Effects of delayed injection of prostaglandin $F_{2\alpha}$ and TAI in the 14-d CIDR-PG & TAI protocol in replacement beef heifers

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Abstract

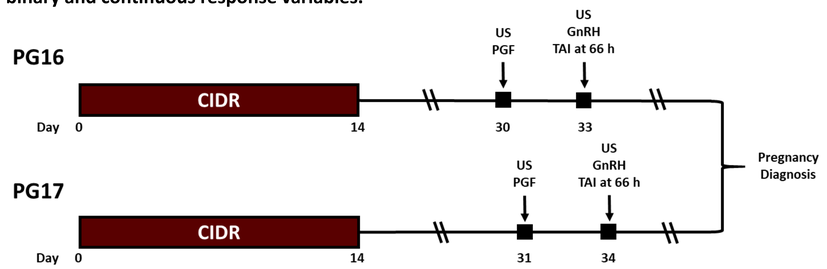
To determine the effects of delaying the injection of prostaglandin $F_{2\alpha}$ (PGF) and fixed-time artificial insemination (TAI) in the 14-d CIDR-PG & TAI protocol, 911 Angus heifers at 5 locations were enrolled in a completely randomized design. Within location heifers were randomly assigned to 1 of 2 treatment groups: 1) PG16 (n = 451), heifers received a CIDR insert on d 0 for 14 d, a 25-mg injection of PGF 16 d after CIDR removal [d 30], and a 100-µg injection of gonadotropin-releasing hormone concurrently with TAI 66 ± 2 h later; or 2) PG17 (n = 459), heifers were treated the same as PG16, however, PGF was administered 17 d after CIDR removal [d 31], and heifers were TAI 66 ± 2 h later. Estrus detection patches were applied to heifers at the time of PGF administration and were examined for activation at TAI. Dominant follicle diameter was determined via transrectal ultrasonography at PGF administration and TAI in a subset of heifers (n = 171). Furthermore, transrectal ultrasonography was performed to determine pregnancy rates to TAI (PR/AI) between 30 and 45 d after TAI. Estrus expression prior to TAI did not differ ($P = 0.15$) between PG16 and PG17 treatments (49.81 vs. 57.61%, respectively). Moreover, dominant follicle diameter at PGF and TAI did not differ ($P \geq 0.27$) between PG16 and PG17 heifers. Pregnancy rates to TAI did not differ ($P = 0.80$) between treatment groups (47.23 vs. 48.05%). The results of this experiment indicate that delaying the injection of PGF from d 30 to d 31 along with TAI in the 14-day CIDR-PG & TAI protocol had no effects on fertility parameters in beef heifers. In conclusion, the PGF injection and TAI in the 14-d CIDR-PG & TAI protocol may be delayed, providing more flexibility in scheduling without negatively affecting fertility.

Introduction

- During the 14-d CIDR-PG protocol, heifers receive a CIDR insert for 14 d followed by an injection of PGF 16 d later, and an injection of GnRH with TAI 66 h after PGF.
- It is likely that 3 follicular waves occur between CIDR removal and TAI, as heifers typically have three follicular waves during their 21-d estrous cycle (Adams et al., 1992). Depending on its size, the dominant follicle of the third wave would either ovulate spontaneously or would be induced to ovulate by the GnRH administered at TAI (Perry et al., 2005).
- After CIDR removal, the majority of heifers return to estrus within 48 h (~ 45%), but a proportion of heifers (~ 23%) also return to estrus between 48 and 96 h (Mallory et al., 2010; Tauck et al., 2007). It is likely that this variation in estrus distribution leads to suboptimal synchrony of the final follicular wave prior to ovulation.
- Heifers that enter into estrus later are likely to have smaller follicles at PGF and TAI, thus more of these follicles will need to be induced to ovulate at TAI via GnRH administration. However, ovulation of smaller, physiologically immature follicles has been reported to reduce pregnancy rates and increase pregnancy loss (Perry et al., 2005; Perry et al., 2007).
- Hence, by delaying the administration of PGF and TAI there is potential to increase the proportion of heifers that have entered into proestrus by PGF administration, increase follicle size, reduce the incidence of GnRH-induced ovulations, increase estrus expression prior to TAI, and therefore, increase PR/AI.

