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SHORT COMMUNICATION

Parity Differences in Heat Expression of Dairy Cows Synchronized with GnRH, CIDR and PGF2α during Dry Season in Zambia

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ABSTRACT

A study was conducted to investigate parity differences in heat expression of dairy cows heat-synchronized during the dry season when feed scarcity is common. Cyclic cows (n=65) aged 2 to 10 years with parity range of 0 to 7 were selected from small-holder dairy farms around Lusaka. Cows were divided into 3 groups of nulliparous, primiparous and pluriparous. Heat-was synchronized using gonadotrophin releasing hormone (GnRH) and controlled intra-vaginal drug releasing device (CIDR). Heat detection was observed after CIDR withdraw. The study showed a significantly ($P<0.05$) lower number of primiparous cows (68%) coming into heat compared to nulliparous (81.8%) and pluriparous cows (83.3%). It was concluded that parity influences estrus expression rate in dairy cows following synchronization with GnRH, CIDR and $PGF_2\alpha$ during the dry season in the sub-tropics.

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INTRODUCTION

Studies have shown that administration of progestogens in the form of CIDR in combination with GnRH and PGF2α is the surest way of controlling ovarian follicular and luteal development as well as enhancing precision of synchronization in cattle (Islam, 2011). As such, time spent on estrus detection is considerably reduced. GnRH causes release of luteinizing hormone (LH) and follicle stimulating hormone (FSH), which triggers ovulation or atresia of mature follicle, and emergence of a new follicular wave within 3 to 4 days after treatment, respectively (Tucker *et al*., 2011). The subsequent 10-days slow release of progesterone by CIDR mimics the luteal phase of the estrus cycle thereby affecting a negative feedback activity on the pituitary resulting in blockage in the release, but not production of FSH and LH by the pituitary (Cerri *et al*., 2009). Injection of PGF2α on day 5 of the CIDR insertion induces luteolysis of any existing ovarian luteal tissue and subsequent emergence and selection of a new ovulatory follicular wave after CIDR removal (Saldarriaga *et al*, 2007; Tucker *et al*., 2011). Thus, the objective of this study was to evaluate the parity differences in heat expression in exotic dairy cattle reared under extensive conditions during the dry season in Zambia following treatment with GnRH, CIDR and PGF2α as synchronization agents.

MATERIALS AND METHODS

The study was conducted in 65 cyclic Holstein-Friesian cows, under regular deworming and dipping, with average body condition score of 4 out of 9 and parity ranges of 0 to 7. This study was carried out during the driest time of the year (May to October) when pasture availability is limited. The animals were on range pasture throughout the day though corn concentrate could be given at milking times, twice a day. Animals were divided into three categories: heifers (0 parity; n = 22); primiparous (1 parity; n = 25) and pluriparous (>2 parity; n = 18). All experimental animals were treated with the CIDR (Eazi-Breed CIDR: InterAG, Te Rapa Road, Hamilton, New Zealand) containing 1.38g progesterone for 10 days. Prior to insertion of the CIDR, cows were examined for signs of endometritis using vaginal speculum and only animals devoid of endometritis, and between 60 and 90 days postpartum in case of primiparous and pluriparous, were used. GnRH injection was also administered at the time of CIDR insertion in

order to synchronize the follicular wave. Five days after CIDR application, a PGF2α injection was given as a luteolytic agent. Following the removal of the CIDR device 10 days after its insertion, animals were observed for heat signs for seven days.

The data were analyzed using SPSS version 19.0. The focus of the statistical analysis was to compare the heat rates on the variable "parity". Analysis of Variance (ANOVA) was used to compare the differences in the proportion of cows of different parities coming into heat within seven days.

RESULTS AND DISCUSSION

Of the 22 heifers, 18 came in heat within an average of 49.8±5.6 hours after CIDR removal while 4 remained anestrous. Seventeen of the 25 primiparous and 15 of the 18 pluriparous exhibited estrus within 47.4±4.7 and 55.3±12.5 hours of CIDR removal, respectively (Table 1). There was no significant difference in the time lapse from CIDR removal to heat between experimental groups. However, the number of cows coming into estrus in the primiparous (68.0%) was significantly lower ($P<0.05$) than those in the nulliparous (81.8%) and pluriparous (83.3%) groups (Table 1).

