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Effect of injectable anti-oxidant vitamins (A, E & SE) in the separation and expulsion of fetal membranes and involution in dairy cows

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Abstract
An analytical study was conducted to assess the effect of supplementation of injectable anti-oxidant vitamins A, E & Se in an experimental group of forty animals. The animals were randomly divided into four groups with ten each and the study was carried out. They were administered with Vitamin A, Vitamin E & Se and Vitamin A, E & Se in Group II, III & IV respectively and group I as control. The animals were monitored after postpartum for their separation and expulsion of fetal membranes and their involution parameters ultrasonographically. The data were statistically analyzed and reported. It was concluded that the prepartum supplementation of injectable anti-oxidant vitamins has a correlative effect in separation of fetal membranes and involution in animals without any postpartum complications.

Keywords: Anti-oxidant, fetal membranes, uterine involution, Vitamin A, Vitamin E, selenium

Introduction
The economy of livestock production largely depends upon the reproductive efficiency of the animals. The major causes of low reproductive efficiency in cows are delayed age of puberty and longer calving intervals. Successful attempts to improve the reproductive and productive efficiency by providing vitamin E-selenium in exotic cows [8], Sahiwal cows [16, 17], Egyptian buffaloes [20] and Nili-Ravi buffaloes [14, 15] during late gestation have been reported previously. Vitamin A is an essential vitamin for sight, bone muscle growth, protection of the integrity of epithelial cells, immune cell functions, gene arrangement and normal reproductive activity in cows [5, 6, 9, 10]. The clinical signs of vitamin A deficiency towards the end of pregnancy are abortion, Retained fetal membranes (RFM), night blindness, diarrhea and an increase in the number of dead, blind, weak and sick calves [6, 10, 19]. Persistence of vitamin A deficiency after parturition may decrease the conception rate [10]. An adult cow needs 76 IU of vitamin A/kg/d in the diet in order to maintain its normal reproductive function [19]. Retained fetal membranes are a common problem in dairy farms, and it can influence the risk of other diseases and fertility of dairy cows [4]. The causes of RFM have not been completely elucidated; however, an important predisposing factor is the immune and antioxidant status before calving. For instance, during the transition period, dairy cows experience a reduction in immune function from approximately 14 d before to 21 d after calving, characterized by reduction in neutrophil and lymphocyte functions, especially on the day of calving [7]. The reduction in neutrophil function has been linked to increased risk of RFM [11]. Inadequate vitamin E supplementation and elevated cortisol around calving may be important risk factors that affect the incidence of RFM and subsequent uterine involution in cows. This study was planned to investigate the effect of pre-partum treatment of vitamin E, selenium and Vitamin A on incidence of retention of placenta and cervix and uterine involution in crossbred dairy cattle.

Materials and Methods
Forty crossbred cows in their last trimester of pregnancy (4 weeks prepartum) were randomly selected and assigned to four experimental groups with 10 animals in each group. Group I animals were kept as control. Group II animals were administered with injection of Vit. E and Se (50 mg DL-alpha tocopheryl acetate and 1.5 mg sodium selenite per ml) @ 1ml/50 kg body

weight subcutaneously at weekly interval until parturition starting from 4 weeks prior to the expected date of parturition. Group III animals were administered with injection of Vitamin A (6, 00,000 IU/ animal- intramuscularly) at weekly interval until parturition starting from 4 weeks prior to the expected date of parturition. Group IV animals were administered with injection of Vit. E and Se at 1 ml/50 kg body weight S/c and Vitamin A (6, 00,000 IU/ animal) at weekly interval until parturition starting from 4 weeks prior to the expected date of parturition. Feeding practices of all animals were recorded. The animals were observed for time required for separation and expulsion of fetal membranes. The cows were per rectally examined day 2, day 10 and day 30 post calving to assess the uterine involution ultrasonographically. The results were statistically analyzed using ANOVA Duncan on SPSS® 20.0. Software package.

Results

The nature of calving, average time taken for fetal membrane expulsion, fetal membrane separation (%), fetal membrane expulsion (%) and post-partum complications are depicted in table.1

Table 1: Fetal Membrane shedding

Treatment groups	Nature of calving	Avg. Time taken for expulsion/ Separation of fetal membrane (hrs)	Fetal membrane separation (Percent)	Fetal membrane expulsion (Percent)	Post-partum complication (Percent)
Group – I (Control)	Normal live birth	9.75	80(8/10)	80 (8/10)	Postpartum metritis - 10 (1/10)
Group – II (Vit E & Se)	Normal live birth	6.5	90(9/10)	90 (9/10)	NOT REPORTED
Group – III (Vit A)	Normal live birth	6.9	80 (8/10)	80 (8/10)	NOT REPORTED
Group – IV (Vit A and E & Se)	Normal live birth	3.83	100 (10/10)	100 (10/10)	NOT REPORTED

The cervix and uterine involution status during day 2, day 10 and day 30 post-partum period was presented in table.2

Table 2: Uterine involution studies (ANOVA – Duncan)

Parameters		Group I (M±SE)	Group II (M±SE)	Group III (M±SE)	Group IV (M±SE)	P value
Uterine involution (cms)	A	0.46±0.269	0.46±0.402	0.46±0.338	0.463±0.42	0.275
	B	0.42±0.524	0.416±0.408	0.419±0.493	0.415±0.388	0.40
	C	0.234±0.273	0.230±0.290	0.233±0.256	0.229±0.193	0.210
Cervical involution (cms)	A	0.454±0.230	0.448±0.180	0.45±0.275	0.447±0.147	0.068
	B	0.34±0.307	0.34±0.303	0.34±0.609	0.375±0.219	0.064
	C	0.247±0.42	0.218±0.365	0.219±0.47	0.029±0.182	0.535

* $P< 0.05$ - Statistically significant, ** $P< 0.01$ - Statistically highly significant

A – Day 2 post-partum

B – Day 10 post-partum

C – Day 30 post-partum

The animals in Group IV showed relatively short time for separation and expulsion of fetal membranes without postpartum complications and efficient cervix and uterine involution.

Discussion

Vitamin E-selenium supplementation has been reported to improve humoral immune responses to bacterial and viral antigens [12], leading to reduced neonatal mortality and improved vigor of the young calves [18]. Furthermore, vitamin E-selenium treatments during the dry period are recommended for reducing postpartum reproductive disorders in cows [3]. It is well known that vitamin A and β-carotene deficiency causes negative impacts in the incidence of retained fetal membranes in dairy cows. In addition, abortion, night blindness, increase in the birth of weak and sick calves, weakening the oestrus symptoms, and delayed ovulation are other negative outcomes related to deficiency of vitamin A and β-carotene [2, 9, 10, 13, 19]. Akar, *et al*., 2005 reported that vitamin A and β-carotene supplementation before or after calving had no effect on calving to the first service e interval in cows. In this study, it is found that supplementation of anti-oxidant vitamins (A, E & Se) in last term prepartum dairy cows showed reduced time for complete separation of fetal membranes with no post-partum complications in Group IV animals. Similarly, involution of cervix and uterus postpartum was highly significant in Group IV. Thus to conclude, the animals would be in stress during the last term of gestation which can be depicted as parturient stress. This could be annihilated by supplementation of injectable anti-oxidants; which in turn enhance the separation and expulsion of fetal membranes and eliminates the occurrence of retained fetal membranes with good rate of involution of cervix and uterus in dairy cows and so optimum fertility in future.

Conclusion

Pre-partum injection of Vit A, Vit. E and Se during last month of gestation in bovines improves, placental shedding and postpartum uterine involution and future fertility without any postpartum complications.

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