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PROGRESS REPORT

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Effects of a Pasteurella haemolytica vaccine and injectable vitamin E on the performance and health of newly received calves[1]

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Pasteurella haemolytica is one of the most frequently isolated organisms in beef cattle affected with bovine respiratory disease (BRD; shipping fever). Vaccines for P. haemolytica are available commercially, but limited data are available regarding efficacy of these vaccines with large-scale application to newly received cattle. Vitamin E can have positive effects on the immune response, and recently released injectable forms of vitamin E might offer a convenient means of administering the vitamin at processing to newly received calves. Our study was designed to evaluate the effects and possible interactions of a P. haemolytica vaccine and injectable vitamin E with newly received beef cattle.

One hundred nineteen mixed breed steer calves were shipped by semi-tractor trailer from Kentucky to the Clayton Livestock Research Center. Calves were approximately 18 h in transit and experienced a 6.6% shrink from a pay weight of 402 lb. Calves arrived at the Research Center at 10:00 PM on March 7, 1991, and were housed in a common pen with ad libitum access to large round bales of sorghum sudangrass hay and water. On the following morning, each calf was weighed and processed as follows: branding and identification with an individual ear tag; castration and dehorning as needed; treatment for external parasites with fenthion pour-on [Tiguvon - Cutter Anim. Health, Mobay Corp., Shawnee, KS - .5 oz/100 lb body weight (BW)]; treatment for internal parasites with oxfendazole (Synanthic rumen injector system - Syntex Anim. Health, Inc., West Des Moines, IA - 1 mL/100 lb BW); injection with vitamins A and D (Hoffmann LaRoche, Inc., Nutley, NJ - 2-mL intramuscular injection - 500,000 IU vitamin A and 75,000 IU vitamin D/mL); vaccination against IBR-PI_3 (Bovishield, modified live virus - Norden Labs, Lincoln, NE - 2-mL intramuscular injection) and vaccination against clostridial organisms (BarVac 7 - Anchor-Boehringer Ingelheim Anim. Health, Inc., St. Joseph, MO - 5-mL intramuscular injection).

Also at the time of processing, treatments were applied randomly to individual calves based on processing order. Treatments were arranged in a 2 x 2 factorial and consisted of: 1) no vaccination and no injectable vitamin E; 2) no vaccination and an intramuscular injection with 2,000 IU of vitamin E (Rocavit E - Hoffmann LaRoche, Inc., Nutley, NJ - each mL contained 400 IU of d,l alpha tocopherol); 3) vaccination with Presponse (P. haemolytica toxoid - Cyanamid, Wayne, NJ - 2-mL intramuscular injection) or 4) vaccination with Presponse and injection with vitamin E. After processing, calves were assigned randomly to one of three pens per treatment (nine to 10 calves per pen) and allowed free choice access to a concentrate diet and sorghum sudangrass hay. The concentrate diet was composed of (dry matter basis) sorghum sudangrass hay (25.61%), alfalfa hay (10.11%), whole shelled corn (9.87%), steam-flaked milo (39.78%), molasses (4.88%), soybean meal (5.03%), limestone (1.01%), dicalcium phosphate (.65%), salt (.5%), urea (.25%), ammonium sulfate (.25%) and hominy feed-based premix (2.06%). The premix supplied trace minerals (.1% of the total diet), Rumensin (20 g/ton of diet), Tylan (10 g/ton of diet), vitamin A (1,134 IU/lb of diet) and vitamin E (45 IU/lb of diet). Concentrate and hay were fed in separate sections of the feed bunk, and fresh supplies of hay were provided only for the first week of the experiment.

Body weight of the calves was determined on days 14 and 28 (end of experiment). Calves that had received Presponse vaccine were revaccinated on day 14. Feed offered to each pen was measured daily, and feed bunks were cleaned on days 14 and 28. Diet samples were collected from the feed bunk on a regular basis throughout the experiment, and samples were analyzed for dry matter, crude protein and acid detergent fiber contents. Dry matter content of the concentrate diet averaged 88%, with crude protein and acid detergent fiber contents of 12.6 and 15.9%, respectively. Dry matter content of the sudangrass hay averaged 94.9%.

Calves were monitored daily for symptoms of BRD. Calves with BRD symptoms [nasal discharge, labored breathing, lethargy and(or) emaciated body condition] were removed from their pen and weighed. After their rectal temperature was determined to verify visual symptoms, sick calves were treated with antibiotics. Two antibiotic treatment regimens were used: 1) intramuscular injection of ceftiofur sodium [Naxcel - The Upjohn Co., Kalamazoo, MI - 1 mL(.5 mg)/100 lb BW] plus intramuscular injection of procaine penicillin G (Pfi-Pen G - Pfizer Animal Health, New York, NY - 5 mL/100 lb BW) on the first day, followed by Naxcel only for two additional days or 2) intramuscular injection of long-acting oxytetracycline (LA-200 - Pfizer Animal Health, New York, NY - 4.5 mL/100 lb BW plus two sulfadimethoxine boluses (Albon SR - Hoffmann LaRoche, Inc., Nutley, NJ - 12.5 g sulfadimethoxine per bolus). After medical treatments were administered, calves were returned to their respective treatment pens; those treated with LA-200 and Albon SR were monitored for two additional days after treatment, but not pulled again for at least 3 d after the initial treatment.

