates of the cows to the synchronized AI. Fifty-two percent of the cows conceived to the synchronized AI.

INTRODUCTION

One of the main objectives of estrus synchronization and ovulation control is to manipulate the reproductive processes so that all females in a given herd can be bred during a short, predefined interval with normal fertility. It has been demonstrated that prostaglandin $F_2 \alpha$ will synchronize estrus in cattle exhibiting estrous cycles (Lambert, et. al., 1976). An intramuscular injection of 25 milligrams of

PFG_2 α will result in regression of the functional corpus luteum (between days 5 and 16 of the estrous cycle) in beef cows. Therefore, one of the recommended procedures which has been approved by the Food and Drug Administration is two injections of $PGF_2\alpha$ spaced 10 to 12 days apart. Theoretically, all cows should have functional corpora lutea at the time of the second PGF_2 α injection. These cows then exhibit estrus during the following 48-96 hours. According to the recommended program, cows should then be inseminated at one predetermined time, about 80 hours after the second injection. With this procedure an approximate conception rate of 50-60 percent may be expected (Lambert, et. al., 1975). An obvious advantage to this program is the reduced labor normally associated with estrus detection, an idea favored by many cattlemen.

However, some cattlemen are not satisfied with a 50 percent plus first service conception rate. Similarly, under field conditions many producers are not achieving this high of a conception rate. One of the reasons for a lower conception rate may stem from the fact that PGF_2 α is not a "tight" synchronizer, exemplified by estrus exhibition occurring over a two to four day range.

Even when two predetermined insemination times are employed following the second injection, conception rates may be lower than 50-60 percent. When cows were inseminated at 72 and 96 hours following the second injection, Beverly (1978) noted conception rates of *only* 39.4 percent.

Using another estrus synchronizing agent (Syncro-Mate-B) Mares, et. al. (1979) observed higher pregnancy rates ($P < .05$) for synchronized cows with a 48 hour calf removal period than for synchronized cows without calf removal. Other researchers (Smith and Vincent, 1972; and Dowling et. al., 1977) have also noted higher pregnancy rates in synchronized cows when short term calf removal was practiced. The exact mechanism by which short term calf removal exerts its influence on conception rate is not known. Echternkamp (1978) has suggested that suckling may suppress LH secretion by retarding the transition of the bovine pituitary from a state of low LH content during gestation to a state of higher LH content in the cyclic cow.

OBJECTIVES

It may be theorized, therefore, that two injections of PGF_2 α in combination with short term calf removal may stimulate cycling cows to exhibit estrus during a shorter time span. The purpose of this experiment is to examine the effects of a 72-hour calf removal period on conception rates in cycling beef cows 1) when cows are synchronized with two injections of PGF_2 α and 2) when cows are inseminated at one predetermined time without estrus detection.

METHODS

This experiment took place in the beef facility on the Illinois State University farm. The experimental design is shown in Table I. The trial began on February 13, 1981. Fifty-two four and five years old Hereford-Angus cross beef cows and their Limousin cross calves were used in this experiment. The cows and corresponding calves were stratified by calving date to four treatment pens subject to calving date and calf sex variation. At the time of the first PGF_2 α injection the cows ranged from 179 to 76 days postpartum. Mean days postpartum were 131. The cows and calves

were kept in confinement on concrete floors year around. The cows were fed silage (according to NRC estimated daily allowances) year around by a Harvestore automatic belt system. Creep areas were provided for the calves. The calves were fed a creep feed ad libitum from birth until weaning. In addition, the calves were allowed alfalfa hay free choice. The creep ration is shown in Table II.

The cows were dewormed on March 5. On April 1, 1981 the cows were started on a feeding supplement consisting of four pounds of shelled corn and one-half pound of 42% protein supplement per head per day (in addition to the corn silage). The corn and protein supplement was fed until May 31.

On April 14, 1981 the cows were given the first intramuscular injection of 25 milligrams of $PGF_2\ \alpha$. They were also given a visual condition score on a scale of 1-7 (1 = lean, 7 = fat) by two technicians operating independently. Their scores were averaged and a composite condition score was given to each cow.

