Effect of Initial Respiratory Viral Vaccination Treatment on Feedlot Performance, Health, and Carcass Characteristics of Auction-Market Derived Light-Weight Feeder Steers[1]

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Summary

Ten replicates of three thousand one hundred forty-seven head of light-weight, auction-market derived steers were utilized to compare the effects of initial viral vaccination product at feedyard arrival on the performance, health, and economic return in a commercial feedlot production setting. The three viral vaccination products which were compared were A) PYRAMID 5, B) Bovi-Shield GOLD 5, and C) Bovi-Shield GOLD IBR-BVD. The PYRAMID 5 cattle had 3.6% improved feed conversion (P = 0.09) relative to the Bovi-Shield GOLD treatments. No differences in carcass traits were noted (P > 0.10). The PYRAMID 5 cattle had 11% lower incidence (P = 0.03) of BRD-first pulls than the Bovi-Shield GOLD 5 cattle and tended (P = 0.14) to have a lower incidence of BRD-first pulls than the Bovi-Shield GOLD IBR-BVD cattle. Additionally, the PYRAMID 5 cattle had 22% (P = 0.02) and 19% (P = 0.04) lower relapse incidence than the Bovi-Shield GOLD 5 and Bovi-Shield GOLD IBR-BVD cattle, respectively, and tended to have lower mortality than the other treatments. The PYRAMID 5 cattle had $8.81/hd (P = 0.002) and $7.56/hd (P = 0.008) lower combined treatment and railer costs than the Bovi-Shield GOLD 5 and Bovi-Shield GOLD IBR-BVD treatments. Altogether, the PYRAMID 5 cattle tended (P = 0.15) to have overall lower combined treatment, railer, and mortality costs than the Bovi-Shield GOLD 5 and Bovi-Shield GOLD IBR-BVD treatments by $15.48/hd and $15.62/hd, respectively.

Introduction

Many respiratory viral vaccines are available for the prevention of Bovine Respiratory Disease (BRD). Each vaccine has unique characteristics such as antigen content, virus strains, and adjuvant. The purpose of this study was to compare the effects of three initial respiratory viral vaccines on performance, health, and carcass quality of light-weight, auction-market derived steers fed in a commercial feedlot setting.

Materials and Methods

Cattle

Ten blocks of light-weight steers totaling three thousand one hundred forty-seven head were utilized to evaluate the effects of initial respiratory viral vaccine on performance, health, and carcass characteristics of light-weight, auction-market derived feedlot steers. Cattle were purchased and delivered to Kuner Feedlot (Kersey, CO) from September 22 to October 31, 2005. To qualify for inclusion into the trial, the groups had to have purchase weights between 500 and 650 lbs and had to be derived via an auction market. The cattle were English and Continental crosses, and they originated from auction markets in Colorado, Idaho, Nebraska, Oregon, South Dakota, Utah, and Wyoming. Cattle which met the qualifications were assigned to the trial and were randomized to one of the three treatments

(PYRAMID 5[5], Bovi-Shield GOLD 5[6], or Bovi-Shield GOLD IBR-BVD[7]) until each replicate was completed. As a result, each pen within replicate had similar backgrounds, ages, and average arrival weights. Across all pens, average inweights ranged from 512 to 609 lbs.

Processing

Upon arrival, cattle remained separated by truckload and source and were placed in receiving pens. Hay and water were provided *ad libitum,* and steers were generally processed within 36 hours of arrival. Prior to initial processing, cattle were weighed as a group by treatment on a ground-scale. Gender was assessed, and calves that were found to be bulls were individually-weighed and castration was delayed until the health status was more optimal. Castration was performed via banding when possible, whereas calves requiring surgical castration were left intact. Clostridium C & D and Tetanus were administered to those bull calves which were banded. Efforts were made to equalize the number of bulls across replicates and treatments during the initial processing. A total of 55 bulls were placed on to the trial (PYRAMID 5: 21 bulls; Bovi-Shield GOLD 5: 18 bulls; Bovi-Shield GOLD IBR-BVD: 16 bulls). At initial processing, cattle were administered the following items:

- Serially-numbered lot ear tag,
- A color-coded ear tag corresponding to the replicate. The date the cattle were processed was written on this tag,
- Respective trial vaccine (PYRAMID 5, Bovi-Shield GOLD 5, or Bovi-Shield GOLD IBR-BVD; 2 mL; intramuscular; left neck)
- PRESPONSE SQ[8] (2 mL; subcutaneous; right neck),
- Micotil[9] (1.5 mL/100 lbs; subcutaneous; right neck), and
- Promectin[10] (1 mL/220 lbs; subcutaneous; left neck).

