The Pharmacological Effects of PGF2α to Prevention and Treatment of Placenta retention and the Increase of Fertility in Postpartum Dairy Cows

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Abstract

This preliminary study was conducted to obtain a first view of the role of PGF2α on placenta expulsion, prevention of postpartum uterine infections, and fertility in dairy cows. The objective of this study was to estimate the role of PGF2α during the excretion of placenta, for the prevention of postpartum pathologies and fertility in dairy cows. The role of PGF2α is well known for its stimulating abilities of the smooth musculatures and local immunity. For the experiment we chose two groups of animals of the Holstein breed each of them containing ten head. The cows were 3-6 years old and had normally calved. The experimental group has been treated as follows: PGF2α (Estrumate®), 2 ml via intramuscular 2 hours after parturition. The treatment was repeated 8 hours after the first one. The control group was not treated and was kept under survey so as to be compared with the indices of the experimental group. Three results of this study were: Firstly, about the index of the placenta excretion the cows of the experimental group have appeared it on average 13±2.4 hours after parturition, versus 19±4.1 hours after parturition to those of the control group. In the control group two cows have been considered with placenta retention. Secondly, in the experimental group only one cow has displayed signs of endometritis, whereas in the control group three. Thirdly, for the indices of fertility there were differences between the groups concerning both main parameters of the Period Serve and Index of Inseminimi too. Thus the cows of the experimental group had their average period serve 92±12.4 days versus 128±9.6 days. For the fertilizing Inseminimi in the experimental group 1.2 doses of sperm were used up versus 1.6 doses in the control group. We concluded that the use of PGF2α after parturition affects positively in the prevention of placenta retention, in the reveal of postpartum infections and in the improvement of fertility in cows.

Keywords: drug, PGF2α, endometritis, metritis, fertility.

Introduction

The main objective of this study was the definition of the most appropriate therapeutic schemes for prevention and treatment of retention of placenta and uterine infections in dairy cows.

Uterine infections are among the most frequent disorders to affect dairy cows during the postpartum period (Sheldon, I. M., G. S. 2006). Some of the most frequent disorders are placenta retention and uterine infections (endometritis and metritis). There are many economic damages caused by these pathologies, such as: it decreases production reduction, permanent or temporary loss of the reproductive ability, increase of the

veterinarian treatment cost and in some cases the culled of the animals (Borsberry S, et al, 1989, Youngquist S. R. 1997, Rajala, P. J., et al, 1998). In normal conditions the uterus is protected from bacterial contamination by the vulva, vestibular sphincter, and cervix. During and immediately after parturition these mechanical barriers are breached and the uterus is normally contaminated by a variety of pathogenic and nonpathogenic microorganisms (Markusfeld, O. 1984, Opsomer, G. Y. T. 2000,). After birth placenta must excrete normally within 12 hours. For different reasons placenta excretion is delayed and the probability of uterus infections is increased. (Bolinder A, et al, 1988, Bruun, J., A. et al, 2002, DeVries, et al, 2005, Hammon, D. S., 2006). Primary retention of the fetal membranes results from a lack of detachment from the maternal caruncles, whereas secondary retention is related to a mechanical difficulty in expelling already detached fetal membranes (ie, uterine atony). Primary and secondary retention mechanisms can coexist. Uterine infections are associated with retained fetal membranes, dystocia, delivery of twins, over conditioning, under conditioning, long-term feeding of urea to dairy cows and a large herd size (Borsberry S, et al, 1989, Kaneene JB, et al, 1995, Youngquist S. R. 1997). Severe uterine infections are frequently followed by manual removal of retained fetal membranes. Unsanitary calving conditions and traumatic obstetric procedures predispose cows to uterine infections (Opsomer, G., Y. T. et al, 2000). Because of differences in their calving environment, postpartum uterine infections more commonly affect dairy cows than beef cows. Primary metritis occurs within the first 21 days of calving, secondary metritis between 21 and 60 days after calving and tertiary metritis after 60 days postpartum (Dahoo IR, et al, 1983).

Prostoglandin F_2 alpha (PGF2α) and its synthetic analogs have been widely used to treat a variety of abnormalities of the reproductive tract, including retention of the fetal membranes, postpartum uterine infections and metabolic diseases (Paisley, L. G., et al, 1986, Youngquist S. R. 1997, Sheldon, I. M. 2002, Melendez, P., J. et al, 2004, Urton, G., et al, 2005).

