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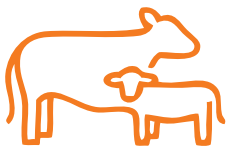
TECHNICAL BULLETIN

June 2014



Large-Pen Feedlot Study: Comparison of BOVATEC®+AUREOMYCIN® vs Rumensin®+Tylan® Starter/Finisher Programs

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BOVATEC® and AUREOMYCIN® in starter and transition rations helped improve gain and intake.

Summary

- An extensive feedlot study examined the performance of yearling steers fed BOVATEC® (lasalocid) in combination with AUREOMYCIN® (chlortetracycline; 350 mg/hd/day) compared to animals fed Rumensin® (monensin) and Tylan® (tylosin).[1]
  - Two treatment groups each comprised of over 960 newly arrived yearlings were evaluated during a 172-day feeding period at a commercial feedlot in Colorado.
- The BOVATEC+AUREOMYCIN program helped improve ($P \leq 0.01$) average daily gain by 4.9% and feed intake by 5.1% during the first 60 days compared to Rumensin+Tylan.
- Rumensin+Tylan produced a 1.6% improvement ($P \leq 0.04$) in feed/gain over the entire study, while the BOVATEC+AUREOMYCIN program improved overall feed intake by 2.4% ($P = 0.03$).
- Study outcomes suggest that BOVATEC+AUREOMYCIN should be considered for inclusion in starter and transition rations for yearling cattle entering the feedlot, while Rumensin+Tylan may be better suited for use in finisher diets.

Most US feedyards routinely feed rations that include ionophore and antimicrobial supplements. These critical productivity tools provide a safe and convenient strategy for improving feedlot performance and limiting disease threats, thereby reducing production costs and helping boost profit potential.

BOVATEC® (lasalocid) and AUREOMYCIN® (chlortetracycline; CTC) and are two widely used feed supplements from Zoetis that beef cattle producers have used for many years to improve health and performance of feedlot cattle. BOVATEC is an ionophore that has demonstrated efficacy both as an anticoccidial as well as a performance enhancer, improving feed efficiency and the rate of gain when fed at 30 g/ton to provide 250 to 360 mg/hd/day.

AUREOMYCIN is approved for feeding to beef cattle at a dose rate of 350 mg CTC/hd/day for the control of bacterial pneumonia (*Pasteurella* spp). AUREOMYCIN may also be fed at a therapeutic dose of 10 mg CTC/lb of body weight/day for up to 5 consecutive days for treatment of bacterial pneumonia

caused by *P. multocida* and bacterial enteritis caused by *Escherichia coli.*

Few (if any) large pen studies have been conducted where the feed additive combination of BOVATEC and AUREOMYCIN was directly compared with a competitive standard program using the ionophore Rumensin® (monensin) and the antimicrobial Tylan® (tylosin) in feedlot cattle. The majority of previous research comparing feed additive programs was conducted in small-pen environments, and the feed management and diet formulations for feedlot cattle are significantly different today than when the earlier work was completed. Thus, contemporary large-pen studies comparing these regimens are of great interest to many feedlot managers and nutritionists.

Most combination feeding of BOVATEC® and AUREOMYCIN® in feedlots is currently during the starting period, not the finishing period.

Most current feedlot use of BOVATEC+ AUREOMYCIN occurs during the starting period, not during the finishing period when Rumensin+Tylan is typically employed, often in combination with Zilmax® (zilpaterol) repartitioning agent in the final days before harvest. A large-pen study was conducted by Zoetis researchers to evaluate the performance impacts of increasing the window of BOVATEC+AUREOMYCIN feeding to encompass most of the finishing period.[1]

Experiment Design

The study involved 1925 cross-bred yearling beef steers (773 lb) received in October through March at a commercial feedlot in Colorado after transport from local ranch and auction market sources. The study was conducted as a randomized complete block design with 'pen' as the experimental unit (2 treatments × 10 replications/blocks = 20 pens; average 96 head/pen). Cattle were blocked by arrival date, with 2 steers at a time randomly allotted to a pen within a block. After allotment, each pen was weighed and the average weight was used as the initial weight.

Both treatment groups received Zilmax® (with Rumensin®+Tylan®) for 20 days shortly before harvest.