Replicate #2 was withdrawn from the trial due to the potential of a defective syringe administering the anthelmintic for one of the three pens within the replicate. Consequently, an additional replicate (#11) was added to the trial to ensure that a total of ten blocks was utilized.

Steers were implanted with a SYNOVEX C[11] at approximately 45 days on feed, and calves received a Component TE-S[12] as their terminal implant at approximately 107 days on feed (range 76-126 days). All replicates were given Titanium 3[13] as a revaccination, and all replicates were revaccinated at the same time as the terminal implant. However, three of the replicates (9, 10, and 11) were also revaccinated prior to receiving their terminal implant due to an early increase in morbidity and mortality.

An ear notch was collected for all animals that died or that were classified as railers. Ear-notch samples were tested for persistently-infected (PI) BVD via immunohistochemistry.

Treatment Assignment

Vaccine treatment and pen assignments were predetermined by randomly drawing treatment group order out of a hat. The first treatment group selected was assigned the lowest lot and pen number. Allotment to the treatment group occurred within each truckload or source. All truckload lots required to fill a block were received at approximately the same time (maximum of a seven-day duration). Within a truckload lot, calves were of similar age, background, health status, weight, and breed type. Randomization of animals to processing group occurred by means of a 3 x 3 x 3 alley sort, which provided for animals to be penned by treatment (10 pens/treatment).

All cattle within replicate were placed in adjacent pens, and the same pen rider(s) was used across treatments to minimize health biases. Pen riders and animal health technicians were blinded to treatment. Cattle were given approximately 200 ft^2/hd and 12 inches of bunk space/hd.

Feed

Cattle were fed two times daily, and diet and bunk management strategies were similar for all pens within a replicate. Feed amounts were recorded for each pen on a daily basis, and dry matter content of the ration was analyzed weekly. Rumensin[14] and Tylan[15] were fed for the entire feeding period, and Optaflexx[16] was fed approximately for the last 28 days of the feeding period for all pens within replicates 3, 5, 7, 10, and 11.

Marketing and Economics

Pens within each replicate were marketed at constant days-on-feed according to visual appraisal and intake patterns routinely used by the feedyard. Pens within each replicate were managed similarly regarding procedures for final weighing, shipment, and slaughter; shipment order (pens within replicate) was randomized. All steers were harvested at the Swift plant in Greeley, CO, from May 12 to June 21, 2006, and routine pen-carcass data were attained for all pens.

All economic data were standardized to common market conditions: $54/cwt live railer salvage value price, $110/cwt equivalent feeder price with a $5/cwt slide, and current medicine costs. Treatment costs were calculated based on current actual medicine costs. Railer cost was determined as the net loss of a realized animal after the net proceeds were calculated by taking the salvage value of the railed animal minus the initial cost. The salvage value of the animal was calculated as $54/cwt multiplied by the average inweight and the percent of animals that were railed; the initial cost was calculated using a

standardized market value of $110/cwt with a $5/cwt slide to a 750-lb equivalent weight multiplied by the percentage of each treatment that was railed. Dead costs were calculated as the value of the animal at arrival using a standardized market value of $110/cwt with a $5/cwt slide to a 750-lb equivalent weight multiplied by the percentage of each treatment that died.

Statistical Analyses

All performance data (i.e. continuous variables) were analyzed using PROC MIXED procedure of SAS as a randomized complete block design with pen as the experimental unit. All categorical data such as morbidity, mortality, and carcass parameters were analyzed using PROC GLIMMIX procedure of SAS as a randomized complete block design with pen as the experimental unit. For all analyses, replicate and treatment were included in the model as class variables. Treatment was considered as a fixed effect, and replicate was considered a random effect.

Results and Discussion

Performance, carcass, health, and economic data are presented in tables 1, 2, 3, and 4, respectively. Cumulative incidence of BRD-related first pulls and BRD-related mortality are shown in charts 1 and 2, respectively. Initial weight did not differ among treatments and averaged 583 lbs across all treatments. Cattle were fed for an average of 234 days. No differences in final weight were detected ($P > 0.10$) when analyzed either on a carcass-weight basis or a live-weight basis. Additionally, dry matter intake and average daily gain did not differ ($P > 0.10$) among treatments. On a deads-in carcass-weight basis, the PYRAMID 5 cattle had 3.6% improved feed conversion ($P = 0.09$) relative to the average of the Bovi-Shield GOLD treatments. No differences in carcass traits were noted ($P > 0.10$).

