



## Therapeutic effect of single over-dose of PGF<sub>2α</sub> on typical postpartum anestrus in dairy cows.

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### ABSTRACT

The present study aimed at evaluating the effect of single over-dose of PGF<sub>2α</sub> on postpartum anestrus due to retained corpus luteum in dairy cows. A total of 40 dairy cows, 3-8 years old and 1-6 parities used in these study, were assigned into two comparable groups; control group of 20 cows were injected by 500μg from PGF<sub>2α</sub> and over-dose group of 20 cows were injected by 750 μg from PGF<sub>2α</sub> i.m. The obtained results indicated the presence of a significant increase in the heat response (85 vs. 65%), decrease in the time elapsed from treatment to heat (2.47 vs. 4.53 days) and the serum progesterone level, 24 hrs. and 48 hrs. after treatment, in the over-dose group than that in the control; there was a non-significance difference in the number of service per conception and the conception rate between both groups.

**Keywords:** PGF<sub>2α</sub>, postpartum anestrus, dairy cows, conception rate

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### 1. INTRODUCTION

Anestrus is the major infertility problem in farm animals. Anestrus is defined by Singh (2013) as the absence of periodic manifestation of estrus, either with absence of normal physiological signs of estrus (sub-estrus) or without palpable follicular or luteal structure (true anestrus). Postpartum anestrus, as the period of anestrus following parturition, becomes abnormal when its duration extends the accepted average from 60-80 days postpartum (Morrow, 1986) with the sequence of considerable economic losses to the dairy industry, prolonged inter calving interval, cost of medication, drop in milk production and early depreciation of potentially useful cows (Thomas, 1989.; Barnouin & Chacoranc, 1992; Merga, 1992). Postpartum anestrus is a result of many interacting factors, management, physiological, pathological and nutritional factors. These factors include age, breed, pre- and postpartum nutrition ( Singh, 2001), body condition at calving, milk yield, suckling ( Stagg, et al., 1998), calving

season, presence or absence of the bull (Butler & Smith 1980), delayed uterine involution, dystocia and general health status ((Baruselli, 2001; Pipaon *et al.*, 2002). Pathological causes include uterine or ovarian causes (Peter, et al., 2009). Anestrus caused by ovarian causes is due to ovarian inactivity, persistent corpus luteum, ovarian cyst or an ovarian hypotrophy (Gordon, 2005). A typical anestrus due to a persistent corpus luteum is characterized by a prolonged luteal phase due to lack postpartum luteal regression (Pineda and Dooley, 2003). The persistence of the corpus luteum in cattle usually occurs postpartum in association with uterine disorders, such as intrauterine fetal death or pyometra (MacLachlan, 1987), mastitis (Nguyen, et al., 2011) and negative energy balance (Zulu, et al., (2002). Luteolysis or regression of cyclic corpus luteum is induced by prostaglandin F<sub>2</sub> alpha (PGF<sub>2α</sub>) secreted from the endometrium around day 17-19 of the estrous cycle (Gordon, 2005) or when exogenously given during the mid-

luteal phase in cows (Levy, et al., 2000; Neuvians, et al., 2004). PGF2 treatment is the most common method to induce estrus in cattle and buffalo suffering from retained corpus luteum because it causes the corpus luteum to regress (luteolysis), resulting in reduction of blood progesterone concentrations, follicular growth, and ovulation within 2–6 days after treatment (Dhaliwal, et al., 1988; El-Belely, et al., 1995; Chohan, 1998). The recommended treatment includes injection of PGF2 $\alpha$  in a dose 500 $\mu$ g, or two doses in an 11 days interval and inseminated to showed estrus (Brito, et al., 2002).

The aim of this study is to evaluate the effect of a single over dose of PGF2 $\alpha$  on postpartum retained corpus luteum in dairy cows.

