

Comparative Study on Efficacy of Different Medicaments on Postpartum Anestrus Dairy Cows

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Abstract

The aim of the present investigation was aimed to evaluate the comparative study efficacy of different medicaments on postpartum anestrus dairy cows. The study was conducted on forty eight Friesian cows. The true anestrus cows (Experiment 1, n=32) were randomly allocated into four equal groups of 8 cows each according to the design of treatment; group 1 served as a control without treatment; group 2 received progesterone (CIDR for 10 days plus i.m. injection of 2ml Estrumate (PGF₂α); group 3 received Lugol's iodine solution and massage; group 4 treated with one injection of GnRH. The suboestrus cows (experiment 2, n=16) were divided into two equal groups. Group 1 served as a control without treatment (n=8); group 2 (PGF₂α group, n=8) were treated by one injection of 2ml Estrumate (synthetic PGF₂α). Fertility measures including the incidence, the mean interval between ends of the treatment to onset of estrus, the number of service per conception and pregnancy rates were recorded. Results showed that, the highest incidence of estrus (87.5%) and pregnancy rates (85.7%) were achieved with treatment of CIDR followed by Lugol's solution plus massage and GnRH treatment regime where, the incidence of the estrus and pregnancy rates were (62.5, 50.0; 50.0, 40.0%, respectively). One of the eight control animals in treatment came into heat (12.5%) at an average post treatment interval of 480.0±22.4 hours and no animal was pregnant. The incidences of estrus and pregnancy rates of suboestrus cows after PGF₂α treatment were 87.5% and 71.42%, respectively. While, in control group (experiment 2) no animal came in heat or pregnancy. In conclusion, CIDR for 10 days plus i.m. injection of 2ml PGF₂α (Estrumate) was the most effective treatment of smooth inactive ovary. Other regimens such as Lugol's solution and uterine as well as ovarian massage could be considered. Moreover, PGF₂α administration appeared to be efficient in treatment of suboestrus cows.

Keywords: Postpartum anestrus, Inactive ovary, Sub estrus, Dairy cows, Treatment.

INTRODUCTION

Cattle productivity depends largely on reproductive efficiency, and is often measured by number of off-spring per breeding animal per unit of time. Since the ovary is one of the central organs of the reproductive system, its normal functioning is pivotal to the cow's breeding soundness and consequently profitability [19]. The postpartum period plays a pivotal role in Cattle reproduction. The duration of postpartum anestrus has an important influence on reproductive performance [14]. It has been suggested that in high – yielding dairy herds, there is increased incidence of anestrus [3, 21]. Numerous studies have shown that ovarian dysfunction is still one of the most prevalent reproductive disorders in dairy cows despite technological advances in animal husbandry [4, 17]. This is a complete ovarian

inactivity with virtually no functional structures on the surface of both ovaries [11]. Nutritional imbalance compounded with other factors is mainly responsible for its occurrence [26,32]. The appropriate nutritional, diagnostic and treatment methods would undoubtedly help in alleviating this disorder [22]. During the last few years, several studies have been attempted to treat the prolonged postpartum anestrus in cows by using hormonal treatments such as gonadotropin releasing hormone (GnRH), estrogen, prostaglandin (PG F₂) and progesterone [18,33,5] and non hormonal such as lugol's iodine , ovarian and uterine massage [5]. The aim of this study was to evaluate and compare efficacy of various treatment methods of postpartum anestrus in dairy cows. Treatment strategy was mainly directed at stimulating the ovary through application of hormonal and non-hormonal remedies.

MATERIALS AND METHODS

Animals, Ration and Experimental Design

This study was conducted during summer season (August 2010) at private dairy cows farm in Sharkia Governorate, Egypt located in the north part of Nile Delta (latitude 30° 01' N; longitude 31° 21' E). Forty eight commercial Friesian dairy cows aged between 3 to 6 years old weighing 350-400 kg average body weight were used in the present study. All the animals were fed green fodder, hay, compounded concentrate and mineral mixture as per the standard feeding schedule on the farm. These dairy cows had BCS ≥ 3 [37]. All animals were in healthy condition and kept under strict control measures for internal and external parasitism, as they undergo a periodical deworming and prophylactic vaccination against the endemic diseases. A full case history of each animal was recorded. The animals were apparently health good. Those animals did not show any visible signs of oestrus before day 60 postpartum. All cows in the present study were subjected to rectal examination of genitalia twice weekly for three successive weeks to follow up the reproductive status of each animal. According to the ovarian findings, the animals were classified into two main approaches. Experiment 1: cows without any structure on their ovaries (true anoestrus) and experiment 2: Cows with persistent corpus luteum (sub estrus).