Cattle were processed according to normal feedlot procedures immediately after allotment and weighing (study day 0). Initial processing included vaccinations (BOVI-SHIELD GOLD® 5,® ULTRABAC® 7), parasite control (DECTOMAX® 1% Injectable; VALBAZEN® Suspension; DURASECT® II or equivalent), application of uniquely numbered ear tags, and implantation with SYNOVEX® C.

Ten pens of cattle were randomly assigned to each of 2 treatment groups which received the following feeding regimens beginning on study day 0 (Figure 1).

- **Treatment 1: BOVATEC+AUREOMYCIN (B+A)**
  - BOVATEC+AUREOMYCIN 28-day starter diet (BOVATEC 30 g/ton at 90% DM basis, AUREOMYCIN 350 mg/h/d);
  - transitioned to BOVATEC+AUREOMYCIN finisher diet (BOVATEC ≤ 360 mg/h/d, AUREOMYCIN 350 mg/h/d);
  - 23 days before expected harvest, single-day transition to Rumensin+ Tylan+Zilmax finisher diet (Rumensin 20 g/ton, Tylan 8 g/ton, Zilmax 6.8 g/ton at 90% DM basis);
  - 3 days before harvest, single-day transition back to BOVATEC+ AUREOMYCIN finisher withdrawal ration (BOVATEC ≤ 360 mg/h/d, AUREOMYCIN 350 mg/h/d).

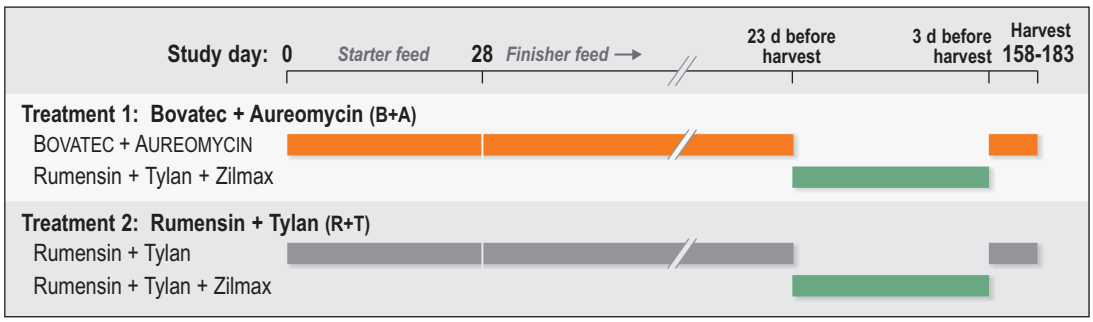

Figure 1 – Summary of treatment groups.

- **Treatment 2: Rumensin+Tylan (R+T)**
  - Rumensin+Tylan 28-day starter diet (Rumensin 15 g/ton, Tylan 8 g/ton at 90% DM basis);
  - transitioned to Rumensin+Tylan finisher diet (Rumensin step-up to 30 g/ton, Tylan 8 g/ton at 90% DM basis);
  - 23 days before expected harvest, transitioned to Rumensin+Tylan+Zilmax finisher diet (Rumensin 30 g/ton, Tylan 8 g/ton, Zilmax 6.8 g/ton at 90% DM basis);
  - 3 days before harvest, transitioned back to Rumensin+Tylan finisher withdrawal ration (Rumensin 30 g/ton, Tylan 8 g/ton at 90% DM basis).

Compositions of the various starting and finishing diets are detailed in Appendix 1.

On study day 60, cattle were re-processed with administration of respiratory viral vaccine (BOVI-SHIELD GOLD® IBR-BVD) and fly control (DURASECT® II or equivalent), and animals received their terminal implant (Revalor®-200). Pen body weights were recorded to determine pen interim gain and feed conversion (feed/gain) performance.

Cattle were observed daily for signs of illness. Husbandry practices (hospital pulls, treatments, recoveries; buller and railer management) were similar for all pens. Steers removed from the study (deads and railers) were documented (date removed, dead weight, railer weight, reason for removal). Feed for removed steers was accounted for, prorated, and assigned to the appropriate pens. Pen riders and any other personnel making observations were blinded to treatment throughout the study. Feeder staff were aware of treatments, but neither steers nor pens were identified by treatment group.

