FAILURE OF PRECALVING SUPPLEMENTATION OF VITAMIN E AND DIETARY FAT TO ALTER REPRODUCTIVE PERFORMANCE OF FIRST LACTATION COWS OR THE HEALTH OF THEIR CALVES

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Summary

A study was conducted to determine the effect of precalving supplementation with vitamin E and fat on the reproductive performance of first lactation cows and the health of their calves. Approximately 50 days before the first expected calving, 48 crossbred heifers were allotted to four treatments: 1) basal diet that consisted of 13 lb of prairie hay, 7.3 lb of milo, and 1 lb of supplement per heifer per day; 2) basal diet+supplement bringing the diet to 4% fat; 3) basal diet+supplement providing 1000 IU supplemental vitamin E/day; and 4) basal diet plus both fat and vitamin E. Supplementation of vitamin E and(or) fat had no effect on any reproductive trait in the cows or any immunological measurement in the calves.

(Key Words: Vitamin E, Fat, Reproduction, Calf Health.)

Introduction

Previous research has shown vitamin E supplementation (500 to 1000 IU per cow per day) before calving to improve the reproductive performance of dairy cows and reduce the incidence of conditions such as mastitis and udder edema. This benefit is apparently related to vitamin E's function as an antioxidant and its ability to prevent lipid peroxidation of membranes. Information is limited on the precalving use of vitamin E supplementation in beef cattle. An Alberta researcher reported a significant reduction in the incidence of calf scours in heifers receiving 1000 IU of vitamin E per day for 60 to 100 days prior to calving.

The objective of our experiment was to examine the effect of precalving supplementation of vitamin E with or without 4% total dietary fat on reproductive traits of first-lactation beef cows and immunological measurements on their calves.

Experimental Procedures

Approximately 50 days before the first expected calving, 48 crossbred beef heifers were allotted randomly to four treatments: 1) a basal diet consisting of 13 lb of prairie hay and 7.3 lb of grain sorghum, plus 1 lb of a basic supplement per day (control); 2) basal diet+1 lb of a supplement to bring the diet to 4% fat; 3) basal diet+ 1 lb of a supplement providing 1000 IU of supplemental vitamin E; and 4) basal diet+both fat and vitamin E. The basic supplement (control) consisted of 72% soybean meal, 27% grain sorghum, and 1% trace mineral premix. In the supplement containing the fat, grain sorghum was reduced to accommodate 24% added fat. In the supplement containing vitamin E, the grain sorghum was reduced to accommodate 3.6% of a vitamin E supplement. The fat was Fat Plus® (100% dry animal fat product; Farmland Industries, Inc.).

Within each treatment, pregnant heifers were allotted to replicates based on weight and expected calving date, resulting in heavy, average, and light weight replicates (n=4). Heifers were maintained as replicates until approximately 14 to 16 days before their expected calving date, when they were transferred to a calving unit and continuously maintained on their respective dietary regimen until 48 h after calving. Heifers were weighed at the onset of

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dietary treatments, precalving, and 36 to 40 hours after calving. Body condition scores were assessed at the beginning of the trial and just before calving.

To determine plasma concentrations of vitamin E and selenium in the dams and their calves, blood was collected at the beginning of the trial, precalving, and 36 to 40 hours after calving. Colostrum samples were collected from each dam at 36 to 40 hours postcalving, and colostral concentration of immunoglobulin (IgG) was determined by the use of single radial immunodiffusion plates containing monospecific antisera in buffered agarose. To determine the calf IgG status, blood was collected from the calves at calving, before suckling, and 36 to 40 hours later.

Beginning 44 days after the first calving, weekly blood samples were collected from the cows and later analyzed for progesterone to determine first occurrence of postpartum ovulation and luteal function. When serum progesterone exceeded 1 ng/ml in two consecutive samples, onset of estrous was presumed. Cows were exposed to a bull for natural mating during a 60-d breeding season.

Results and Discussion

Supplemental vitamin E and(or) fat had no effect on body weights, body condition score, rate of fetal membrane expulsion, interval to first ovulation, or pregnancy rates at the end of the breeding season (Table 2).

Neither fat nor vitamin E supplementation had any impact on the immunoglobulin concentration in calves, calf vigor, or their weaning weight (Table 2).

Table 1. Nutrient Content of Basal Diet [a]

Item	Prairie[b] Hay	Sorghum[c]	Soybean Meal[d,e,f]	Total Diet
Dry matter, %	90.2	86.7	88.6	88.5
Crude protein, %	6.2	10.4	47.8	9.6
Selenium, mg/kg	.10	.14	.72	.3
Vit. E[g], IU/kg	112	10.0	3.0	125
Fat[h], %	1.9	3.2	.73	3.1

[a]Results are expressed on a dry matter basis.
[b]Prairie hay and sorghum fed at the rate of 13 lb and 7.3 lb per heifer per day, respectively.
[c]Soybean meal fed as part of supplement, supplement fed at the rate of 1 lb per heifer per day. Basic supplement (control) consisted of: 72% SBM; 27% sorghum; 1.0% Z 10 mineral mix; and .004% Se premix.
[d]Vitamin E treatment received the basic supplement with the following changes: sorghum was reduced to accommodate vitamin E premix providing 1000 IU daily
[e]Fat treatment received the basic supplement with the following changes: sorghum was reduced to accommodate 24% fat.
[f]Vitamin E+fat received the basic supplement modified to contain 24% fat and 1000 IU/day vitamin E by removing sorghum.
[g]dl-∝-tocopheryl acetate.
[h]Fat Plus™ 100 (100% dry animal fat product).

Table 2. Effect of Maternal Treatment on Dam and Calf Weigh ts, Reproductive Traits, Colostral Vitamin E, and Immune Status of the Neonatal Calves

Item	n	Control	Fat	Vit E	Vit E+Fat	P	SE
Dam weight, lb							
Day 0	48	997	988	983	983	.94	19.6
Precalving	48	1032	1063	1038	1067	.57	20.9
Postcalving	46	1001	983	1001	1012	.77	20.9
Dam BCS [a]							
Day 0	48	5.0	5.2	5.1	5.0	.32	.10
Precalving	48	5.1	5.3	5.4	5.4	.10	.09
Fetal membrane expulsion, h	48	4.8	4.1	4.7	3.4	.43	.69
Days to 1st luteal function	46	52.2	69.6	64.1	73.4	.08	6.0
Pregnancy rate, %	46	100	91	91	100	.59	
Colostral vitamin E, µg/ml	46	3.1	4.9	5.1	4.2	.53	1.1
Calf IgG [b]							
Pre-suckle, mg/100 ml	47	132	282	140	132	.19	62.0
Post-suckle, mg/100/ml	47	1684	1725	1347	1589	.65	247.0
IgG <800 mg/100 ml, no.	47	1	2	3	2	.82	
Calf vigor							
1st nurse, min	47	103	145	178	115	.32	33.0
1st stand, min	47	38	63	95	73	.52	28.0

[a]Body condition score reported on a 1-8 scale (1=extremely thin; 5=moderate; 8=obese).

[b]Passive transfer: poor/low <800 mg/100 ml; moderate 800-1600 mg/100 ml; excellent >1600 mg/100 ml.