The key to reduce the detrimental effects of uterine infections on milk production and fertility is the prevention of uterine infections by giving attention to the calving pen environment and dry cow nutrition along with early identification of uterine infections requiring therapy. Overly aggressive therapy on minimally infected cows with uterine infusions and hormones may be detrimental to subsequent fertility and perhaps cause a residue in your bulk tank milk. (Youngquist S. R. 1997, Dohoo IR, et al, 1983, Kimura, K., J. P.2002).

Materials and methods

The study was carried out during 2009 (March – October) in a private farm (Tirana) for breed cows of Holstein race. For the study we chose 20 head of cows from 3 to 6 years old and which have undergone the last parturition normally. The study aims to evaluate the role of PGF2α in the acceleration of placenta excretion, the prevention of uterine infections and the improvement of the fertility indices. For this reason the cows after birth were divided randomly on two groups and treated as follows:

The experimental group (10 cows): The cows of this group were treated with PGF2α

(Estrumate®) twice with dosage of 2 ml via intramuscular, 2 hours after parturition and the second dose 8 hours after the first one.
The control group (10 cows): The control group was not treated and was kept under survey so as to be compared with the indices of the experimental group.
The indices derived for the following steps: the time of placenta excretion, the display of uterine infections (metritis) and fertility indices (Calving to conception interval and Service per conception), have been processed statistically.

Results and discussion

The main focus of this study was concentrated on the time needed for placenta excretion considering both groups. The results for this index are presented in table 1.
Table 1. Time of placenta excretion and the indices of fertility in cows of the two groups (experimental and control)

Groups	1st treatment 2 hours after parturition	2nd treatment, 8 hours after parturition	Placenta prolapse (hours)	Calving to conception interval, (d)	Service per conception, (n)
Experiment (10)	(PGF2α), 2 ml	(PGF2α), 2 ml	13±2.4	92±12.4	1.2
Control (10)	-	-	19±4.1	128±9.6	1.6

From the data it results that placenta excretion has happened previously in the cows treated with $PGF_{2\alpha}$ opposite to the cows of the control group which were not treated with the mentioned hormone (P>0.05). We think that the hormonal treatment has played a positive role in this concern. PGF2α has a positive effect on the musculature tonus of the uterus by contracting it and simultaneously by removing the placenta and the content of the uterus. PGF2 alpha has positive effects even in the increase of the immunity of the uterus towards infections. (Youngquist S. R. 1997, Hammon, D. S., I.et al. 2006). Our results are approximate to the studies of foreign researchers in this field. (Melendez, P., J, et al. 2004).
Another important moment during this study has been the monitoring of uterine infections 2 weeks after parturition and mainly of cows that have had placenta retention or delay in its excretion. From the data it results that from the control group 3 head have been infected with metritis (30%), from which 2 cows have been considered with placenta retention (>24 hours), and from the experimental group only one head has been infected (10%) with metritis, although it does not result with placenta retention. One of the factors influences highly in the display of uterine infections after parturition is placenta retention. This fact has been evidenced even in the studies of foreign researchers. (Youngquist S. R. 1997, Kaneene, J. B., at al. 1998, Sheldon, I. M., G. S. et al. 2006).
The cows were kept under survey even for the fertility indices such as: the period from parturition to inseminine fecundation (Calving to conception interval) and the number of inseminations per fecundated cow. (Servis per conception). The data appear in the table.
Considering the data of the cows of the control group they need a longer time to be fecundated again and simultaneously a higher dosage of sperm. The two above indices are significant to evaluate the influence of placenta retention and the uterine

infections after parturition on the fertility indices. (Youngquist S. R. 1997, Bruun, J., A. K. et al. 2002, Opsomer, G., Y. T. et al, 2000, Urton, G., M. A. G. von Keyserlingk, et al, 2005).

Conclusion

As a conclusion the main advantages of the application of the PGF2α in the placenta retention were:

- The treatment of the cows with PGF2α accelerated placenta removal, receptively in the treated cows placenta was removed after 13±2.4 hours while in the control group cows removed placenta after19±4.1 hours
- Application of the PGF2α, decrease the frequency of the uterine infections, specifically in our study the uterine infection resulted 10 % in the experiment group and 30 % in the control group.
- From the application of the PGF2α the Calving to conception interval is decreased from 128±9.6 days in the control group to 92±12.4 days in the experiment group and the Service per conception index is decreased from 1.6 in the control group to 1.2 in the experiment group.