Complete pens of cattle were harvested at an average of 172 days on feed (range 158-183). Weight gain, dry matter (DM) intake, and feed efficiency were calculated on an actual and a carcass-adjusted basis, including and excluding animals that either died or were rejected/removed during the course of the study. A 4% pencil shrink was applied to final pen weights for calculation of performance parameters (with exception of removals-in calculations). Carcass data obtained by pen from the packing plants included hot carcass weights, dressing percentage, and percentage of quality and yield grades.

Collected data were statistically analyzed by appropriate standard methods. Probabilities (P) ≤ 0.05 were considered significant. The study was conducted in accordance with the Zoetis Institutional Animal Care and Use Committee.

Results

Day 0 to 60

BOVATEC®+ AUREOMYCIN® improved ADG and intake during the first 60 days on feed.

Performance results for the first 60 days of the feeding period are summarized in Table 1 and Figure 2 (see Appendix 2 for details on animals removed from the study). Compared to the R+T program, the B+A feeding regimen generated significant

Table 1 – Yearling steer performance, day 0 to 60.

Item	Treatment		SEM[1]	*P*
	Bovatec+ Aureomycin	Rumensin+ Tylan		
Pens (n)	10	10		
Initial head count (n)	962	963		
Removals by day 60 (n)	9	11		
Day 60 head count (n)	953	952		
Initial body weight (lb) [2,3]	772	773	20	0.73
Day 60 body weight (lb) [3]				
Removals out [2]	1042	1032	21	0.31
Removals in [4]	1041	1029	61/63[5]	
Weight gain (lb)				
Removals out [2]	270	259	7	0.21
Removals in [4]	269	256	22/16[5]	
ADG (lb) [2]				
Removals out	4.49	4.30	0.11	0.21
Removals in	4.48	4.27	0.11	0.01
DM intake (lb/day) [2]				
Avg. daily feed intake	20.35	19.36	0.36	0.0003
Feed/Gain [2,6]				
Removals out	4.52	4.49		0.70
Removals in	4.53	4.52		0.88

[1] Standard error of mean, n = 10
[2] Least squares means
[3] Non-shrunk weight
[4] Arithmetic means
[5] Standard deviation per respective treatment group
[6] *P* value based on gain/feed analysis

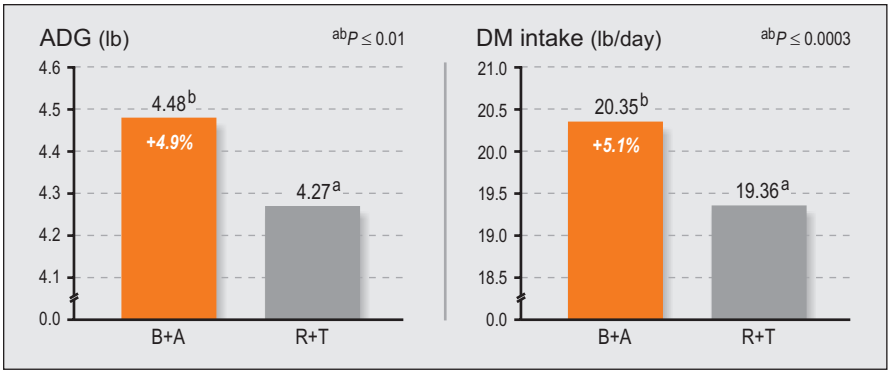

Figure 2 – Performance benefits of BOVATEC+AUREOMYCIN vs Rumensin+Tylan during the first 60 days on feed.

($P \leq 0.01$) improvements in average daily DM intake and removals-in average daily gain (ADG). Steers fed B+A demonstrated 4.9% better ADG compared to cattle fed R+T, and feed consumption improved 5.1% vs R+T.

Table 2 – Yearling steer performance, day 0 to harvest.