Experiment 1: Cows without any structure on their ovaries (true anoestrus)

Cows (n=32) had smooth structureless ovaries without CL. They were diagnosed as true- anoestrus. In addition, Blood samples for progesterone assay were simultaneously collected from coccygeal vein into test tubes. The collected blood was immediately centrifuged and serum samples transferred into sterilized test-tubes and stored at -20°C until assayed. Progesterone was analysed using RIA according to [8]. Low

(< 1ng/ml) progesterone levels on both examinations was indicative of inactive ovary. Rectal palpation of both ovaries was performed according to [26, 20]. The animals were classified into four equal groups (n=8) according to design of the treatment. Group 1 served as a control without treatment; Group 2 was treated with progesterone in the form of CIDR (Eazi-Breed™CIDR ; InterAg, Hamilton, New Zealand) for 10 days plus i.m. injection of 2 ml Estrumate (synthetic PGF₂α) on the 9th day of CIDR insertion for each animal. The third group (lugol's iodine) received twice intra-uterine infusion of 100 ml of lugol's iodine solution 1.0%, 7days apart in addition to ovarian and uterine massage (2-3 minutes). Cows in group 4(GnRH) were treated by one i.m. injection of GnRH (5 ml Receptal, 0.02 mg buserelin Receptal®, Intervet international B.V., Boxmeer, Holland).

Experiment 2: Cows with persistent corpus luteum (sub estrus)

Cows had persistent corpus luteum on their ovaries without any signs of estrus (subestrus, n=16). The animals were classified into 2 equal groups. Group 1(n=8) served as a control without treatment; group2 (PGF₂α group, n=8) were treated by one injection of 2ml Estrumate (synthetic PGF₂α).

Estrus evaluation and fertility traits

Response of different animals groups to various treatments was evaluated. Cows were observed twice daily at a 12 hr interval by experienced herdsman for at least one hour for estrous signs, especially the acceptance of cows to the bull. The day at which the female stand to be mounted was considered the day of estrus (Day 0). The females were checked for pregnancy 45 days after natural mating by palpation per rectum. Fertility measures including the incidence, the mean interval between ends of the treatment to onset of estrus, the number of service per conception and pregnancy rates were recorded.

Table.1. Effects of different treatment protocols on Incidence of estrus (%) and onset of estrus in postpartum anoestrus dairy cows (mean±SEM).

Traits	Control group	CIDR group	lugol's iodine group	GnRH group
No. of cows	8	8	8	8
Incidence of estrus	1(12.5) ^c	7(87.5) ^a	5(62.5) ^b	4(50.0) ^b
Hours from treatment to onset of estrus	480.0±22.4 ^b	68.4±3.2 ^a	144.0±8.2 ^c	62.7±4.2 ^a

Values in the same row with different superscripts (a, b, c) are significantly different at least (P<0.05).

Table.2. Effects of different treatment protocols on no. of service per conception (mean±SEM) and pregnancy rates (%) in postpartum anoestrus dairy cows.

Traits	Control group	CIDR group	lugol's iodine group	GnRH group
No. of cows showed estrus	1	7	6	5
No. of service per conception	1.5± 0.6	1.9± 0.8	1.5±0.4	1.9±0.7
Pregnancy rate	0	6(85.7%) ^a	3(50.0%) ^b	2(40.0) ^b

Within the same row with different superscripts (a, b) are significantly different (p<0.05).

Statistical Analysis

Data were expressed as mean \pm SEM. The data were analyzed statistically by ANOVA method and student's 'test' was used to detect differences among means using SPSS® Statistical Software (SPSS ©11.01 for Windows, 2001). Reproductive performance percentages were analyzed by the Chi-square test.

RESULT

Experiment 1: cows without any structure on their ovaries (true anestrus)

Reproductive performance after different treatment were illustrated in Table 1 and 2. The Incidence of estrus animals treated with CIDR was significantly higher ($P < 0.05$) than those treated with lugol's iodine and GnRH group ((87.5 vs. 62.5 and 50.0%, respectively). Out of the eight animals (control group) one cow exhibited estrus (12.5%) at an average post treatment interval of 480.0 ± 22.4 hours. On the other hand, the mean intervals from treatments to the 1st estrus (onset of estrus) were significantly shorter ($P < 0.05$) in CIDR and GnRH groups than those in lugol's iodine group (68.4 ± 3.2 , 62.7 ± 4.2 vs. 144.0 ± 8.2 hours, respectively). No significance differences in service per conception were observed between different groups. The pregnancy rate was significantly higher in CIDR group (85.7%) than that in lugol's iodine and GnRH group (50.0 and 40.0%, respectively), while, no pregnancy was achieved in control group as shown in Table 2.

Table.3. Effects of $PGF_2\alpha$ treatment on incidence of estrus (%) and onset of estrus in suboestrus cows (mean \pm SEM).

Traits	Control group	$PGF_2\alpha$ group
No. of cows	8	8
Incidence of estrus	0	7(87.5)
Hours from treatment to onset of estrus	0	53.7 ± 4.2

Table.4. The effects of $PGF_2\alpha$ treatment on no. of service per conception (mean \pm SEM) and pregnancy rate (%).

Traits	Control group	$PGF_2\alpha$ group
No. of cows showed estrus	0	7
No. of service per conception	0	1.9 ± 0.8
Pregnancy rate	0	5(71.42%) ^a

Experiment 2: Cows with persistent corpus luteum (Sub estrus)

$PGF_2\alpha$ treatment was found effective in induction of estrus in post-partum cow. Seven out of eight treated cows exhibited estrus (87.5%) at mean interval to 1st estrus post treatment 53.7 ± 4.2 hours. The pregnancy rate was 71.42% with average service per conception 1.9 ± 0.8 , while in control group no animal came in heat without pregnancy as illustrated in Table 3 and 4.