On April 25 the cows were given a second injection of 25 milligrams of $PGF_2\ \alpha$. At this time the calves in two of the pens were removed from their mothers and were not allowed to nurse for a 60-hour period. During the calf removal period the calves were provided hay, creep and water ad libitum. The cows and calves were allowed to see and touch each other inasmuch as the cattle panels which separated them would allow. The calves were returned to their mothers immediately following the 60-hour calf removal.

The cows were artificially inseminated once to a Black Angus bull. This bull is a known carrier of the red gene. They were inseminated once 80 hours after the second injection of $PGF_2\ \alpha$. Table III shows the time and order of the second injection and the time and order of the artificial insemination.

Following the second $PGF_2\ \alpha$ injection a record of estrus exhibition was kept. Observations were recorded immediately after the second injection. Observations were recorded three times daily. Each observation period was two hours in duration. The observations were made between the hours of 6:00 and 8:00 a.m., 11:00 a.m. to 1:00 p.m. and 5:00 to 7:00 p.m. Only cows exhibiting estrus for the first time were recorded. Any cow exhibiting estrus during an earlier observation was not recorded in a later observation if she was still exhibiting estrus.

Twelve days following the 80-hour insemination one Charolais bull was placed in each treatment pen. He was allowed to serve any cows coming to estrus for a 50-day period. All cows were rectally palpated to estimate date of conception 28 days after the bulls were removed. A schedule of events is listed in Table IV.

The main criteria to be measured were the conception rates of the cows to the timed insemination. In addition, conception rates to natural service were also measured. Any effects the short term calf removal had on calf performance were observed by calculating 205 day weaning weights. Conception rates and estrus exhibitions were analyzed by Chi-square procedure (Steel and Torrie, 1960). Adjusted 205 day calf weights and cow condition scores were statistically analyzed by least-squares analysis of variance using pens as the unit of analysis.

RESULTS AND DISCUSSION

The experimental procedure called for a 72-hour calf removal. On the third day of calf removal the cows with the older calves appeared to be weaning themselves. Therefore, the calf removal was terminated after a 60-hour removal period and all calves and cows were rejoined. No serious visual ill effects of the 60-hour calf

removal were observed. All cows did display struted udders. Some of the calves did exhibit a small amount of diarrhea when returned to the cows.

Adjusted 205 day calf weaning weights were calculated according to procedures outlined by Ricketts and Carr (1978). No differences ($P > .05$) were observed in adjusted 205 day weights between the calf removal groups and non-calf removal groups. Mean 205 day weight of the calves was 255 kilograms (kg) (Table VI).

A comparison of cow condition score was made between the cows with calf removal and the cows without calf removal. Since cows in poor condition can be expected to have a decrease in fertility this analysis was important as cow condition was not a factor in the initial allotment. The mean condition score was 4.37. No difference ($P > .05$) in cow condition score was observed. Therefore, any variation in condition between the cows should not have had any effect on conception rates.

No cows were observed to exhibit estrus during the first 48 hours following the second injection. Between 48 hours post injection two and 96 hours post injection two, several cows were observed to exhibit varying degrees of estrus. Table VI shows the number of cows exhibiting estrus during the observation periods. No difference ($P > .1$) in number of cows exhibiting estrus was observed by the end of 60 hours post injection two comparing the cows with calf removal and the cows without calf removal. The number of cows observed to exhibit estrus by 84 hours post injection two was different ($P < .1$) between the calf removal and non-calf removal group.

The total number of cows observed to exhibit estrus by the end of the 96 hour observation period was different ($P < .05$) between the calf removal group and the non-calf removal group comparing 22 vs. 15, respectively. On a percentage basis, 85% of the cows with calf removal exhibited estrus compared to 58% of the cows without calf removal. One additional cow exhibited estrus during the observation period after the 96 hour interval. Interesting is the fact that this cow conceived to the synchronized artificial insemination. This fact was determined by the color of her calf and the date of calving.

