

Influence of a prostaglandin synthesis inhibitor administered at embryo transfer on pregnancy rates of recipient cows

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Abstract

Elevated uterine luminal concentrations of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) have been negatively associated with embryo quality and pregnancy rates. Two studies were performed in cows to determine $PGF_{2\alpha}$ release from uterine endometrium following embryo transfer and to investigate administration of flunixin meglumine (FM), a prostaglandin synthesis inhibitor, on pregnancy rates following embryo transfer. In Experiment 1, blood samples were collected prior to and after embryo transfer from the posterior vena cava via saphenous vein cannulation. Serum profiles of $PGF_{2\alpha}$ indicated that manipulation of the reproductive tract during embryo transfer was followed by increased release of $PGF_{2\alpha}$ from the uterine endometrium. In Experiment 2, estrus (day = 0) was synchronized in recipient animals and a single embryo transferred 7 days after estrus. At the time of non-surgical embryo transfer, animals were randomly assigned to receive either FM (FM; $n = 1300$) or remain untreated (control (CON); $n = 797$). Data collected at transfer included stage of embryo development, embryo quality, technician, and transfer quality score. Overall pregnancy rates of cows receiving FM (65%) were higher than control cows (60%; $P < 0.02$). Pregnancy rates following transfer of quality 1 (good) embryos did not differ ($P > 0.05$) between treatments. However, pregnancy rates of quality 2 (fair) embryos were higher in animals receiving FM than in CON ($P < 0.01$). Moreover, pregnancy rates of transferred morula- and blastocyst-stage embryos were higher in FM-treated than in controls ($P < 0.06$ and

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$P < 0.04$, respectively). In conclusion, uterine release of $\text{PGF}_{2\alpha}$ is elevated following embryo transfer and administration of a $\text{PGF}_{2\alpha}$ synthesis inhibitor at the time of embryo transfer improved pregnancy rates in cows.

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1. Introduction

Usage of advanced technologies such as artificial insemination (AI) and multiple ovulation and embryo transfer (MOET) programs results in extraordinary improvement in genetic merit of dairy and beef cows. However, pregnancy rates associated with embryo transfer (ET) are generally lower than those using AI. In cows, the procedure of ET includes placement of an embryo into the uterine horn ipsilateral to the corpus luteum. However, manipulation of the female reproductive tract has been shown to increase release of prostaglandin $\text{F}_{2\alpha}$ ($\text{PGF}_{2\alpha}$) into the uterine lumen [1,2].

Several *in vivo* studies have shown negative effects of $\text{PGF}_{2\alpha}$ on embryonic survival in beef cows [3–7]. Moreover, Schrick et al. [3] determined that elevated uterine concentrations of $\text{PGF}_{2\alpha}$ were negatively correlated with embryo quality. Furthermore, addition of $\text{PGF}_{2\alpha}$ to the culture medium has been shown to inhibit *in vitro* development of rabbit [8], rat [9], and bovine embryos [10].

The objectives of the current studies were (1) to determine $\text{PGF}_{2\alpha}$ release following embryo transfer and (2) to evaluate whether administration of a prostaglandin synthesis inhibitor (flunixin meglumine (FM)) at the time of transfer would prevent deleterious effects of $\text{PGF}_{2\alpha}$ on embryonic survival and increase pregnancy rates after transfer of single embryos.

2. Materials and methods

2.1. Experiment 1

Estrus (day 0) was synchronized in 10 lactating dairy cows utilizing two injections of $\text{PGF}_{2\alpha}$ (25 mg/injection *i.m.*; Lutalyse, Pfizer Animal Health, New York, NY, USA) 14 days apart. Following the second injection of $\text{PGF}_{2\alpha}$, cows were observed for estrus 3×/day visually and with the aid of the HeatWatch System (DDX, Denver, CO, USA). On day 5 after estrus, cows had indwelling saphenous vein catheters positioned as described by Benoit and Dailey [11].

Briefly, cows were sedated with xylazine (10–20 mg, Fort Dodge Animal Health, Fort Dodge, IA, USA) and the right rear leg was anesthetized dorsal and lateral to the hock with 6–10 ml of 2% lidocaine (Phoenix, St. Joseph, MO, USA). Hair was clipped, area disinfected by scrubbing with a solution of 10% povidone iodine, and a 3 cm incision made approximately 7 cm dorsal to the hock and 3 cm lateral to the Achilles tendon. The saphenous

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