The most striking finding in this study was the significant poor estrous expression rate observed in the primiparous in relation to the nulliparous and pluriparous groups. Although a number of factors could be attributed to this outcome, nutritionally induced physiological responses could have played a major role in the observed variations. The limited feed availability coupled with new experience of lactational energy demands and stress could have played a role in the observed poor response to the used synchrony regimens in the primiparous group. While the nulliparous and pluriparous could also be in a physiological comfort, carryover effects of pregnancy, nutritional adjustment postpartum and lactation stress in the primiparous group could affect the response to synchronization (Islam, 2011). At calving, the energy needs of dairy cows increase due to onset of lactation while feed intake is still low, and this could result in negative energy balance leading to fat utilization and liver neoglucogenesis, which may have suppressive effects on ovarian activity (Delany *et al*., 2010). This reduced ovarian activity may manifest itself in the form of classical ovarian afunction or anovular cow with growth of relatively small follicles unable to trigger estrous activity in the cow (Delany *et al*., 2010). It is believed that the low energy status of the cow could cause inadequate number of LH pulses thereby resulting in insufficient follicle growth and subsequent minimal estradiol production by the follicle (Macmillan, 2010).

Early lactation period is typically a time of high oxidative stress for the cow, especially those experiencing lactation for the first time. Unlike the nulliparous (no lactation) and the pluriparous (physically matured) cows faced with growth and nutritional demands only, respectively, the primiparous group has to meet both lactational and growth demands. As such, physiological adjustment due to lactational and growth demands may take priority over reproduction and lead to suppression of the hypothalamo-pituitary-gonadal axis by different stressors resulting in ovarian inactivity (Islam, 2011). Some studies have also shown a greater incidence of anovulation in primiparous than in multiparous cows. For example, Moreira *et al* (2001) observed a 37.3% incidence of anovulation in primiparous cows compared to only 15.7% incidence in multiparous cows, and that this higher incidence occurred at all levels of body condition score, suggesting that this increased incidence may not be due to energy imbalance only but other factors as well. Similarly, Bousquet *et al*. (2004) observed better conception rates in heifers and primiparous cows than pluriparous cows. This variation in parity effect on estrous expression could be attributed to variable nutritional and ovarian status, production levels, and physiological diversity at the time of CIDR insertion of experimental animals as well as differences in selection and classification of the primiparous and pluriparous experimental groups. More information is however needed to really elucidate other factors that may lead to parity differences in synchronization response in dairy cattle.

Although use of synchronization protocols for efficient reproductive management in cattle has been widely used, it is clear from this study that parity consideration is critical for their successful outcome. The results in this study showed poor response in primiparous compared to nulliparous and pluriparous cows synchronized during the dry season.

Table 1: Comparison of heat rates in nulliparous, primiparous and pluriparous cows synchronized with GnRH, CIDR and PGF2α agents during the dry season in Zambia

Group	Parity	Time of heat expression after CIDR removal (hours)	No. of cows in heat	% of cows in heat
Nulliparous (n = 22)	0	49.8±5.6	18.0	81.8[a]
Primiparous (n = 25)	01	47.4±4.7	17.0	68.0[b]
Pluriparous (n = 18)	≥2	55.3 ±12.5	15.0	83.3[a]

Figures bearing different alphabets in a column differ significant ($P<0.05$).

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REFERENCES

Bousquet D, E Bouchard and D Du Trembly, 2004. Decreasing fertility in dairy cows; myth or reality. Proc 23rd WBC Congress, Quebec, Canada.

Cerri RLA, HM Rutigliano, RGS Bruno and JEP Santos, 2009. Progesterone concentration, follicular development and induction of cyclicity in dairy cows receiving intra-vaginal progesterone inserts. Anim Reprod Sci, 110: 56-70.

Delany KK, KL Macmillan, C Grainger, PC Thomson, D Blanche, KR Nicholas and MJ Auldist, 2010. Blood plasma concentration of metabolic hormones and glucose during extended lactation in grazing cows or cows fed a total mixed ration. J Dairy Sci, 93: S913-S920.

Islam R, 2011. Synchronization of estrus in cattle. A Review. Vet World, 4: 136-141.

Macmillan KL, 2010. Recent advances in the synchronization of estrus and ovulation in dairy cows. J Reprod Dev, 56: S42-S47.

Moreira F, O Orlandi, CA Risco, R Mattos, F Lopes and WW Thatcher, 2001. Effects of presynchronization and bovine somatotropin on pregnancy rates to a timed artificial insemination protocol in lactating dairy cows. J Dairy Sci, 84: 1646-1659.

Saldarriaga JP, DA Cooper, JA Cartmil, JF Zuluaga, RL Stanko and GL Williams, 2007. Ovarian, hormonal, and reproductive events associated with synchronization of ovulation and timed appointment breeding of *Bos indicus*-influenced cattle using intravaginal progesterone, gonadotropin-releasing hormone, and prostaglandin $F_2\alpha$. J Anim Sci, 85: 151-162.

Tucker AL, HL Sanchez, WB Tucker, A Wil JW Fuquay, ST Willard and PL Ryan, 2011. Effect of earlys postpartum and GnRH and prostaglandin $F_2\alpha$ administration on reproductive activity and ovulation synchronization in lactating dairy cows. J Anim Vet Adv, 10: 900-908.