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Administration of prostaglandin to beef heifers at time of artificial insemination

Abstract

Transportation of sperm is a critical component of reproductive success. Another factor in reproductive success are the contractions of the uterine myometrium, which influence the number of sperm that reach the oviduct. prostaglandin F2α(PG) is present in bull semen and has a variety of functions in reproduction, including stimulating myometrial contractions. Evidence of improved fertility after administration of PG at breeding has been shown in the rabbit, sow, and cow. An injection of PG at the time of insemination improved conception rates in heifers inseminated with semen with only 30% motility. The objective of the study was to determine if administration of prostaglandin F2αat the time of insemination would improve pregnancy rate to artificial insemination (AI) when insemination occurred after observed estrus or at fixed-time insemination.

Keywords

Cattlemen's Day, 2014; Kansas Agricultural Experiment Station contribution; no. 14-262-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1101; Beef Cattle Research, 2014 is known as Cattlemen's Day, 2014; Beef; Artificial insemination; Fertility; Prostaglandin

Administration of Prostaglandin to Beef Heifers at Time of Artificial Insemination

S.K. Johnson and J.R. Jaeger

Introduction

Transportation of sperm is a critical component of reproductive success. Another factor in reproductive success are the contractions of the uterine myometrium, which influence the number of sperm that reach the oviduct. Prostaglandin $F_{2\alpha}$ (PG) is present in bull semen and has a variety of functions in reproduction, including stimulating myometrial contractions. Evidence of improved fertility after administration of PG at breeding has been shown in the rabbit, sow, and cow. An injection of PG at the time of insemination improved conception rates in heifers inseminated with semen with only 30% motility. The objective of the study was to determine if administration of prostaglandin $F_{2\alpha}$ at the time of insemination would improve pregnancy rate to artificial insemination (AI) when insemination occurred after observed estrus or at fixed-time insemination.

Experimental Procedures

Angus and Angus cross yearling heifers (n = 268) at a single location were assigned randomly to AI either after observed estrus or at a fixed time. To synchronize estrus, all heifers received a standard melengesterol acetate (MGA)–PG protocol of 0.5 mg/head per day of MGA (Pfizer Animal Health, Whitehouse Station, NJ/Zoetis Florham Park, NJ) for 14 days and 5 mL Prostamate (PG, IVX Animal Health, St. Joseph, MO/Bayer, Shawnee Mission, KS), either 18.5 (n = 117; fixed-time AI) or 19 (n = 151; observed estrus AI) days after the last feeding of MGA (Figure 1). Experienced technicians inseminated heifers in the observed estrus AI group 6 to 12 hours after detected estrus. Sixty hours after the Prostamate injection, heifers in the fixed-time AI group received 2 mL OvaCyst (gonadotropin-releasing hormone, IVX Animal Health/Bayer) and were inseminated. At the time of insemination, every other heifer received 2 mL Estrumate (PG, Intervet-Shering Plough, Millsboro, DE/Merck, Summit, NJ). Seven sires were used and were balanced across treatments. Pregnancy rate to AI was determined via ultrasonography 42 days after AI.

Results and Discussion

Reproductive tract scores, measured 45 to 60 days prior to breeding in a subset of 166 heifers (Table 1) indicated heifers met standard recommendations of 50% or more with tract scores of 3 or greater prior to breeding. The average interval between PG injections on day 18.5 to fixed-time AI was 62.2 ± 1.1 hours. Pregnancy rate to AI ($P < 0.06$) tended to be higher in heifers inseminated after observed estrus (57%) than timed-AI (46%). The interaction of insemination type with PG treatment at AI tended to be significant ($P < 0.08$). Pregnancy rate to AI was lowest in fixed-timed AI heifers that did not receive PG at insemination (Figure 2). The incidence of standing estrus was not recorded for heifers in the fixed-timed AI group. Sperm transport may be improved in fixed-time AI heifers treated with PG that were not in heat at the time of insemination.

Further research is needed to clarify if administration of $PGF_{2\alpha}$ at the time of insemination may improve conception to fixed-time AI.

Implications

This study provides evidence that insemination after observed estrus tends to produce more AI pregnancies than fixed-timed AI at 60 hours after PG in the MGA-PG protocol. The study also shows that additional research is needed to determine the potential benefit of $PGF_{2\alpha}$ at fixed-timed AI.

Table 1. Distribution of reproductive tract scores in yearling heifers

	Reproductive tract score[1]				
	1	2	3	4	5
Proportion of heifers, %	0.6	41	47.6	10.8	0

[1] 1 = infantile; 5 = mature tract and corpus luteum.