Materials and Methods

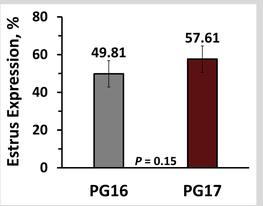
- 1,050 *Bos taurus* beef heifers enrolled at 6 locations in Colorado, Georgia, Nebraska, and Texas. Data from 910 heifers has been collected up until now.
- Heifers were randomly assigned to receive 1 of 2 treatments:
  - PG16 (n = 451), heifers were exposed to the 14-d CIDR-PG protocol wherein they received a CIDR insert (EAZI-BREED CIDR; 1.38 g P4; Zoetis Animal Health) on d 0 for 14 d, a 25-mg injection of PGF (Lutalyse HighCon; dinoprost tromethamine; Zoetis Animal Health) 16 d after CIDR removal (d 30), and a 100-µg injection of gonadotropin-releasing hormone (GnRH; Factrel; gonadorelin hydrochloride; Zoetis Animal Health) administered at TAI 66 ± 2 h later.
  - PG17 (n = 459), heifers were treated the same as PG16, however, PGF was administered 17 d after CIDR removal (d 31), and heifers were TAI 66 ± 2 h later.
- All heifers were fitted with estrus detection patches (Estrotect; Rockway Inc., Spring Valley, WI) at PGF administration, which were evaluated for activation at TAI to determine expression of estrus. Breeding indicator patches were considered activated when at least 50% of the rub-off coating was removed from the patch or when the patch was missing.
- Transrectal ultrasonography was performed at PGF injection and TAI in a subset of heifers (n = 171) to determine dominant follicle diameter and to record if ovulation had occurred prior to TAI.
- Pregnancy diagnosis was performed via transrectal ultrasonography between d 30 and 45 after TAI to determined PR/AI.
- All data were analyzed as a completely randomized design using the SAS statistical package (version 9.4; SAS/STAT, SAS Inst. Inc., Cary, NC, USA). The GLIMMIX procedure of SAS was used to analyze binary and continuous response variables.

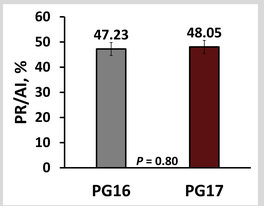


Hypotheses: 1) PG17 heifers would have larger follicles at PGF and more PG17 heifers would ovulate prior to TAI than PG16 heifers; 2) PG17 heifers would have greater expression of estrus prior to TAI and thus greater PR/AI than heifers in the control treatment.

Results

Item	Treatment		SEM	*P*-value
	PG16	PG17		
Descriptive variables				
No. of heifers	451	459		
Body weight, kg	378.26	375.74	3.80	0.51
Body condition score	5.06	5.11	0.10	0.65
Ovarian response variables				
No. of heifers	83	88		
Dominant follicle at PGF, mm	9.26	9.54	0.26	0.27
Dominant follicle at TAI, mm	11.33	11.13	0.34	0.57
Ovulated between PGF and TAI, %	4.49	10.00	3.88	0.16





Summary and Conclusions

- No differences were determined between PG16 and PG17 heifers in dominant follicle size at either PGF administration or TAI.
- No difference was determined between treatments in the percentage of heifers that ovulated between PGF and TAI.
- No differences in estrus expression or in PR/AI were determined between PG16 and PG17 heifers.
- Administration of PGF as well as TAI in the 14-d CIDR-PG & TAI protocol may be delayed, providing more flexibility in scheduling for beef cattle producers without negatively affecting fertility.

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