Theriogenology 85 (2016) 1415–1420

Contents lists available at ScienceDirect

Theriogenology

journal homepage: www.theriojournal.com

The effect of parturition induction treatment on interval to calving, calving ease, postpartum uterine health, and resumption of ovarian cyclicity in beef heifers

Miha Šavc[a], David A. Kenny[b], Marijke E. Beltman[a,*]

[a] Herd Health and Animal Husbandry Section, UCD School of Veterinary Medicine, University College Dublin, Dublin, Ireland
[b] Animal and Bioscience Research Department, Animal & Grassland Research and Innovation Centre, Teagasc, County Meath, Ireland

A R T I C L E I N F O

Article history:
Received 18 August 2015
Received in revised form 21 December 2015
Accepted 24 December 2015

Keywords:
Induction of parturition
Uterine health
Calving ease
Beef cattle

A B S T R A C T

The aim of this study was to compare the effects of two parturition induction protocols with a nontreated control group, on interval to calving, calving ease, postpartum uterine health, and ovarian cyclicity in beef heifers. At Day 285 of gestation, 81 crossbred recipient beef heifers carrying purebred Simmental fetuses, were blocked by live-weight, body condition score, expected calving date and fetal sex, and assigned to one of three groups: (1) control (CON; no induction treatment, n = 29); (2) induction with corticosteroids (CORT; n = 27); or (3) induction with corticosteroids plus prostaglandin (CORT + PG; n = 25). Interval from induction to calving in hours and calving ease on a scale of 1 to 5 were recorded. Vaginal mucus samples were collected on Day 21 and Day 42 after calving (Day 0) by means of a Metricheck and scored on a scale of 0 to 3. Reproductive tract examinations were conducted on Day 21 and Day 42 after calving, and uterine cytology samples were obtained on Day 21. A positive cytologic sample was defined as greater than 18% neutrophils in the sample obtained via a cytobrush technique. Cows were considered to have resumed ovarian cyclicity if the presence of the CL was confirmed. Data were analyzed using the Mixed (normally distributed data) and Genmod (nonparametric data) procedures of SAS (v. 9.3). The interval from treatment to calving was longer ($P < 0.0001$) for CON (161.9 ± 15.12 hours) animals compared with CORT (39.7 ± 11.64 hours) or CORT + PG (32.6 ± 12.10 hours), which did not differ. Treatment did not affect calving difficulty score. There was also no difference in incidence of retained placenta between the three groups. At Day 21 postpartum, cytology score tended to be higher for both induced groups (48%) compared with the control animals (24%), but this was not the case for vaginal mucus score (CON 52%, CORT 70%, and CORT + PG 52%). A higher proportion of CON had an involuted uterus by Day 21 postpartum (69%) compared with both induced groups (CORT 48%, CORT + PG 32%). Day 21 ovarian cyclicity was higher in both CON (52%) and CORT (59%) compared with CORT + PG (29%). By Day 42, there was no difference in ovarian cyclicity or uterine involution between CON and CORT; however, a positive relationship was observed between uterine involution score on Day 21 and return to cyclicity on Day 42 in these two groups. There was a negative relationship between uterine involution score and return to cyclicity in the CORT + PG group, and these animals were slower ($P < 0.05$) to resume cyclicity by Day 42 with a larger proportion animals having evidence of having resumed postpartum ovarian cyclicity in both CON ($P = 0.03$) and CORT compared with CORT + PG on Day 42. In conclusion, the use of corticosteroid-based treatments is an effective strategy to advance parturition in full term dams and does not

* Corresponding author. Tel.: +353 1 7166084; fax: +353 1 7166005.
E-mail address: marijke.beltman@ucd.ie (M.E. Beltman).

0093-691X/$ – see front matter
http://dx.doi.org/10.1016/j.theriogenology.2015.12.026

have a negative effect on calving progress or dam health. However, when prostaglandin is also included in the protocol, these treatments may lead to greater delay in uterine involution with increased chance of uterine infection and slower resumption of ovarian cyclicity.