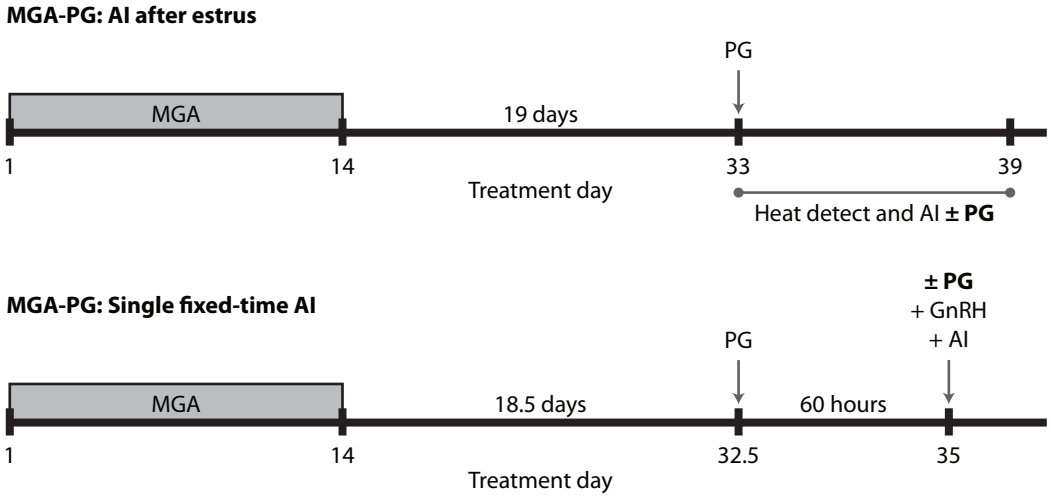

Figure 1. Diagram of treatments for synchronization of estrus and time of artificial insemination (AI). MGA = melengesterol acetate (Pfizer Animal Health, Whitehouse Station, NJ); PG = prostaglandin $F_{2\alpha}$, Prostamate (IVX Animal Health, St. Joseph, MO) day 32–33 and Estrumate (Intervet-Schering Plough, Millsboro, DE) after day 33; GnRH = gonadotropin-releasing hormone (OvaCyst, IVX Animal Health, St Joseph, MO).

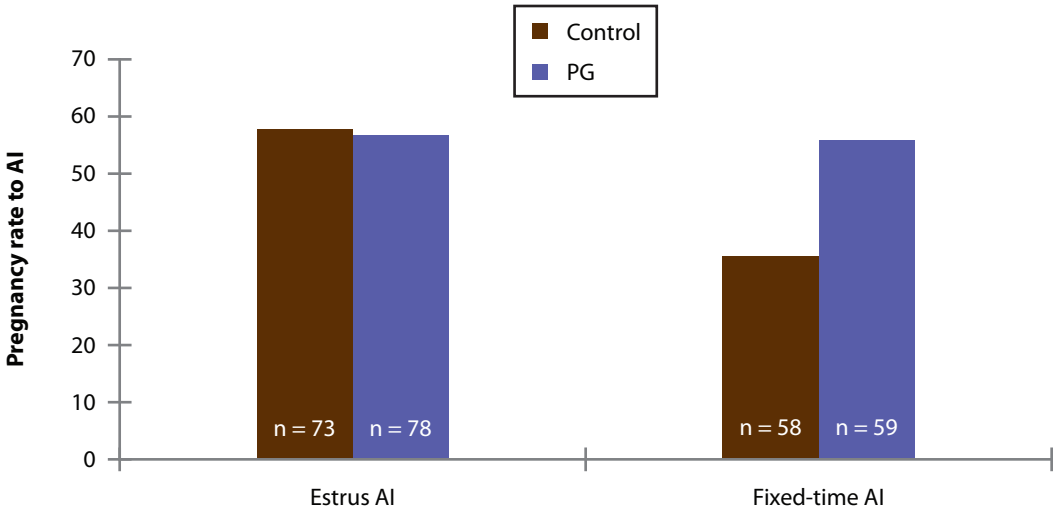

Figure 2. Pregnancy rate for heifers inseminated after observed estrus or at a single fixed-time artificial insemination (AI) that did or did not receive prostaglandin $F_{2\alpha}$ (PG) at time of insemination. Insemination type × prostaglandin $F_{2\alpha}$ treatment, $P < 0.08$.