EFFICACY OF DIETARY VITAMIN E AND SELENIUM SUPPLEMENTATION IN THE DIET OF PREGNANT BUNAJI COWS ON POSTPARTUM PARAMETERS

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Abstract

An experiment was conducted to evaluate the efficacy of supplementing dietary vitamin E and selenium on postpartum parameters of pregnant Buanji cows. Twenty pregnant Bunaji cows in the third trimester were used. The animals were grouped into four treatments, with each treatment containing five animals. Treatment I served as the Control: no supplementation of either selenium or vitamin E. Treatment II was supplemented with 3 mg of feed grade selenium. Treatment III was administered 20 mg of feed grade vitamin E. Treatment IV received a combination of 3 mg feed grade selenium and 20 mg of vitamin E. The animals received the treatments once every week during the 3rd trimester of pregnancy until calving. The following parameters; dystocia (ease of calving), days to first return of oestrus and time to ejection of placenta were observed/recorded. Data generated were analysed using the General Linear Model of SAS (2002). Significant means were compared using Dunnett (1964). Dystocia (ease of calving) was not observed in all the treatment groups. Time to ejection of placenta and days to first oestrus postpartum for Bunaji cows were significantly different ($P<0.05$) with Se + vitamin E supplementation than other treatment groups. It was concluded that vitamin E and selenium was effective in reducing time to ejection of placenta and days to first oestrus postpartum.

Keywords: Postpartum, Selenium, Vitamin E, Pregnant, Bunaji Cows

Introduction

Vitamins and minerals play an important role in the growth of animals and their reproductive performance. Vitamin E and selenium (Se) are essential nutrients that have complementary biological functions as antioxidants to minimise cellular damage caused by endogenous peroxides (Kolb *et al*., 1997). Antioxidants have been defined as substances that delay or inhibit oxidative damage to cellular molecule (Gutteridge *et al*., 1994). Selenium has a biological function related to vitamin E in that selenium is an essential component of GPx, an enzyme involved in detoxifation of hydrogen peroxide and lipid hydroperoxides.

Antioxidants are necessary for prevention of some female reproductive disorders (Fujii *et al*., 2005). Effects of Se, vitamin E, or their combination on fertility are variable, with some studies reporting no effect (Gunter *et al*., 2003) or an increase in fertility (Arechiga *et al*., 1994). Retained foetal membranes (RFM) occur when the placenta has not been shed within a short time after parturition. Cows with RFM have increased risks for metritis (Correa *et al*., 1993; Emanuelson *et al*., 1993). Eger *et al*. (1985) observed a reduction in the incidence of RFM with a single injection of Se and vitamin E, given approximately 21 d prepartum. In contrast, Hidiroglou (1989) found no benefit from the use vitamin E or Se.

Biological functions of selenium are complemented by vitamin E, and their effect is reflected as a cellular antioxidant. Therefore, some clinical manifestations of hypovitaminosis E and selenium deficiency are very similar. Therapy and prophylaxis of these disorders usually consist of the administration of both substances together (Allison and Laven, 2000). Selenium is an important trace mineral, acting in synergy with vitamin E and other anti-oxidative agents such as Cu and Zn which inhibit the oxidation of membrane fat polyunsaturated acids and DNA by oxygen radicals produced during aerobic metabolism (Florence, 1995). Therefore, the objective of the study was to evaluate the efficacy of supplementing dietary vitamin E and selenium on postpartum parameters of pregnant Buanji cows.

Materials and methods

Study Site

The study was conducted at the Dairy Research Programme Farm of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika-Zaria, Nigeria.

Experimental Design and Management of Animals

A total of 20 Bunaji cows with an average weight of 300 kg were used for this study. The animals were grouped into four treatments, with each treatment containing five animals. Treatment I served as the Control: no supplementation of either selenium or vitamin E. Treatment II was supplemented with 3 mg of feed grade selenium. Treatment III was administered 20 mg of feed grade vitamin E. Treatment IV received a combination of 3 mg feed grade selenium and 20 mg of vitamin E. The animals received the treatments once every week during the 3rd trimester of pregnancy until calving. The stage of pregnancy was determined by rectal palpation according to the procedures of Zemjanis (1970).

The animals were allowed to graze on pastures (*Digitaria smutsi*), crop residues and supplemented with a concentrate diet, consisting of 48 % cotton seed cake, 13.7% wheat bran, 35.3% maize, 2% bone meal, 1% common salt; the diet comprised about 88% dry matter, 15% crude protein and 55% total digestible nutrients. Water was provided *ad libitum*. All the experimental animals were ear-tagged for ease of identification. The animals were dipped once a week during the dry season and twice a week during the wet season for effective control of ectoparasites.

The following parameters were observed:

Calving ease: ease of calving was determined according to the grade by National Association of Animal Breeders scoring system for calving ease as follows;

Degree of Difficulty	**Calving Ease Score**
No problem	1
Slight problem	2
Needed assistance	3
Considerable force	4
Extreme difficulty	5

Source: NAAB

Days to first eostrus: This was determined as the time in days the cow took to return to estrus (observed standing to be mounted) after calving

Ejection of the placenta: This was determined as the time taken in hours for the placenta to be ejected after calving.