1. Introduction

Dystocia, more commonly known as difficult calving, is a problem most beef producers encounter, and its incidence can range from 5% to 25% [1] depending on the breed of bull used, with a higher occurrence rate generally recorded for sires of the larger and well-muscled continental breeds [2]. Consequences of dystocia range from the need for increased producer intervention, to the loss of the calf and/or cow [3]. Indeed, dystocia is a leading cause of perinatal mortality in calves and can subsequently lead to retained placenta, uterine infections, and longer calving intervals [4,5], all of which, in turn, lead to reduced reproductive efficiency of the herd and concomitant economic loss. The most common cause of dystocia is foeto-maternal disproportion, which is typically the result of relative oversize of the calf. This condition in turn can be caused by various factors, the most common of which are prolonged gestation with associated maximum growth rate of the calf [6,7], sex of the calf, with bull calves (in general) being larger, and higher body condition score (BCS) of the dam leading to less physical space in the birth canal for the calf to pass through [8]. Relative immaturity of the dams reproductive tract is also a contributory factor in primiparous animals [8,9]. In addition, oversized calves can also result from IVM/IVF pregnancies and have been known to result in 'large offspring syndrome' [10]. Monitoring and controlling parturition, where possible, is a key factor in minimizing the incidence and effects of dystocia [11,12]. The importance of this was recently confirmed by an Irish study, which showed that lack of observation at stage two of the parturition (expulsion of the calf) led to higher incidence of dystocia and morbidity and/or mortality in beef cattle [13]. To achieve controlled and supervised parturition, the due date needs to be known or at least accurately predicted [14]. One management practice that has been used for cattle is the pharmacologic induction of parturition, thereby ensuring maximization of supervision of parturition and a decrease in dystocia [7,14].

Induction of parturition, however, can have potential side effects as most methods include the use of a corticosteroid which can lead to immunosuppression [15], which in turn can lead to an increased susceptibility to postpartum disease [16]. Indeed, there is strong evidence in dairy cows that those cows suffering significant immunosuppression around parturition are both predisposed to uterine disease and being less able to clear these infections on their own [17]. The impaired immune system also puts the animal at increased risk of the development of retained fetal membranes, mastitis, and suppression of appetite, all with repercussions on subsequent health and reproductive potential of the animal [18]. Maternal bond and the presence of a suckling calf [19] in beef animals are well known to increase the frequency of the LH pulse frequency and postpartum resumption of ovarian cyclicity. These stimuli can also affect the uterine pathogen clearance immediately postpartum via oxytocin-induced uterine contractions and may also advance uterine involution.

Timing of parturition by induction needs be predictable to be an effective intervention. Although long acting steroids can be used, the response rate of these is relatively unpredictable, and it can lead to an increased chance of side effects such as retained fetal membranes [20]. The time of induction relative to due date will also affect response time with the dams endocrinological system being more responsive when she is closer to her natural due date. When using short acting steroids to induce parturition ,this can result in 80% of the calves being born between 30 and 46 hours later thus giving a relatively short window over which the close supervision has to take place [21].

Although there are some data available in the literature on timing of parturition after various induction regimens and on the incidence of retained fetal membranes after induced parturition [21–24], there are no data available on the incidence of uterine disease after induced parturition in beef cows or heifers, using short-acting steroids. Therefore, the aim of the present study was to examine the effects of two short term parturition induction treatments on timing of induction to calving, calving ease, postpartum uterine health, and ovarian cyclicity in beef heifers with the ultimate goal of providing a reliable and effective protocol that can be used by farmers and veterinary practitioners alike.

2. Materials and methods

All experimental procedures involving animals were approved by the Animal Research Ethics Committee of University College Dublin and were licensed by the Health Products Regulation Authority in accordance with the Cruelty to Animals Act and European Community Directive 2010/63/EU. The study was conducted at the Teagasc Animal and Grassland Research and Innovation Center, Grange, Dunsany, Co. Meath, Ireland.

2.1. Animal management and treatments

Crossbred pregnant beef heifers (n = 81) were used for this study. In autumn 2012, these heifers received embryos obtained via standard embryo transfer techniques from purebred Simmental cows through nonsurgical transfer, 7 days after a synchronized estrus. The research herd from which the embryos were sourced has been described previously [25]. Pregnancy was confirmed at 35 days and again at 90 days of pregnancy using transrectal ultrasonography using 7.5-MHz linear-array transducer and fetal sex was determined at the Day 90 scan. All heifers were managed as a single group throughout pregnancy. Animals were body condition scored using a five-point BCS system [26]