References

Bruun, J., A. K. Ersbøll, and L. Alban. 2002. Risk factors for metritis in Danish dairy cows. Prev. Vet. Med. 54:179–190.

Bolinder A, Seguin B, Kindahl H, et al: Retained fetal membranes in cows: Theriogenology; 1988;30-45.

Borsberry S, Dobson H: Periparturient diseases and their effect on reproductive performance in five dairy herds. Vet Rec 1989; 124:217-219.

DeVries, T. J., and M. A. G. von Keyserlingk. 2005. Time of feed delivery affects the feeding and lying patterns of dairy cows. J. Dairy Sci. 88:625–631.

Dohoo IR, Martin SW, Meek AH, et al: Disease, production and culling in Holstein-Friesian cows, 1983; 1,132.

Drillich, M., Reichert , U., Mahlstedt, M., Hewieser, W., 2006b. Comparasion of two strategies for systemic antibiotic treatment of dairy cows with retained fetal. membranes: preventive vs. selective treatment . Journal of Dairy Science 89, 1502-1508.

Hearth,S., Dobson, H., Bryant, C.E., Sheldon, I.M., 2006a. Use of the cow as a large animal model of uterine infection and immunity. Journal of Reproductive Immunology 69, 13-22.

Islam R, 2011. Synchronization of estrus in cattle. A Review.Vet World, 4; 136-41.

LeBlanc,S.J., Duffield, T.F., Leslie, K.E., Bateman, K.G., Keefe, G.P., Walton , J.S, Johnson, W.H., 2002b. The effect of treatment of clinical endometritis on reproductive performance in dairy cows. Journal od Dairy Science 85, 2237-2249.

Lewis , G.S, Wulster Radcliffe, M.C., 2006. Prostaglandin F2alfa upregulates uterine immune defenses in the presence of the immunosuppressive steroid progesterone.
American Journal of Reproductive Immunology 56, 102-111.

Kaneene, J. B., and R. Miller. 1995. Risk actors for metritis in Michigan dairy cattle using herd- and cow-based modeling approaches. Prev. Vet. Med. 23:183–200.

Kimura, K., J. P. Goff, M. E. Kehrli Jr., and T. A. Reinhardt. 2002. Decreased PMN function as a cause of retained placenta in dairy cattle. J. Dairy Sci. 85:544–550.

Markusfeld, O. 1984. Factors responsible for post-parturient metritis in dairy cattle. Vet. Rec. 114:539–542.
Melendez, P., J. McHale, J. Bartolome, L. F. Archbald, and G. A. Donovan. 2004. Uterine involution and fertility of Holstein cows subsequent to early postpartum $PGF_{2\alpha}$ treatment for acute puerperal metritis. J. Dairy Sci. 87:3238–3246.
Opsomer, G., Y. T. Gröhn, J. Hertl, M. Coryn, H. Deluyker, and A. de Kruif. 2000. Risk factors for post partum ovarian dysfunction in high producing dairy cows in Belgium: A field study. Theriogenology 53:841–857.
Paisley, L. G., W. D. Mikelsen, and P. B. Anderson. 1986. Mechanisms and therapy for retained fetal membranes and uterine infections of cows: A review. Theriogenology. 25:353–381.
Rajala, P. J., and Y. T. Gröhn. 1998. Effects of dystocia, retained placenta, and metritis on milk yield in dairy cows. J. Dairy Sci. 81:3172–3181.
Sheldon, I. M. 2002. Effect of postpartum manual examination of the vagina on the uterine bacterial contamination in cows. Vet. Rec. 151:531–534.
Sheldon, I. M., G. S. Lewis, S. LeBlanc, and R. O. Gilbert. 2006. Defining postpartum uterine disease in cattle. Theriogenology 65:1516–1530.
Urton, G., M. A. G. von Keyserlingk, and D. M. Weary. 2005. Feeding behavior identifies dairy cows at risk for metritis. J. Dairy Sci. 88:2843–2849.
Youngquist S. R. Current Therapy in Large Animal Theriogenology. 1997, 335 – 339, 340 -348, 441-450.