Source of mineral and vitamin: Selenium and vitamin E were purchased from Hi-nutrients International, Lagos, Nigeria.

Permission was obtained from the Committee on Animal Use and Care, Ahmadu Bello University, Zaria with the Approval No: **ABUCAUC/2017/004**

Results and discussion

Table 1 shows the effect of selenium, vitamin E and selenium + vitamin E supplementation on postpartum parameters of Bunaji cows. Dystocia incidences were not observed in the experimental animals as all the cows calved unaided (without difficulty). There were highly significant ($P < 0.001$) differences in the time of placenta expulsion across the treatments. The time was shorter in the supplemented cows than in the control group. Among the supplemented groups, the time of placenta expulsion was shortest in Se + Vit E cows than in the Vit E and Se treatments. Days to first oestrus after calving of Bunaji cows are significantly ($P < 0.05$) higher with Se + vitamin E supplementation. Days to first oestrus after calving ranged between 59.60 and 50.40 days. Both parameters had a general pattern of reduction across the treatments with supplementation; they declined from the control to the Se + Vit E treatment.

All experimental animals in the treatment groups calved with ease without any help. All experimental animals calved unaided (without difficulty). There was no difficult calving, this implied that the cows were able to calve without aid or surgical intervention. This could be attributed to the age of the cows used for the study were neither young heifers nor primiparous cows. Time to ejection of placenta was higher ($P < 0.05$) in Bunaji cows supplemented with Se + vitamin E due to the synergistic attributes of Se and vitamin E. Time to ejection of placenta and number of days to first oestrus after postpartum

observed in the Bunaji cows had similar values of 6.80 – 10.40 hours and 59.60 – 80.40 days, respectively. The reduction in time to ejection of placenta observed in this study could be as a result of the antioxidative effect of vitamin E in scavenging reactive oxygen species (ROS) involved in the pathogenesis of livestock diseases such as abortion and retained palcenta (McDowell *et al*., 1996). The combination of Se and Vitamin E proved to be the best as it reduced time to ejection of placenta from about 10 hours in the controls to about 7 hours in the Se + vitamin E treatment. This could be attributed to the synergistic and complementary role played by Se and vitamin E as antioxidants, as the presence of one enhances the availability and function of the other. Time to ejection of placenta observed in the present study could also be attributed to meeting the requirement for Se and vitamin E in the diet as deficiency results to retained placenta. This corroborates the findings of Sordillo (2013), who reported that Se deficiency favours the appearance of perinatal metritis and retention of placenta in dairy cattle. Spears and Weiss (2008) reported that selenium supplementation in dairy cows decreases the incidence of retained placenta. Supplementation of approximately 1000 IU/d of vitamin E (usually all-*rac*-α-tocopheryl acetate) to dry cows when adequate Se is supplemented reduces the incidence of retained foetal membranes (Wichtel *et al*., 2004). The finding for reduced time to first oestrus in the present study agrees with the result of (Miller *et al*., 1993) that supplementation reduces postpartum anoestrus.

Days to return to first oestrus after postpartum in Bunaji cows were significantly shorter (reduced) ($P < 0.05$) with Se + vitamin E supplementation. The reduction in number of days to return to oestrus postpartum is an indication of improved fertility. This is because a cow with longer duration to return of oestrus is a sign of infertility. The improvement in fertility when selenium was added to the diet may be attributed to the reduction in embryonic death in the first month of gestation. Ceko *et al*. (2015) reported that the expression of the selenoprotein gene, GPx is significantly increased in granulosa cells of large healthy follicles of cows. The authors concluded that selenoproteins have an antioxidant role during the delayed follicular development. The reduction in number of days to return of oestrus observed in the present study could be attributed to the efficacy of Se and vitamin E as antioxidants in improving reproductive capacity of the cows by shortening the days to return of oestrus and this agrees with (Campbell and Miller, 1998). Baldi *et al*. (2000) reported that increasing vitamin E intake could lead to reduction in the number of days to first estrus after calving.

Table 1: Effect of selenium, vitamin E and selenium + Vitamin E supplementation on postpartum parameters of Bunaji cows

Parameters	Control	Se	Vit-E	Se + Vit-E	SEM	P-value
Ease of calving	1	1	1	1	1	1
Time to ejection of placenta (h)	10.40^{c}	8.60^{bc}	7.60^{b}	6.80^{a}	0.39	< 0.0001
Postpartum anoestrus period (days)	80.40^{d}	75.40^{c}	68.20^{b}	59.60^{a}	0.82	< 0.0001

^{abc}Means within the same row having different superscript letters are significantly ($P<0.05$) different.
Se-Selenium, Vit-E-Vitamin E, SEM-Standard Error of the Mean.

Conclusion

From the findings of the study, it could be concluded that vitamin E and selenium were effective in improving time to ejection of placenta and postpartum anoestrus period.

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