Looking at health parameters, the temperature at first pull did not differ among treatments ($P > 0.10$) and averaged 105.0°F for all three treatments. It must also be noted that necrotic tracheitis was clinically diagnosed in the necropsies of 21 animals (PYRAMID 5: 6 head; Bovi-Shield GOLD 5: 7 head, and Bovi-Shield GOLD IBR-BVD: 8 head) indicative of an IBR challenge, and five were confirmed positive via fluorescent antibody staining and virus isolation. These deads occurred between d 71 and 101 and seem to correspond with the second elevation in incidence of BRD-related first pulls and BRD-related mortality as observed in charts 1 and 2.

There were no differences in non-BRD pull incidence ($P = 0.30$). The PYRAMID 5 cattle had 11% lower incidence ($P = 0.03$) of BRD-first pulls than the Bovi-Shield GOLD 5 cattle and tended ($P = 0.14$) to have a lower incidence of BRD-first pulls than the Bovi-Shield GOLD IBR-BVD cattle. Additionally, the PYRAMID 5 cattle had 22% ($P = 0.02$) and 19% ($P = 0.04$) lower relapse incidence than the Bovi-Shield GOLD 5 and Bovi-Shield GOLD IBR-BVD cattle, respectively. Although no statistical differences were detected ($P > 0.10$) for mortality among treatments, the PYRAMID 5 cattle had the lowest numerical BRD-death loss incidence (3.08%) relative to the Bovi-Shield GOLD 5 treatment (3.95%) and the Bovi-Shield GOLD IBR-BVD cattle (4.31%). Moreover, the PYRAMID 5 cattle had 70% ($P < 0.10$) lower BRD railer incidence than the Bovi-Shield GOLD treatments.

Of all the railers and mortalities, only four animals tested positive for persistently-infected BVD. Three of the animals were realized whereas one animal died (PYRAMID 5: 1 PI animal; Bovi-Shield GOLD 5: 1 animal; Bovi-Shield GOLD IBR-BVD: 2 animals).

When looking at the economic consequences associated with the BRD treatment, railer, and mortality costs, the PYRAMID 5 cattle had significantly lower treatment costs than the Bovi-Shield GOLD 5 ($P = 0.008$) and the Bovi-Shield GOLD IBR-BVD ($P = 0.04$) cattle by $3.79/hd and $2.79/hd, respectively. Similarly, the PYRAMID 5 cattle had significantly lower railer costs than the Bovi-Shield GOLD 5 ($P = 0.02$) and the Bovi-Shield GOLD IBR-BVD ($P = 0.03$) cattle by $5.02/hd and $4.77/hd, respectively. Combined, the PYRAMID 5 cattle had $8.81/hd ($P = 0.002$) and $7.56/hd ($P = 0.008$) lower combined treatment and railer costs than the Bovi-Shield GOLD 5 and Bovi-Shield GOLD IBR-BVD treatments. Although not significant ($P > 0.10$), mortality costs associated with the PYRAMID 5 cattle were numerically lower than the Bovi-Shield GOLD 5 and Bovi-Shield GOLD IBR-BVD treatments by $6.68/hd and $8.07/hd, respectively. Altogether, the PYRAMID 5 cattle tended ($P = 0.15$) to have overall lower combined treatment, railer, and mortality costs by $15.48/hd and $15.62/hd, respectively.

Implications

Although PYRAMID 5 and Bovi-Shield GOLD 5 are designed to cover the same viruses (IBR, BVD Type I and II, PI_3, BRSV), in this trial with light-weight steer calves, there were no differences between Bovi-Shield GOLD 5 and Bovi-Shield GOLD IBR-BVD in terms of performance, health, and economic benefits. Moreover, the PYRAMID 5 vaccine had lower morbidity and hence treatment and railer costs than the Bovi-Shield GOLD vaccines.

Table 1. Effects of viral vaccine on live performance. (LS Means).