## 2. MATERIALS AND METHODS

A total of 40 dairy cows, 3-8 years old and 1-6 parities, kept under the village system in Dakahlia Province, were used in the current study during the period from November 2011 to February 2014. Animals were allowed to have the available daily ration, which consisted of adlib barseem in winter and darawa in summer as well as about 10 kg wheat straw and 4-6 kg concentrate mixture. All animals were vaccinated against the common epidemic diseases and dewormed against the common parasitic diseases. These animals had normal parturition with a history of 4 – 6 months post- parturient anestrus characterized by normal genital tract and persistent corpus luteum diagnosed by rectal examination two times with 10 days interval. Animals were divided into two comparable groups each of 20 cows, injected intra-muscularly by a single dose of PGF2 $\alpha$  (Estrumate<sup>®</sup>, Schering Plough Co., USA) either in 2 ml (500  $\mu$ g) as control or in 3 ml (750  $\mu$ g) as over-dose group. All cows in both groups were put under continual observation for detecting the estrous signs and recording the following parameters:

- The 1<sup>st</sup> heat response for treatment.

- Time elapsed from treatment to the appearance of estrous signs.
- Number of services per conception.
- Conception rate.

A blood serum sample of 10 ml was taken in sterile tubes from each animal via the jugular vein before treatment (0 day), one, two days after treatment and day of estrus . Samples were centrifuged at 3000 rpm for 20 minutes and the serum was stored at -20<sup>o</sup> C till progesterone analysis according to Tietz (1995). After two months from the natural service, all animal in the two groups were examined to confirm pregnancy by rectal examination. The obtained data were tabulated and statistically analyzed, where appropriate, by SPSS (2007).

## 3. RESULTS

As shown from table (1), the rate of heat response appeared much higher in anestrus cows of the over-dose group treated by PGF2 $\alpha$  in a dose of 750 $\mu$ g (85.00%) than those of the control group treated by PGF2 $\alpha$  in a dose of 500  $\mu$ g (65.00%). Time elapsed from treatment to estrus appeared to be highly significantly ( $P < 0.01$ ) increased in the control group ( $4.53 \pm 0.44$  days) than that in the over-dose group ( $2.74 \pm 0.10$ ). There was non-significant difference in number of service/conception and conception rate between the control ( $1.61 \pm 0.24$ , 84.6%) and the over-dose ( $1.41 \pm 0.17$ , 82.3%) groups, respectively. From the obtained results (Table, 2), the progesterone level appeared significantly ( $P < 0.01$ ) higher 24 and 48 hours after treatment in the control than that in the over-dose groups; however, a non-significant difference in the progesterone level was shown between the different treated groups at heat.

## 4. DISCUSSION

Anestrus is one of the major problems in dairy industry affecting both reproduction by prolonging the calving interval and production by milk dropping. In addition to

Table (1): The effect of PGF2 $\alpha$  treatment on heat response (HR), time elapsed from treatment to estrus T-E interval), number of service /conception (S/C) and conception rate (CR) of post-parturient anestrus cows.

Group	HR (%)	T-E interval (days)	No of S/C	CR (%)
Control	65.00	4.53 $\pm$ 0.44 <sup>a</sup>	1.61 $\pm$ 0.24 <sup>a</sup>	84.60
Over-dose	85.00	2.47 $\pm$ 0.10 <sup>b</sup>	1.41 $\pm$ 0.17 <sup>a</sup>	82.30

Different letters within the same column showed significance at least at  $p < 0.05$

Table (2): The effect of PGF2 $\alpha$  treatment on serum progesterone concentration (Mean  $\pm$  S.E. ng/ml) of post-parturient anestrus cows.

Group	In relation to time of treatment			At heat
	0 day	After 24 hours	After 48 hours	
Control	6.672 $\pm$ 0.190 <sup>a</sup>	2.896 $\pm$ 0.315 <sup>a</sup>	0.878 $\pm$ 0.064 <sup>a</sup>	0.394 $\pm$ 0.170 <sup>a</sup>
Overdose	6.490 $\pm$ 0.201 <sup>a</sup>	1.394 $\pm$ 0.169 <sup>b</sup>	0.400 $\pm$ 0.010 <sup>b</sup>	0.340 $\pm$ 0.141 <sup>a</sup>

Different letters within the same column showed significance at least at  $p < 0.05$ .