Item	Treatment		SEM[1]	*P*
	Bovatec+ Aureomycin	Rumensin+ Tylan		
Pens (n)	10	10		
Initial head count (n)	962	963		
Removals by harvest (n)	31	29		
Harvest head count (n)	931	934		
Initial body weight (lb) [2,3]	772	773	20	0.73
Harvest body weight (lb) [3]				
Removals out [2]	1333	1330	25	0.89
Removals in [4]	1380	1376	28/39[5]	
Carcass adjusted [2]	1333	1330	26	0.92
Weight gain (lb)				
Removals out [2]	561	557	15	0.85
Removals in [4]	608	602	42/46[5]	
Carcass adjusted [2]	561	557	15	0.87
ADG (lb) [2]				
Removals out	3.25	3.23	0.09	0.85
Removals in	3.57	3.54	0.07	0.41
Carcass adjusted [2]	3.25	3.23	0.09	0.87
DM intake (lb/day) [2]				
Avg. daily feed intake	20.30	19.82	0.34	0.03
Feed/Gain [2,6]				
Removals out	6.23	6.13		0.04
Removals in	5.68	5.59		0.03
Carcass adjusted [2]	6.24	6.13		0.08

[1] Standard error of mean, n = 10
[2] Least squares means
[3] Non-shrunk weight
[4] Arithmetic means
[5] Standard deviation per respective treatment group
[6] *P* value based on gain/feed analysis

Day 0 to harvest

Overall performance results for the entire feeding period are summarized in Table 2, and Appendix 3 offers details on animals removed from the study. Mortality rates were modest in both groups (<2.5%) and did not statistically differ between treatments.

No differences ($P > 0.05$) in overall live weights, total gains, or ADG were detected between treatment groups. However, average daily DM intake over the entire study was improved 2.4% ($P = 0.03$) in the B+A group compared to the R+T group. Feed/gain was improved 1.6% ($P \leq 0.04$) for steers fed the R+T program.

Carcass characteristics

Table 3 reports results of carcass evaluations at processing. The dietary treatments did not generate any significant differences ($P > 0.05$) in hot carcass weight, dressing percent, or quality and yield grades. However, the percentage of yield-grade 2 carcasses trended ($P = 0.07$) higher in the R+T group compared to B+A.

Implications

Study outcomes suggest that BOVATEC (30 g/ton, 90% DM basis) and AUREOMYCIN (350 mg/h/d) should be considered for inclusion in starter and transition rations for yearling feedlot cattle. Steers fed A+B generated 4.9% greater ADG with 5.1% increased feed intake in the first 60 days on feed compared to a Rumensin step-up program plus Tylan. This outcome was not unexpected given the historical experience of initially reduced intake of Rumensin-supplemented rations.[2]

Because the R+T program produced a 1.6% improvement in feed/gain over the entire feeding period vs B+A, Rumensin at 30 g/ton (90% DM basis) plus Tylan may be better suited for use in finisher diets than B+A.

Table 3 – Carcass characteristics at processing.

Item	Treatment		SEM[1]	*P*
	Bovatec+ Aureomycin	Rumensin+ Tylan		
Number of carcasses	931	934		
Hot carcass weight (lb) [2]	870	868	7	0.70
Dressing percent (%) [2]	65.27	65.31	0.22	0.70
USDA quality grades (%) [3]				
Prime + Choice	59.43	57.64		0.61
Prime	0.83	0.65		0.63
Choice	58.42	56.84		0.65
Select	39.12	41.13		0.58
No roll	1.37	1.05		0.54
Cutter	0.09	0.18		0.58
USDA yield grades (%) [3]				
Yield grade 1	22.64	21.40		0.61
Yield grade 2	40.60	45.15		0.07
Yield grade 3	26.11	22.99		0.17
Yield grade 4	5.27	4.62		0.49
Yield grade 5	0.19	0.44		0.16

[1] Standard error of mean
[2] Least squares means
[3] Back-transformed least squares means

Conclusions

Results of this study support combination feeding of BOVATEC and AUREOMYCIN in starter and transition rations for yearling feedlot cattle. Feeding protocols that include BOVATEC and AUREOMYCIN represent valuable tools that can help optimize the early performance of feedlot cattle.

BOVATEC®+ AUREOMYCIN® should be considered for inclusion in starter and transition rations for feedlot cattle.

Appendix 1 – Composition of starting and finishing diets.

