Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 2 (12) November 2013: 27-31

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

ORIGINAL ARTICLE

Uses of CIDR, FSH and GnRH for Treatment of Anoestrus Syndrome in Dairy Cow

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ABSTRACT
Primiparous cows with low body condition at calving have an extended anovulatory period. The objective of present study was to comparative use of CIDR, FSH and GnRH in treatment of anoestrus syndrome in dairy cow. In this study, 200 anestrus cows with similar body condition score and production state without history of any disease were selected. Animals were divided into the 4 groups of 50 cows in each, randomly. Animals of group 1 received no treatment and their estrous was evaluated during the 30 days. Animals of group 2 were received CIDR for 10 days and 24 hours after CIDR removal were received estradiol at the dose of 1 mg. Animals of group 3 and 4 were received 3000IU FSH and 5ml gonadotropin in the early treatment, respectively. At the end, estrous occurrence and fertility rate were evaluated. Our data showed that the difference between estrous induction and groups CIDR and GnRH was significant (P=0.001). The difference between estrous induction and groups GnRH and FSH was significant (P=0.001). The difference between fertility in the first insemination in groups CIDR and FSH was significant (P=0.028). The difference between fertility in the first insemination in groups CIDR and GnRH was no significant (P=0.076). The difference between fertility in the first insemination in groups GnRH and FSH was no significant (P=0.775). Also, difference between control group and CIDR was significant (P=0.001); difference between control group and FSH was significant (P=0.001) and difference between control group and GnRH was significant (P=0.025). The difference in fertility in the first insemination between groups CIDR and control was no significant (P=0.646). The difference in fertility in the first insemination between groups FSH and control was no significant (P=0.110) and the difference in fertility in the first insemination between groups GnRH and control was no significant (P=0.242).
KEYWORDS: *FSH, GnRH, CIDR, anestrous, fertility, cow.*

Received 12.10.2013 Accepted 02.11.2013

INTRODUCTION

Loss of fertility is a major issue for dairy cows, with only around 40% of conceived pregnancies proceeding to live birth in dairy cows. The multitudes of biological processes that determine fertility are part of an extremely complex system and mathematical modeling has become a useful tool to complement experimental studies in reproduction biology.The Mathematical Modeling team has developed a model of ovarian and uterine activity that is regulated by complex interacting factors and feedback mechanisms at the cell (intra-follicle), organ (ovarian/uterine) and systemic (brain, pancreas, liver, gut, adipose tissue) levels. The model is being used to identify the effect of lactation, nutrition and genetics on ruminant fertility.Anoestrus is also a serious reproductive problem in dairy cows under seasonal production pasture based systems. Anoestrus is the interval that occurs naturally in all female mammals between parturition and the onset of the next ovulation. It is related to the nutrition levels both before and after calving, although the mechanisms underlying this relationship are largely unknown. We have used mathematical modelling to understand the interactions of the metabolic hormones and other indicators of nutritional status with the levels of reproductive hormones controlling follicle development and ovulation.

The team is also developing a model of fetal and placental steroid hormone synthesis pathways. This model will help us understand how the placenta and fetus co-ordinate the synthesis of the different hormones necessary for a successful pregnancy.

Gonadotropin-releasing hormone (GnRH) is a trophic peptide hormone responsible for the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the anterior pituitary. GnRH is

synthesized and released from neurons within the hypothalamus. The peptide belongs to gonadotropin-releasing hormone family.GnRH is considered a neurohormone, a hormone produced in a specific neural cell and released at its neural terminal. A key area for production of GNRH is the preoptic area of the hypothalamus, which contains most of the GnRH-secreting neurons. GnRH neurons originate in the nose and migrate into the brain, where they are scattered throughout the medial septum and hypothalamus and connected by very long >1-millimeter-long dendrites. These bundle together so they receive shared synaptic input, a process that allows them to synchronize their GnRH release [1].

GnRH is secreted in the hypophysial portal bloodstream at the median eminence. The portal blood carries the GnRH to the pituitary gland, which contains the gonadotrope cells, where GnRH activates its own receptor, gonadotropin-releasing hormone receptor (GnRHR), a seven-transmembrane G-protein-coupled receptor that stimulates the beta isoform of Phosphoinositide phospholipase C, which goes on to mobilize calcium and protein kinase C. This results in the activation of proteins involved in the synthesis and secretion of the gonadotropins LH and FSH. GnRH is degraded by proteolysis within a few minutes.

At the pituitary, GnRH stimulates the synthesis and secretion of the gonadotropins, follicle-stimulating hormone (FSH), and luteinizing hormone (LH). These processes are controlled by the size and frequency of GnRH pulses, as well as by feedback from androgens and estrogens. Low-frequency GnRH pulses lead to FSH release, whereas high-frequency GnRH pulses stimulate LH release.There are differences in GnRH secretion between females and males. In males, GnRH is secreted in pulses at a constant frequency, but, in females, the frequency of the pulses varies during the menstrual cycle, and there is a large surge of GnRH just before ovulation.GnRH secretion is pulsatile in all vertebrates and is necessary for correct reproductive function. Thus, a single hormone, GnRH1, controls a complex process of follicular growth, ovulation, and corpus luteum maintenance in the female, and spermatogenesis in the male.