Item	PYRAMID 5	Bovi-Shield GOLD 5	Bovi-Shield GOLD IBR-BVD	SE	P-Value
Pens, n	10	10	10		
Head-in, n	1,047	1,050	1,050		
Head-out, n	982	964	956		
Initial weight[c], lb	583	581	584	7.65	0.64
Final weight, lb					
Live-weight basis[d], lb	1289	1286	1291	12.85	0.69
Carcass-weight basis[f], lb	1287	1277	1287	5.89	0.19
Days on Feed	234	234	234	0.00	1.00
DMI, lb/d	15.7	15.6	15.7	0.14	0.56
Average Daily Gain[g], lb					
Live-weight basis[e], lb	2.83	2.76	2.74	0.05	0.20
Carcass-weight basis[f], lb	2.82	2.73	2.73	0.05	0.15
Feed:Gain[g],					
Live-weight basis[e]	5.54[a]	5.66[ab]	5.76[b]	0.10	0.09
Carcass-weight basis[f]	5.56[a]	5.74[b]	5.79[b]	0.10	0.09

[a,b] Means in the same row with different superscripts differ (P < 0.10).
[c] Weight at feedyard.
[d] Shrunk (4%) weight at feedyard of cattle that were harvested.
[e] Based on unshrunk initial weights and shrunk final weights.
[f] Adjusted to 64.0% dressing percent.
[g] Deads-in.

Table 2. Effects of viral vaccine on carcass traits. (LS Means).

Item	PYRAMID 5	Bovi-Shield GOLD 5	Bovi-Shield GOLD IBR-BVD	SE	P-Value
Hot carcass weight, lb	823	817	824	7.9	0.19
Dressing Percent[a], %	63.88	63.57	63.80	0.19	0.14
Prime, %	0.35	0.35	0.36		1.00
Choice, %	40.84	37.77	41.22		0.27
Standard, %	3.93	5.42	4.74		0.30
Commercial, %	0.10	0.31	0.21		0.63
Yield Grade 1, %	6.61	6.91	7.19		0.88
Yield Grade 2, %	39.80	40.25	41.60		0.71
Yield Grade 4, %	8.09	6.47	7.46		0.40
Yield Grade 5, %	0.61	0.83	0.83		0.81

[a] Based on shrunk final weight at feedyard.

Table 3. Effects of viral vaccine on health parameters. (LS Means).

Item	PYRAMID 5	Bovi-Shield GOLD 5	Bovi-Shield GOLD IBR-BVD	SE	P-Value
Temperature at first pull, °F	105.0	105.0	105.0	0.05	0.65
First Pull-BRD cause[c], %	40.83[a]	45.83[b]	44.17[ab]		0.09
Relapse[d], %	14.92[a]	19.09[b]	18.53[b]		0.04
Treats-Non-BRD cause, %	2.76	3.67	2.57		0.30
Mortality-BRD causes, %	3.08	3.95	4.31		0.31
Mortality-All causes, %	4.51	5.88	6.34		0.19
Railer-BRD causes, %	0.47[a]	1.59[b]	1.59[b]		0.06
Railer-All causes, %	1.50	2.16	2.34		0.37

[a,b] Means in the same row with different superscripts differ (P < 0.10).
[c] Cattle that were pulled and treated for the first time for BRD-related diagnosis.
[d] Cattle that were pulled and treated again regardless of location after already being treated for BRD-related ailments. An animal that relapsed more than one time was only counted once.

Table 4. Effects of viral vaccine on economic parameters[c]. (LS Means).

Item	PYRAMID 5	Bovi-Shield GOLD 5	Bovi-Shield GOLD IBR-BVD	SE	P-Value
Treatment Costs[d], $/hd	$8.09[a]	$11.88[b]	$10.88[b]	1.88	0.02
Railer Costs[e], $/hd	$2.25[a]	$7.27[b]	$7.02[b]	1.52	0.03
Treatment + Railer Costs, $/hd	$10.34[a]	$19.15[b]	$17.90[b]	2.52	0.005
Mortality Costs[f], $/hd	$23.56	$30.24	$31.63	6.46	0.52
All Costs, $/hd	$33.91	$49.39	$49.53	8.15	0.15

[a,b] Means in the same row with different superscripts differ (P < 0.10).
[c] All costs associated with initial BRD ailments, and all values are calculated as a per-head basis across the entire lot.
[d] Only includes medicine costs and does not include a chute charge.
[e] Calculated as the net cost from the initial animal cost minus the potential salvage value multiplied by the percent that were railed.
[f] Calculated as the initial cost of the animals multiplied by the percent that died.

Chart 1. Cumulative BRD-Related First Pull Incidence.