Results of the rectal palpations taken 91 days post artificial insemination did not agree with the estrus observation data. Fifty-four percent of the cows with calf removal were estimated to have conceived to the AI compared to 58% of the cows without calf removal. This 4% difference was determined to be non-significant. According to the rectal palpation all cows were estimated to be pregnant either to the AI or natural matings of the clean up bulls. Apparently many of the cows in the non-calf removal group either exhibited estrus during the night hours or had silent heats. The latter is doubtful. Perhaps removing the calves stimulated the cows to have stronger and longer heats which were more easily observed. However, it is more likely that since the average days postpartum at calf removal was 142, all cows were cycling and calf removal had little synchrony affect on the cows.

The rectal palpation data was a good estimate of the actual calving data. Since there was a color pattern change in the calves an evaluation of the synchronization success was easy. Calves resulting from the synchronized AI were either red or black. Calves resulting from natural matings were cream colored.

Fifty-two percent of the cows became pregnant to the synchronized AI. There was no difference ($P > .1$) in synchronized conception rates between cows with calf removal and cows without calf removal comparing 46% vs. 58%, respectively. Twelve percent more cows without calf removal settled to the synchronized AI than did the cows with calf removal.

A higher ($P < .1$) percentage of the cows with calf removal settled on the first estrus of natural mating than did the cows without calf removal, comparing 50% vs. 27%, respectively. This would be expected since the total number of cows settled by the end of the first estrus of natural mating was not different ($P > .1$) between the two groups. The number of cows becoming pregnant by the end of second and third estrus of natural mating was similar between the two groups. All cows were pregnant at the end of the fifty day breeding season. Only two cows became pregnant during the third estrus. These two cows were not allowed to calve but were culled from the herd. It should be noted that 90% of the cows became pregnant and calved to either the synchronized AI or the first estrus of natural mating. Those cows which conceived to the synchronized AI calved during a 15 day time span. The most cows to calve in any one day were six. All the cows which were allowed to calve did so in a 60-day time span.

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TABLE I. Experimental Design

pen	1	2	3	4
calf removal	+	+	–	–
number of cows	13	13	13	13
mean days postpartum at first injection	130	131	131	132

TABLE II. Creep Feed

Percent	*Item*
57.5	whole oats
22.5	cracked corn
20.0	32% protein supplement (all natural protein plus 140 grams/Ton aueromycin

Table III. Relationship to Second Injection Time to Artificial Insemination Time

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Pen number	1	2	3	4
Calf Removal	+	−	+	−
Injection time (4-25-81)	5:30-5:45 AM	6:35-6:45 AM	7:32-7:41 AM	8:30-8:37 AM
Insemination time (4-25-81)	1:22-1:40 PM	2:24-2:40 PM	3:31-3:46 PM	4:18-4:36 PM

Table IV. Schedule of Events

Date	*Event*
2-13-81	Allotted cows
3-5-81	Deworm cows
4-1-81	Begin feeding corn + protein supplement to cows
4-14-81	1st PGF_2 α injection + visually score cows for condition
4-25-81	2nd PGF_2 α injection + remove calves from cows
4-27-81	Return calves to cows
4-28-81	AI cows
5-11-81	Turn in clean up bulls
5-31-81	Stop feeding corn + protein supplement
6-30-81	Remove clean up bulls
7-28-81	Palpate cows

TABLE V. Criteria Measured

Calf Removal	+	−	mean	S.E.
Adj. 205 day weights (kg)	255	255	255	.51
Cow condition score	4.47	4.27	4.35	.03
Conception Rate AI %	46	58	52	
Conception Rate First Estrus Natural Mating (%)	50[a]	27[a]	38	
Conception Rate AI + First Estrus (%)	96	85	90	
Conception Rate Second Estrus Natural Mating (%)	4	7.5	6	
Conception Rate Third Estrus Natural mating (%)	0	7.5	4	
Total Conception Rate (%)	100	100	100	

[a]Means with same superscript differ (P < .1).

TABLE VI. Observed Estrus Exhibition

Calf Removal	+	-
Hours Postinjection 2	*Number of cows*	
0	0	0
24	0	0
48	0	0
60	16	12
84	21[a]	15[a]
96	22[b]	15[b]

[a]Numbers with same superscript differ P < .1.

[b]Numbers with same superscript differ P < .05.