[1]We thank Cyanamid for supplying Presponse vaccine and Hoffmann LaRoche, Inc., for supplying Rocavit E. Appreciation also is expressed to Syntex Animal Health, Inc. for supplying the Synanthic Rumen Injector System and to Elanco Products Co. for supplying Rumensin and Tylan.

Daily gain, feed intake and feed efficiency data were analyzed statistically as a completely random design with pen as the experimental unit. Morbidity and mortality data were analyzed by non-parametric statistical methods with individual calves as the experimental unit. The statistical model included effects for Presponse vaccine, injectable vitamin E and the Presponse by vitamin E interaction.

Performance data for the experiment are shown in Table 1. Main effect means are reported because no interactions were detected between Presponse and vitamin E. Neither Presponse nor injectable vitamin E significantly affected performance during the experiment. Nonetheless, calves treated with injectable vitamin E and those not vaccinated with Presponse had the lowest gains from days 1 to 14. During days 14 to 28, calves injected with vitamin E compensated for low gains, and overall (28 days) daily gain was similar regardless of vitamin E injection. Although not statistically significant, calves vaccinated with Presponse had about 12% faster gains than non-vaccinated calves. Dry matter intake and feed-to-gain ratio did not differ among treatments.

A Presponse by vitamin E interaction was noted for morbidity (Table 2). Percentage of calves treated for BRD was least ($P < .05$) for calves that were vaccinated with Presponse, but not injected with vitamin E. Injection of Presponse-vaccinated calves with 2,000 IU of vitamin E increased number of calves treated to a level equal to that of calves that were not vaccinated. Within non-vaccinated calves, injectable vitamin E had little effect on morbidity. The number of medical treatments per sick calf did not differ among treatments, nor did the number of calves that died (four calves total).

Under the conditions of our experiment, vaccination with Presponse reduced the number of calves treated for BRD, if the calves were not injected with 2,000 IU of vitamin E. Our results do not suggest positive benefits for injectable vitamin E in terms of calf performance or morbidity. Research in Oklahoma (Hays et al., 1987) demonstrated a tendency for increased morbidity and increased ($P < .07$) sick days in newly received calves injected with 3,000 IU of d,l alpha tocopherol. Further experiments will be required to fully define effects of P. haemolytica vaccines and injectable vitamin E in newly received beef cattle.

References

Hays, V. S., D. R. Gill, R. A. Smith and R. L. Ball. 1987. Animal Sci. Res. Rep. pp 198-201. Oklahoma Agric. Exp. Sta., MP-119.

Table 1. Performance of newly received calves in response to vaccination with Presponse and(or) injection with vitamin E

	Treatment[a]				
	Presponse		Vitamin E		
Item	0	+	0	+	SE[b]
No. of calves	56	59	58	57	
Initial BW, lb	384.9	375.7	380.3	380.3	2.2
28-d BW, lb	427.5	425.1	426.8	425.8	5.9
Daily gain, lb					
d 0 to 14	.26	.61	.73	.14	.28
d 14 to 28	2.78	2.92	2.57	3.13	.24
d 0 to 28	1.60	1.79	1.71	1.69	.19
Daily DM intake, lb/steer					
d 0 to 14					
Hay	2.34	2.15	2.33	2.15	.11
Concentrate	3.79	4.23	3.91	4.11	.22
Hay + concentrate	6.13	6.37	6.25	6.26	.23
d 14 to 28	10.74	11.10	11.07	10.77	.37
d 0 to 28	8.44	8.74	8.66	8.52	.29
Feed-to-gain					
d 0 to 28	5.35	5.32	5.53	5.14	.60

[a]Presponse 0 = no vaccination; Presponse + = vaccination with a P. haemolytica toxoid; Vitamin E 0 = no injectable vitamin E; Vitamin E + = 2,000 IU of Rocavit E (intramuscular injection).

[b]Standard error of main-effect means, n = six pens per treatment.

Table 2. Morbidity and mortality of newly received calves in response to vaccination with Presponse and(or) injection with vitamin E

	Treatment[a]			
	Pre 0/Vit E 0	Pre 0/Vit E +	Pre +/Vit E 0	Pre +/Vit E +
No. of calves	30	29	30	30
Calves treated for BRD, %[b]	50.0[c]	44.8[c]	13.3[d]	40.0[c]
Treatments per sick calf	2.0	2.5	2.5	1.9
Mortality, %	6.7	3.4	0	3.3

[a]Pre 0/Vit E 0 = no vaccination and no vitamin E; Pre 0/ Vit E + = no vaccination and 2,000 IU injectable vitamin E; Pre +/Vit E 0 = vaccination with a P. haemolytica toxoid and no vitamin E; Pre +/Vit E + = vaccination with a P. haemolytica toxoid and injection with 2,000 IU of vitamin E.

[b]BRD = bovine respiratory disease.

[c,d]Row means that do not have common superscripts differ ($P < .05$).