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Strategy Trials for Prevention of Retained Fetal Membranes in a Friesian Herd in Egypt

[1]Amal R. Abdelhameed, [1]W.M. Ahmed, [2]K.I. El Ekhnawy and [1]H.H. El Khadrawy

[1]Department of Animal Reproduction and AI,
Veterinary Research Division, National Research Centre, Giza, Egypt
[2]Animal Health Research Institute, Tanta Branch, Tanta, Egypt

Abstract: Retained placenta is a frequent problem in dairy cows. This phenomenon is dependent on external and internal factors, such as improper nutrition, mal management, stress, hormonal imbalance, infections and others idiopathic factors. It has negative influence on post-calving period and lactation with consequent great economic losses. Cows in a Frisian herd suffering from high incidences of placental retention were the materials of the current research. Animals were kept under the common managemental conditions practiced in governmental farms in Egypt. Cows during their last month of gestation were divided into a control group (Group1) as well as 4 treated groups (Groups 2-5). Cows in group 2 and 3 were given selective systemic anti-inflammatory doses of either dexamethasone (Dexa-Taomanol) or isoflupredone (Predef) just after calving, before placental dropping, respectively. Cows in groups 4 and 5 were subjected to either intra-vulval injection with $PGF_{2\alpha}$ just after delivery or systemic injection with AD_3E weekly during the last month of gestation before calving, respectively. Cows were followed up and timing of placental dropping and some post partum reproductive parameters were recorded. All the used prophylactic measures improve the studied reproductive parameters with normal placental dropping, rapid uterine involution, short days open, low number of services/conception and high incidence of pregnancy as compared with the control group. It was concluded that RFM is a multi factorial phenomenon which still needs a lot of research work for its prevention to reduce the great associated economic losses.

Key words: Cows · Retained placenta · PGF2α · Predef · ADE3 · Dexamethasone

INTRODUCTION

Infertility in dairy cattle is a complex, multi-factorial problem that cannot be evaluated in isolation of other diseases and disorders. Clearly there is a role for the prevention of problems in the peri-parturient period, in particular hypocalcaemia, mastitis, lameness and retained fetal membranes (RFM), that all have a negative impact on the subsequent fertility of the cow [1].

RFM is one of the most common disorders affecting reproduction of dairy cattle; it affects 5-10% of calving and greatly increases the risk of metritis and endometritis [2]. The condition is defined as the failure to expel the fetal membranes within 12 to 24 hours after calving [3]. Various causes of RFM have been identified i.e. uterus paresis, abortion, stress, late or premature birth, dystocia, twinning, infections, seasonal and hormonal disorders. Additionally, some vitamin and mineral deficiencies induce or predispose animals to RFM [4, 5]. Moreover, [6] concluded that RFM is due to complex metabolic disturbances during the pre-partum period. This disorder causes reduction in the fertility with a reduction in pregnancy rate, increases number of services per conception and consequently longer calving interval [7]. The higher occurrence of metritis after RFM has been identified as the main reason for reduced fertility of cows with RFM [8]. Economic losses include decreased milk yield, reduced fertility, increased culling and treatment costs [9, 10].

Clearly there is a role for the prevention of problems in the peri-parturient period, in particular RFM, to exclude the negative impact on the subsequent fertility of the herd. It was found that this disorder can be reduced by prevention of hypocalcaemia and also adequate supplementation with minerals and vitamins in dairy cows [10, 11].

Corresponding Author: Dr. Amal R. Abdelhameed, Department of Animal Reproduction andAI, National Research Centre, Postal code: 12622, Giza, Egypt

The current study was carried out to investigate some strategies for preventing or reduction of RFM in a Frisian herd kept under the prevailing Egyptian condition and suffered from high incidence of RFM. Trials were based on either selective systemic anti-inflammatory injection with dexamethasone (Dexa-Taomanol) or isoflupredone (Predef), intra-vulval application of $PGF_{2\alpha}$ and injection of vitamins AD_3E. A secondary objective was to evaluate the subsequent reproductive performance of these cows.

MATERIALS AND METHODS

The study had been carried out in El-Gemmiza Farm, which belongs to the Animal Production Research Institute.

Experimental Animals: The study aimed to carry out some prophylactic trials to avoid the retention of fetal membranes in polyparous Frisian cows. Cows were fed on Egyptian clover during December-May (the green season) and green corn during June-November (the dry season). Rice straw and water were provided *ad libidum* all over the year; in addition to 5 kg commercial concentrate mixture/head/day.