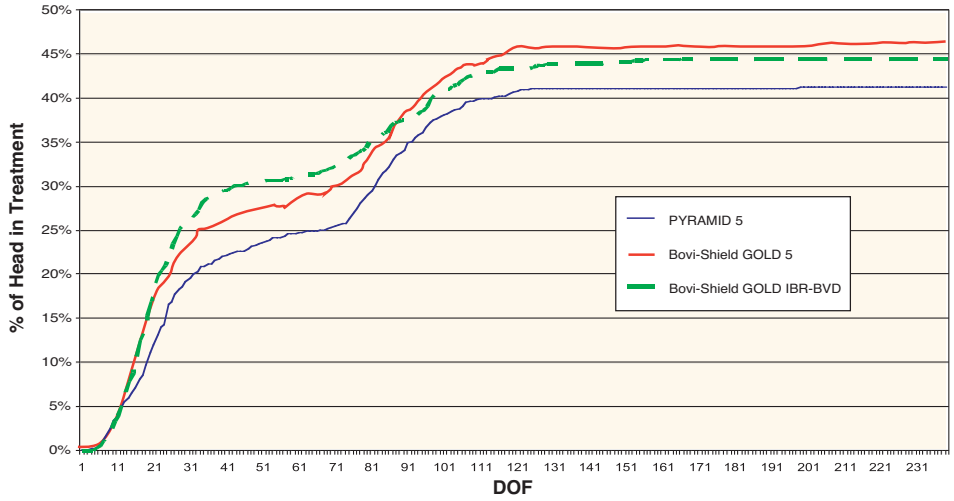
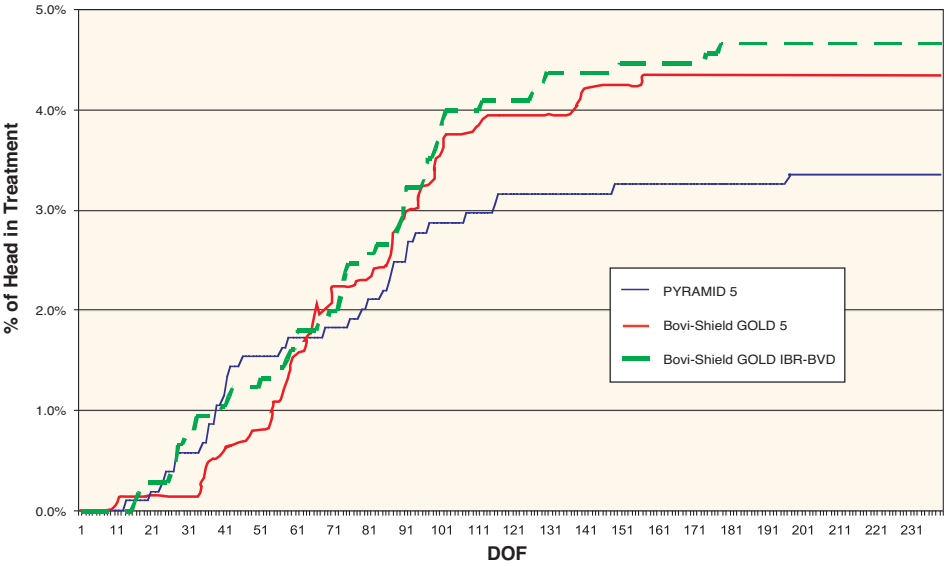


Chart 2. Cumulative BRD-Mortality Incidence.



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[6] Bovine Rhinotracheitis (IBR)-Virus Diarrhea (BVD I & II)-Respiratory Syncytial Virus (BRSV)-Parainfluenza-3 (PI_3) Vaccine, Pfizer Animal Health, New York, NY.
[7] Bovine Rhinotracheitis (IBR)-Virus Diarrhea (BVD I & II) Vaccine, Pfizer Animal Health, New York, NY.
[8] Pasteurella haemolytica vaccine, Fort Dodge Animal Health, Overland Park, KS.
[9] Tilmicosin, Elanco Animal Health, Greenfield, IN.
[10] Ivermectin, Phoenix Scientific, Inc., St. Joseph, MO.
[11] 100 mg progesterone and 10 mg estradiol benzoate, Fort Dodge Animal Health, Overland Park, KS.
[12] 120 mg trenbolone acetate and 24 mg estradiol, VetLife, West Des Moines, IA.
[13] Bovine Rhinotracheitis (IBR)-Virus Diarrhea (BVD I & II) Vaccine, Agrilabs, St. Joseph, MO.
[14] Monensin, Elanco Animal Health, Greenfield, IN.
[15] Tylosin, Elanco Animal Health, Greenfield, IN.
[16] Ractopamine, Elanco Animal Health, Greenfield, IN.