high costs of medication and early depreciation of potentially useful cows (Thomas, 1989; Barnouin & Chacoranc, 1992; Merga, 1992). The use of PGF2 $\alpha$  in treatment of retained corpus luteum (CL) has been widely advised (Plunkett, et al., 1984; Ahmed, 1993). However, the effect of PGF2 $\alpha$  depends mainly on the presence of corpus luteum in the ovaries by its action as a luteolytic factor (Singh, et al., 1979). The present investigation was undertaken to assess the efficacy of single over-dose of PGF2 $\alpha$  to induce estrus in post-parturient anestrus dairy cows with persistent corpus luteum. As shown in table (1) there is a significant increase in rate of the heat response for the over-dose than that for the control group. This finding came in agreement with that reported by Vallecabres-Torres, et al. (2012) who noticed that more cows treated with over-dose of PGF2 $\alpha$  tended to have full luteolysis with heat response 80% when compared to the standard dose 40%. Moreover, Repasi (2005) found that the estrus started sooner in cows treated with 35 mg PGF2 $\alpha$  than that in those treated with 25 mg PGF2 $\alpha$ . This result might be attributed to the direct effect of high dose of PGF2 $\alpha$  enough to lysis the

corpus luteum within short period and consequently a rapid decline in the progesterone concentration followed by elaboration of F.S.H from the anterior pituitary, development of further ovarian follicles and hence, entrance of the animal in a new cycle (Ono, et al., 1982). Other investigations reported that the difference in heat response to the dose of PGF2 $\alpha$ , is also related to the body condition, nutrition, breeds, season of the year and types of housing (Britt, 1987; Ingawale, et al., 2003; Jha, 2011). The present study indicated the occurrence of a highly significant decrease in the time elapsed from treatment to heat with the over-dose than that with the control group (Table 1). This finding came in accordance with that reported by Vallecabres-Torres, et al. (2012) who noticed that the interval from treatment to heat was shorter (2.4  $\pm$  0.1 days) in cows treated with double doses from PGF2 $\alpha$  than that in cows treated with the standard dose (3.8  $\pm$  0.4 days). It has been reported to differ from 2.8 to 3.7 days (Repasi, et al., 2003; Levy, et al., 2006; Wenzinger & Bleul, 2012). Such difference might be related to the individual responsiveness (Roy, et al., 1972) and age of the corpus

luteum in relation to the estrous period (Singh, et al., 1979).

From the present study, there is no difference in number of services per conception between both treated groups (Table, 1). This finding came in agreement with that reported by Fernandes, et al. (2012) who found no difference in the number of services per conception in treatment of beef cows by different doses from sodium cloprostenol during postpartum period. On the other hand, these finding came in disagreement with that reported by Fernandis, et al. (2002b) who obtained lower number of services per conception on treating cows with two doses than one dose of cloprostenol, and this difference probably occurred due to a lower incidence of uterine infection. In the present study, there is no significant difference in the conception rate between both treated groups (Table, 1). This finding came in consistent with that some previous reports (Repasi, et al., 2003; Levy, et al. 2006; Wenzinger & Bleul, 2012) which did not find any significant difference in the conception rate after treatment of cows suffering from persistence corpus luteum by different doses of PGF2 $\alpha$ . On the other hand, others indicated the presence of a variable range from 67 to 90% after treatment of cows by PGF2 $\alpha$  (Hardin, et al., 1980; Santos, et al., 2000; Ingawale, et al., 2003; Repasi, 2005). This might be due to better synchrony of ovulation and fertilization as the existing follicles were influenced by the next wave of follicles during induction (Gimenes, et al., 2008; Sahatpure & Patil, 2008; Murugavel, et al., 2011). Serum progesterone concentration seemed to be significantly decreased in the first and second day after treatment by PGF2 $\alpha$  in over-dose than that in the control group (Table, 2). This finding came in parallel with that reported in some previous studies (Vallecabres-Torres, et al., 2012; Wenzinger & Bleul, 2012) which recorded a decrease in the serum progesterone concentration of cows treated with double than single dose of PGF2 $\alpha$ . El-Sherry et al.

(2013) indicated the presence of a significant decrease in progesterone concentration within 24 hours after treatment of ewes by PGF2 $\alpha$ . Such decrease is mainly attributed to regression of the corpus luteum followed by a dramatic decrease in the serum progesterone level and ovulation within 2-6 days after PGF2 $\alpha$  treatment (Ono, et al., 1982; Brito, et al., 2002).

From the present study, it can be concluded that the single over-dose of PGF2 $\alpha$  has an encouraging effect to confront the problem of postpartum typical anestrus in dairy cows as evidenced by the increase in the rate of heat response, the decrease in the period from treatment to heat response and the abrupt decrease in the serum progesterone concentration followed by enhancement of the ovarian activity.

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