Ingredients	Percent of diet (100% DM basis)[1]				
	Starter	Finisher-1	Finisher-2	Zilmax-1	Zilmax-2
Flaked corn (%)	38.18	75.32	77.07	72.44	74.21
Ground alfalfa hay (%)	38.43	2.63	7.67	2.65	7.72
Silage, corn, sorghum (%)	7.48	6.99		7.04	
Wet distillers grain (%)	9.82	6.89	7.04	6.94	7.09
Yellow grease (%)		3.01	3.02	3.03	3.04
Starter suspension supplement (%)	6.08				
Finisher suspension supplement (%)		5.15	5.19	5.18	5.23
Zilmax liquid supplement (%)				2.71	2.70
Micro-ingredients (%)	0.01	0.01	0.01	0.01	0.01
Total	100.00	100.00	100.00	100.00	100.00
Nutrients (100% DM basis)					
CP (%)	15.02	13.03	13.07	13.15	13.20
NE_m (%)	83.26	103.77	103.42	103.68	103.33
NE_g (%)	53.84	72.19	71.84	71.91	71.58

[1] Multiple finisher diets utilized after depletion of silage inventory. Average 22 days to finisher diet.

Appendix 2 – Steers removed from study, day 0 to 60.

	Bovatec+ Aureomycin	Rumensin+ Tylan
Initial head count (n)	962	963
Removals (n)	9	11
Day 60 head count (n)	953	952
Mortalities (n)	**7**	**6**
Bloat	2	3
Arthritis-cripple	1	
Brisket-congestive heart failure	1	
Bronchopneumonia	1	
Chronic pneumonia - *Mycoplasma*		1
Enteritis - cocci	1	
Facility musculoskeletal injury	1	
Infectious bovine rhinotracheitis		1
Peritonitis		1
Other removals (n)	**2**	**5**
Buller		2
Chronic	2	1
Cripple		2

Appendix 3 – Steers removed from study, day 0 to harvest.

	Bovatec+ Aureomycin	Rumensin+ Tylan
Initial head count (n)	962	963
Removals (n)	31	29
Harvest head count (n)	931	934
Mortalities (n)	**26**	**16**
Abscess/cellulitis		2
Bloat/overload	7	7
Arthritis-cripple	4	
Brisket-congestive heart failure	1	1
Bronchopneumonia	2	
Chronic pneumonia - *Mycoplasma*		1
Enteritis - cocci	1	
Facility musculoskeletal injury	6	
Infectious bovine rhinotracheitis		1
Peritonitis		1
Undiagnosed	5	3
Mortality %[1] (SE[2])	2.41 (0.68)	1.47 (0.48)
Other removals (n)	**5**	**13**
Buller	1	6
Cripple	2	6
Morbid	1	1
Respiratory	1	

[1] Back-transformed least squares means [2] Standard error

AUREOMYCIN IMPORTANT SAFETY INFORMATION: Do not use AUREOMYCIN in calves to be processed for veal.

BOVATEC IMPORTANT SAFETY INFORMATION: Do not use BOVATEC in calves to be processed for veal. Do not allow horses or other equines access to feeds containing lasalocid, as ingestion may be fatal. Feeding undiluted or mixing errors resulting in excessive concentrations of lasalocid could be fatal to cattle and sheep.

DECTOMAX INJECTABLE IMPORTANT SAFETY INFORMATION: DECTOMAX Injectable has a 35-day pre-slaughter withdrawal period. Do not use in female dairy cattle 20 months of age or older. Do not use in calves to be processed for veal. DECTOMAX has been developed specifically for cattle and swine. Use in dogs may result in fatalities.

SYNOVEX C IMPORTANT SAFETY INFORMATION: Do not use SYNOVEX products in veal calves. Refer to label for complete directions for use, precautions, and warnings.

VALBAZEN IMPORTANT SAFETY INFORMATION: Cattle must not be slaughtered within 27 days after the last treatment with VALBAZEN. Do not use in female dairy cattle of breeding age. Do not administer to female cattle during the first 45 days of pregnancy or for 45 days after removal of bulls.

References

1. Data on file, Study Report No. A131R-US-12-106, Zoetis Inc.
2. National Research Council. Nutrient requirements of beef cattle, 7th revised edition. National Academy Press, Washington DC, 1996.

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