Recently, an intravaginal insert impregnated with 1.38 g of progesterone (CIDR, controlled internal drug-releasing device) was approved for use in lactating dairy cattle in the United States. Use of a CIDR between 14 and 21 d after AI improved the return to estrus of nonpregnant cows [2]. Furthermore, incorporation of the CIDR into a timed AI protocol improved pregnancy rates in anovulatory dairy [3,4] and beef cows [5]Anovulation by 65 d in milk (DIM) affects more than 20% of the lactating dairy cows in the United States [6-8], with some herds having more than 40% of the primiparous cows not cycling by 65 DIM [8], leading to reduced conception rates [9,7,8] and increased embryonic losses [10]. Treatment of anovulatory cows with CIDR for 7 d improved detection of estrus, ovulation rate, and pregnancy rates [9], and incorporation of a CIDR into a timed AI protocol using GnRH to induce ovulation improved pregnancy rates [3]. The objective of present study was to comparative use of CIDR, FSH and GnRH in treatment of anoestrus syndrome in dairy cow.

MATERIALS AND METHODS

Present study was carried out in a dairy farm with 1000 cows during year 2012. In this study, 200 anestrus cows with similar body condition score and production state without history of any disease were selected. Animals were divided into the 4 groups of 50 cows in each, randomly. Animals of group 1 received no treatment and their estrous was evaluated during the 30 days. Animals of group 2 were received CIDR for 10 days and 24 hours after CIDR removal were received estradiol at the dose of 1 mg. Animals of group 3 and 4 were received 3000IU FSH and 5ml gonadotropin in the early treatment, respectively. At the end, estrous occurrence and fertility rate were evaluated. Data obtained from groups was analyzed using SPSS ver. 17 and chi-square statistical method and $P<0.05$ considered as significance difference.

RESULTS

Data showed that in group 1, of 50 cases 9 cases showed no estrous and 41 cases showed estrous. Of 41 cases 12 (29.3%) cases were fertile in first insemination and 29 (70.7%) cases showed no fertility. In group 2 (FSH), 7 cases showed no estrous and 10 cases showed estrous. Also, 33 cases showed mature corpus luteum 10 days after first examination. They were received PG then 30 of them respond to the PG and showed estrous. Finally, 40 cases showed estrous and 10 cases don't response to treatment. Of 40 cases 18 cases (45%) were fertile and 22 cases (55%) showed infertility. In group 3 (GnRH), 45 cases showed no estrous and 5 cases showed estrous. Also, of 45 cases 9 cases showed mature corpus luteum 10 days after first examination. They were received PG then 7 of them respond to the PG and showed estrous. Finally, of 38 cases showed no response to treatment, 12 cases showed estrous. Of 12 cases, 5 cases (14.7%) were fertile and 7 cases (85.3%) showed infertility.In the group 4, 3 cases showed estrous in which 1 case (33.3%) was fertile and 2 cases (66.7%) showed infertility and 47 cases showed no estrous. The difference between estrous induction and groups CIDR and FSH was no significant ($P=0.798$). The difference between estrous induction and groups CIDR and GnRH was significant

(P=0.001). The difference between estrous induction and groups GnRH and FSH was significant (P=0.001). The difference between fertility in the first insemination in groups CIDR and FSH was significant (P=0.028). The difference between fertility in the first insemination in groups CIDR and GnRH was no significant (P=0.076). The difference between fertility in the first insemination in groups GnRH and FSH was no significant (P=0.775). Also, difference between control group and CIDR was significant (P=0.001); difference between control group and FSH was significant (P=0.001) and difference between control group and GnRH was significant (P=0.025). The difference in fertility in the first insemination between groups CIDR and control was no significant (P=0.646). The difference in fertility in the first insemination between groups FSH and control was no significant (P=0.110) and the difference in fertility in the first insemination between groups GnRH and control was no significant (P=0.242).

DISCUSSION AND CONCLUSION

In present study use of CIDR, FSH and GnRH in treatment of anoestrus syndrome in dairy cow was evaluated. Our data showed that the difference between estrous induction and groups CIDR and GnRH was significant (P=0.001). The difference between estrous induction and groups GnRH and FSH was significant (P=0.001). The difference between fertility in the first insemination in groups CIDR and FSH was significant (P=0.028). The difference between fertility in the first insemination in groups CIDR and GnRH was no significant (P=0.076). The difference between fertility in the first insemination in groups GnRH and FSH was no significant (P=0.775). Also, difference between control group and CIDR was significant (P=0.001); difference between control group and FSH was significant (P=0.001) and difference between control group and GnRH was significant (P=0.025). The difference in fertility in the first insemination between groups CIDR and control was no significant (P=0.646). The difference in fertility in the first insemination between groups FSH and control was no significant (P=0.110) and the difference in fertility in the first insemination between groups GnRH and control was no significant (P=0.242).

