

Comparison of serum progesterone curves in beef heifers during luteolysis after administration of dinoprost in the muscle or the ischiorectal fossa

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Introduction

Many producers and veterinarians report injection of products in the rear legs or hip due to convenience or lack of access to the neck. Provision of an acceptable injection site that can be accessed from behind the cow for administration of therapeutics may improve compliance and beef products. The authors propose the ischiorectal fossa (IRF), located adjacent to the tailhead and craniomedial to the tuber ischia, as an alternate injection site for products in cattle. A suitable drug to use for proof of concept is Prostaglandin F_{2α} (PGF_{2α}), given that the physiological outcome variable (luteolysis) is detected by a decline in serum progesterone. Colazo et al demonstrated that PGF_{2α} given in the IRF or IM in the neck resulted in similar rates of luteolysis (2002). However, Chebel et al found a difference in time to estrus in beef heifers given a prostaglandin analog either IM in the neck or subcutaneously (2007). The objective of this study was to determine if PGF_{2α} given in the IRF results in luteolysis at a similar time as PGF_{2α} given IM in the neck. Our goal is to provide producers and veterinarians with an alternative to the current practice of harmful injections in the rear legs.

Materials and Methods

Yearling Angus-cross beef heifers (n = 71) were blocked by sire and yearling weight and randomly assigned within block to be injected with PGF_{2α} (Lutalyse®; Pharmacia & Upjohn Animal Health, Orangeville, Ontario) either intramuscularly in the neck (IM) with an 18 g x 1.5" needle or in the IRF with a 1" needle. Heifers were given 5 mL Lutalyse® according to their assigned treatment group. Blood was sampled at 0, 8, 16, 24, 36, and 48 hours post-injection. Serum progesterone concentration was determined using a commercial radioimmunoassay (Coat-A-Count Progesterone; Diagnostic Products, Los Angeles, California).

Only heifers with a competent CL at time zero that responded to the dinoprost were included in the analysis (n = 31). Heifers were considered to have a competent CL if initial serum progesterone concentration was greater

than 2 ng/mL and were considered to have responded if serum progesterone decreased to less than 1 ng/mL. For each heifer included in the analysis, a sigmoidal logistic model was used to predict when serum progesterone decreased to less than 1 ng/mL (Turino et al, 2010). A survival analysis was performed to determine median time for serum progesterone to fall below 1 ng/mL. Significance was set at $p < 0.05$.

Results

Seventeen IM and 14 IRF heifers had competent CLs and were considered responders. The intra-assay coefficient of variation for serum progesterone was 3.1%. For treatment group IM, median time for serum progesterone concentrations to decrease to less than 1 ng/mL was 24.7 hrs (95% CI, 18.3 to 29.7 hrs). For treatment group IRF, median time was 21.8 hrs (95% CI, 17 to 28.8 hrs). A difference between the IM and IRF treatments in response time was not detected ($P = 0.22$).

Significance

In the current study we did not detect a difference in time to luteolysis between routes of administration. Surprisingly, heifers given dinoprost in the ischiorectal fossa responded numerically faster than heifers given dinoprost in the muscle (2.9 hrs). A difference of 4 hours would be meaningful in terms of altering a timed artificial insemination (TAI) protocol. The authors will enroll a second cohort of 35 heifers to detect a difference of 4 hours with a power of 0.8.

It is currently unknown whether injections given in the IRF are given subcutaneously or intramuscularly. The medial and ventral borders of the fossa are made up of the coccygeus and levator ani muscles, respectively, but varying amounts of adipose tissue are also found in the fossa. Further work in describing the IRF as an injection site will augment our understanding of pharmacokinetics in that region; however, this work demonstrates the feasibility of giving PGF_{2α} in the ischiorectal fossa rather than the muscles of the rear legs and should augment beef quality assurance.