DISCUSSION

The problem of postpartum infertility is one of the well known drawbacks in cattle production, resulting in substantial financial losses due to prolongation of the service period and culling [6, 1]. One of the four treatment methods used in this study involved administration of progesterone in the form of CIDR inserted into the vagina for a period of 10 d. The CIDR-treated group was significantly ($P < 0.05$) shorter onset of estrus and increased the incidence of estrus and pregnancy rate in comparison to the control group. This result is in agreement with some earlier studies [2, 5, 12] in cow and buffaloes [38]. They indicate that CIDR treatment of smooth inactive ovary in cows could be profitable. Progesterone (P) had been released from CIDR inserted intra-vaginally in these cows and was absorbed through the vaginal wall into the circulation as recorded in buffaloes [33]. This increased circulatory concentration of P exerted negative feedback on hypothalamus and anterior pituitary. Following termination of P therapy (after CIDR withdrawal by the day 7 after insertion), the rapid drop in circulatory concentration of P promotes the release of GnRH as the negative feedback of P was abolished, followed by FSH and LH release with subsequent resumption of ovarian cyclicity [39]. Also, the increased circulatory concentration of P has sensitized the hypothalamic-pituitary system [33]. Likewise, P increased hypothalamus sensitivity to estrogen with subsequent increase in the intensity of heat [7]. Furthermore, CIDR in combination with i.m. injection of $PGF_2\alpha$ was more effective than CIDR alone in terms of exhibition of estrus and conception rate [33]. This can be explained by the fact that $PGF_2\alpha$ increases pituitary responsiveness to GnRH in the postpartum cow [25]. Hence, the released GnRH after CIDR removal effectively stimulates the pituitary gonadotropins with subsequent estrus induction in anestrus cows. Another trial was based on a single intramuscular injection of a synthetic analogue of GnRH, Buserelin. Its activity causes a rapid secretion of LH and FSH from the pituitary with subsequent elevation of the concentration of these hormones in peripheral blood [35]. The mean intervals from treatments to the 1st estrus were significantly shorter in GnRH groups (62.7 ± 4.2 hours). However, the pregnancy rates were greatly reduced (40.0%). However, some earlier studies showed reduced interval from calving to conception in relation to GnRH treatment [10]. The overall results obtained in this trial bring in question the cost effectiveness of a single GnRH injection treatment of smooth inactive ovary in dairy cows. This is going in parallel in dairy cows [5].

Lugol's iodine treatment was found effective in treatment of postpartum anestrus cow. Out of 8 treated cows 5 (62.50%) exhibited estrus with mean interval to estrus post treatment of 144.0 ± 8.2 hours and the pregnancy rate was 50.0%. The obtained results is lower than obtained by [24] in buffalo who achieved 73.34% (7/15) incidence of estrus with an average

post treatment interval lugol's iodine in induction of estrus in post-partum true of 7.54 ± 2.03 days. This is may be attributed to species differences. Various workers have reported varied response with lugol's iodine [23, 24,27,36,29]. The mechanism by which Lugol's solution acts on the reproductive system is not well understood intrauterine infusion of Lugol's solution causes hyperemia of the utero-mucosa, a sign of enhanced circulation, which consequently leads to high degree of drug absorption. The absorbed iodine probably stimulates production of thyroid hormones which increase body's metabolism rate [28]. This increased metabolic activity could be one of the triggering factors of ovarian function since one of the main causes of ovarian disorder is energy utilization imbalance [26, 32]. The enhanced uterine blood circulation might also influence ovarian activity. Amongst all treatment methods employed in this study, uterine and ovarian massage is the cheapest since no drugs are used. The efficacy of this method in treating reproductive disorders has been reported [19]. The mechanism by which massage brings back cows ovary to function is not clearly understood, but is probably the result of activation of intrinsic ovarian factors [13, 19] and enhancement of blood circulation [27]. The uterine and ovarian massage is a simple and relatively viable treatment method that should be considered especially when dealing with economically disadvantaged cattle farmers [16].

In the present study, sub estrus cows with active corpus luteum showed estrus of average 53.7 ± 4.2 hours after $\text{PGF}_2\alpha$ treatment. These results confirm those of the previous reports, which promote the onset of estrus in sub estrus cows [9, 30] and buffaloes [31, 15]. The overall pregnancy rate (71.42%) obtained in the present study is higher than 65.2% that obtained by [15] Mansour et al. (1999) in buffaloes. The different results of pregnancy rate were due to the different sources, route of administration of $\text{PGF}_2\alpha$ and species difference. In conclusion, CIDR for 10 days plus i.m. of 2ml Estrumate, $\text{PGF}_2\alpha$ was the most effective treatment of smooth inactive ovary. Other regimens such as Lugol's solution and uterine as well as ovarian massage could be considered. Moreover, $\text{PGF}_2\alpha$ administration appeared to be efficient in treatment of suboestrus cows.

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