In one study gradual increase in progesterone and decrease in total progesterone in cows which have fertility problems has been proved on day 6 after estrus and evidence showed that the Most of fetal deaths in cattle is due to inadequate secretion of the corpus luteum in early pregnancy [11].

The idea which use of progesterone on days 9-5 after insemination was to prevent a possible diminish of progesterone during the first week after insemination [12], improvement in embryo development [13], secretion of interferon [14] and to stimulate uterine to secretions necessary for embryo development [15].

Anovulation in the first 65 d postpartum affects more than 20% of the lactating dairy cows in the United States [6-8], with some herds having more than 40% of the primiparous cows not cycling by 65 DIM [7], leading to reduced conception rates [7,8, 9]. and increased embryonic losses [10]. Treatment of anovulatory cows with progesterone before first postpartum ovulation minimized the occurrence of short luteal cycles and improved conception rates [16].

The loss of 2.6% of the CIDR inserted is similar to the 2.7% reported by Chenault et al. [2]. As expected, the CIDR insert eliminated estrous behavior before its removal and tended to decrease ovulation in the first 48 h after the last PGF2α treatment because of the negative feedback of progesterone on LH secretion, which prevents estrus and the LH surge. The smaller diameter of the dominant follicle for the CIDR group at the last PGF2α injection was observed mainly because of a decrease in follicle size in primiparous cows. This effect may be attributed to an inhibitory effect of progesterone on LH pulse frequency when CIDR is administered [17], which might have been more pronounced in primiparous cows due to the lower milk yield and consequent reduced clearance of progesterone [18]. This could explain the effect of parity on follicle diameter at the final injection of PGF2α and 48 h later; however, when the CIDR was removed, follicle growth and diameter before ovulation were similar for both treatments, indicating that follicle growth was resumed similarly between groups when the CIDR was no longer inserted.

Of the 476 cows with high progesterone levels at the GnRH, only 6.7% had premature spontaneous CL regression during the timed AI protocol. This low proportion was expected because cows had their estrous cycles presynchronized with two injections of PGF2α [6]; however, more CIDR-treated than control cows experienced premature spontaneous CL regression. It is not clear why CIDR-treated cows had increased spontaneous CL regression during the timed AI protocol, but it is possible that the presynchronization with PGF2α was not as effective in cows in the CIDR compared to those in the control group. Although ovulatory response to GnRH was not evaluated in all cows, those with progesterone <1 ng/mL at the GnRH injection and treated with a CIDR insert had a decreased incidence of CL at the final injection of PGF2α compared with control cows with progesterone <1 ng/mL at the GnRH. The decreased ovulation to GnRH in low-progesterone cows when treated with CIDR might be related to the negative feedback of progesterone on LH secretion. When ovariectomized cows received a CIDR insert, LH

concentrations and pulse frequency were decreased in the first 8 h of insert administration [16]. However, ovulation to GnRH, based on changes in progesterone from the day of GnRH treatment and 7 d later, did not differ in dairy [4] or beef cows [5] when treated with a CIDR. The decreased ovulation rate to the GnRH, and the greater premature luteolysis resulted in a reduced proportion of cows in the CIDR-treated group with a CL at the PGF2α treatment of the timed AI protocol. The presence of CL at PGF2α treatment of timed AI protocols has been shown to positively affect pregnancy rates [6,7], which was also observed in the current study. Incorporation of a CIDR insert into a timed AI protocol using ECP to induce ovulation did not influence reproductive variables in lactating dairy cows. Control and CIDR-treated cows had similar detection of estrus, pregnancy rates, and late embryonic losses. When the CIDR was incorporated into the Ovsynch (d 0 GnRH, d 7 PGF2α, d 9 GnRH, and timed AI 12 to 20 h after GnRH) protocol, pregnancy rates were improved on d 28 of gestation for anovulatory cows [3] and on d 57 for all cows [4]. However, when cows were presynchronized withPGF2α,incorporation of a CIDR insert into the Ovsynch protocol did not benefit pregnancy rates and embryo survival [4]. It is possible that the benefits from incorporation of a CIDR insert into Ovsynch timed AI protocol were related to preventing cows from prematurely coming into estrus and ovulating, thereby improving synchrony of ovulation and conception at timed AI. Another explanation for lack of response to the CIDR in the current study was the fact that cows were inseminated the day before scheduled timed AI if observed in estrus. When incorporation of a CIDR insert demonstrated benefits in fertility, cows were inseminated at fixed-time, 12 to 20 h after the final GnRH of the Ovsynch, which requires optimal synchronization after the GnRH-induced ovulation because of lack of estrus detection. In conclusion can be state that combined use of therapeutically methods what observed in this study is good method in dairy farms to treatment the anestrous.

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How to cite this article
Mahmood Khalilzadeh, Samad Mosaferi, Amir Ali Kaveh. Uses of CIDR, FSH and GnRH for Treatment of Anoestrus Syndrome in Dairy Cow. Bull. Env.Pharmacol. Life Sci., Vol 2 (12) November 2013: 27-31