Experimental Design: Twenty five late pregnant cows were separated in a special pen during the last month of gestation and were divided into 5 groups, each of 5 animals:

- Group 1, the control group, kept without any special treatment.
- Group 2, received intramuscular injection of 5 ml/100 kg live body weight of Dexa-Tomanol (Schering-Plough, santé Animale, France) just after delivery and before placental dropping. It consists of isopyrin, phenylbuazone sodium and dexamethasone and cinchocaine hydrochloride.
- Group 3, received 4 ml of Predef (Upjon, the Netherlands) /cow just after delivery and before placental drop. It contained isoflupredone acetate.
- Group 4, injected in the middle part of the vulva with 1ml of $PGF_2\alpha$ (Estrumate, Intervet, the Netherlands) just after delivery.
- Group 5 injected intramuscularly with 1ml/50 kg live body weight of AD_3E (Medco-ErpBv) once a week during the last month of pregnancy. It contained vitamin A 80.000 IU, vitamin D_3 40.000 IU and vitamin E 20 mg.

Cows were followed up and the response to the used prophylactic trials in the different groups was recorded after calving. Time of fetal membranes dropping after calving was recorded. Rectal palpation was carried out twice a week to record the time of uterine involution. Intact proven bulls were used for daily teasing of cows to confirm heat detection signs and for servicing. Cows were followed up till conception and pregnancy was confirmed by measuring plasma progesterone level (>1 ng/ml on days 30 - 40 post mating).

Postpartum Reproductive Parameters: The reproductive performance variables monitored and documented as outlined by [10] were: days from calving to 1st insemination, days from calving to conception, number of services required per conception, first-service conception rate and total conception rate (number of cows pregnant by total number of inseminations).

Data were computed and statistically analyzed with one way ANOVA test [12].

RESULTS

Table 1 shows the percent of fetal membranes dropping as well as the post partum time of dropping in the Friesian herd under the current prophylactic trials. 100% of cows in Predef, PGF2α and Ad_3E treated groups as well as 80% in Dexa-Tomanol group dropped their fetal membranes in the proper time (<12hrs) versus only 60% of the cows in the control group.

Cows subjected to Predef, $PGF_{2\alpha}$ and AD_3E gave the best results ($P<0.05$) in fetal membranes dropping as regards hours taken till dropping of the membranes as well as the time for completion of uterine involution.

Table 2 indicates the post partum time taking for the commencing of ovarian activity, number of services per conception and the period of time elapsed from calving till

Table 1: Effect of some prophylactic trials on fetal membranes dropping and uterine involution in Frisian cows (Mean± SE)

	Fetal Membranes Dropping		
Treatment group	Incidence (%) **	Time of dropping (hr)**	Completion of uterine involution (days)*
Control	60	14.80±3.78^{b}	37.75±2.17^{b}
Dexatomanol	80	10.10±3.55^{ab}	32.00±2.19^{b}
Predef	100	2.80±0.37^{a}	20.40±1.74^{a}
$PGF_{2\alpha}$	100	4.60±0.43^{a}	19.20±1.52^{a}
AD_3E	100	6.40±1.08^{a}	21.60±1.12^{a}

Means with different superscript significantly different at least at $P<0.05$

Table 2: Effect of some prophylactic trials on first observed heat and conception in Frisian cows (Mean± SE)

Treatment group	first observed heat(days)*	No. of services per conception*	Period from delivery topregnancy**(Days)
Control #	139	2	160
Dexatomanol	124.20±22.78^{ab}	2.00±0.54^{ab}	156.20±14.148^{b}
Predef	68.00±15.87^{a}	1.00±0.00^{a}	77.00±17.255^{a}
$PGF_{2\alpha}$	64.20±14.37^{a}	1.40±0.24^{a}	79.80±9.33^{a}
AD_3E	31.6±2.44^{a}	2.10±0.24^{b}	73.40±5.60^{a}

Means with different superscript significantly different at $P<0.05$

a single case

the occurrence of the subsequent pregnancy in the experimental cows. Predef, $PGF_{2\alpha}$ and AD_3E treatments gave more favorable results, whereas, cows in these groups showed earlier first observed post partum estrus(especially, AD_3E), low number of services /conception (especially, Predef)and short calving to pregnancy interval (especially,AD_3E).

The overall pregnancy rate reached to 100% in groups of Dexa-Tomanol, $PGF_{2\alpha}$and AD_3E3. 80% in Predef group and 20% in the control group.

DISCUSSION

Calving associated problems cause great economic losses, especially in large dairy farms. RFM delayed uterine involution with consequent postpartum anoestrum as well as long days open and calving intervals [10].

The key event in the pathogenesis of RFM is a failure of prompt breakdown of the cotyledon-caruncle attachment after delivery of the calf. The condition was attributed to insufficient uterine motility [13,14], failure of the immune system to successfully degrade the plancentomes at the end of pregnancy[15], prepartum negative energy balance [16] as well as low circulating concentration of vitamin E [17]. However, it appears that RFM is multifactorial phenomenon.

Various aspects of immune function are suppressed in dairy cows from 1 to 2 weeks prepartum until 2-3 weeks postpartum [18-20]. The precise causes of impaired immune function in transition cows are unclear, although the peripartum drop in energy, vitamin and mineral intake, negative energy balance and mobilization of body fat and protein, dramatic changes in progesterone and estrogen levels in late gestation and the massive increase in cortisol level at calving appear to contribute to the condition [15,21,22]. Moreover, it was recorded that an elevated secretion of cortisol in the peripartum period diminishes the accumulation of leucocytes in the plancentomes and inhibits the expulsion of the fetal membranes [23].

The goal of an ideal prevention of RFM would be to hasten the separation of the placenta and its expulsion from the uterine cavity as well as to eliminate the bacterial contamination of the uterus.

All the current prophylactic measures reduce the incidence of RFM, especially Predef, $PGF_{2\alpha}$ and AD_3E. Similar finding were reported following treatment with $PGF_{2\alpha}$ within the immediate postpartum period [24].

Use of $PGF_{2\alpha}$ is common during the early postpartum period to improve uterine involution [25, 26] and fertility in dairy cattle [27, 28]. This result might be explained in light of increased myoelectrical activity and contraction of the uterus [29, 30]. In this respect Risco *et al.* [31] mentioned that conception rate after first AI was higher for cows treated with $PGF_{2\alpha}$ at 12 and 26 d postpartum. Also, Heuwieser *et al.* [32] indicated that $PGF_{2\alpha}$ treatment program increase estrous detection efficiency, the interval to first service was shorter and the cows had fewer days open than the cows in other programs. At the contrast, Stevens and Dinsmore [33] noticed that administration of $PGF_{2\alpha}$ at the time of calving does not reduce the incidence of RFM or improve reproductive performance. In the same time, the use of intra vulval mode of injection herein is more economic whereas, it reduces the applied dose with rapid response following the fast anti current theory of diffusion from the uterine vein to the ovarian artery [25].

Both $PGF_{2\alpha}$ and corticosteroids are elevated in mammals before the onset of parturition. Data suggest that corticosteroids play a role in parturition through $PGF_{2\alpha}$ synthesis regulation by fetal placental cells. Since abnormalities during parturition e.g. RFM, are common following dexamethasone induction of labor in cows, It was postulate that the local inhibition of $PGF_{2\alpha}$ accumulation by cotyledon cells after corticosteroid administration, may be involved in RFM [34]. However, Wiltbank *et al.* [35] found that none of $PGF_{2\alpha}$ or corticoids reduce incidence of RFM in dairy cattle. Also, Garcia *et al.* [36] did not support the use of $PGF_{2\alpha}$ or dexamethasone within one hour after parturition to reduce the incidence of RFM

Regarding Vitamin E, Wilde [11] mentioned that vitamin E is effective in prevention of RFM; through enhanced antioxidant function. Days to first observed estrus, AI and days open were reduced by supplementation with vitamin E [37, 38].

A deficiency of vitamin E results in a diminished activity of glutathione peroxidase in the uterus and placenta. As a result the content of lipid peroxides increases and the synthesis of $PGF_{2\alpha}$ is lowered. The injection of vitamin E and selenium 21 days before parturition before parturition diminishes the frequency of

RFM [23]. Moreover, LeBlanc *et al.* [39] found that dairy cattle received an injection of vitamin E, a week before the expected day of calving, tended to have reduced risk of RFM, confirming the hypothesis that the incidence of RFM could be reduced by limiting oxidative stress by combination of vitamins. Also, Mee [40], conclude that Vitamin E supplementation of dairy cows could reduce the risk of RFM. On the other hand, Gupta *et al.* [41] recorded that a single treatment of vitamin E at 3-week preparturn did not affect the incidence of RFM. Moreover, Campbell and Miller [37] mentioned that vitamin E did not affect the incidence of RFM, despite it reduced days to first observed estrus, reduced days to first artificial insemination and tended to reduce days open.

Because the cause of RFM is multifactorial, no one preventive measure will be universally effective. The principle for prevention is to optimize peripartum immune function, principally through management to encourage feed intake in the transition period [42]. In particular, the prepartum diet should include 0.3 ppm selenium (ideally 5 mg/day [43] and 1000-2000 IU/cow/day of vitamin E [44,45]. Injection of vitamin E prepartum may help to prevent RFM [38], but the effect is conditional. Among animals with sub-optimum circulating vitamin E in the last week prepartum (serum α-tocopherol: cholesterol ratio $<2.5 \times 10^{-3}$), injection of 3000 IU α-tocopherol subcutaneously, one week before expected calving reduced the risk of RFM [39].

In conclusion, retained fetal membranes in dairy cattle is a multi factorial phenomenon which still needs a lot of research work for its prevention to reduce the great associated economic losses. However, it is principally recommended to encourage vitamins and minerals supplementation during the peripartum period or injection of intravulval reduced dose of prostaglandin $F_{2\alpha}$.

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