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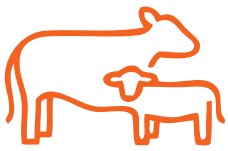

Pooled Statistical Analysis of 7 Feedlot Studies Comparing the Performance of Steers Fed CATTLYST®+AUREOMYCIN® vs Rumensin®+Tylan®

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CATTLYST® and AUREOMYCIN® in feedlot rations helped improve steer finishing performance compared to Rumensin®+Tylan®, with no adverse impacts on liver abscesses or digestive mortality.

Summary

- A pooled statistical analysis of 7 feedlot studies examined the performance of steers fed finishing rations formulated with CATTLYST® (laidlomycin) in combination with AUREOMYCIN® (chlortetracycline; 350 mg/hd/day, plus 10 mg/lb BW pulses in 2 studies) compared to animals fed Rumensin® (monensin) and Tylan® (tylosin).[1-7]
  - The analysis involved 69 pens/treatment group (representing 10,526 beef steers) compiled from individual studies conducted between 2008 and 2010 at commercial feedlots in Colorado, Idaho, Nebraska, Oklahoma, and Texas.
- Steers fed CATTLYST+AUREOMYCIN generated significant ($P \leq 0.02$) improvements in final weight (11.4 lb/head), ADG (2.1%), feed intake (2.8%), and hot carcass weight (1%, 8.7 lb), with equivalent feed/gain ($P \geq 0.14$) compared to cattle fed Rumensin+Tylan.
- No differences ($P \geq 0.17$) were observed between treatments in the incidence or severity of liver abscesses or the incidence of digestive or total mortality.
- Feeding protocols that include CATTLYST and AUREOMYCIN represent valuable tools that can help optimize the performance of feedlot cattle.

The inclusion of ionophores in rations for feedlot cattle is a standard performance-enhancing management tool that has been used for decades. Rumensin® (monensin, an ionophore; Elanco) and Tylan® (tylosin, an antibacterial; Elanco) represent the traditional feeding program intended to improve feed efficiency and control liver abscesses in feedlot cattle. The availability of alternative feed additive programs, however, may allow feedyard nutritionists, veterinarians, and managers greater flexibility for improving health, elevating performance, and overcoming economic challenges. CATTLYST® (laidlomycin) and AUREOMYCIN® (chlortetracycline; CTC) represent alternative medicated feed additives from Zoetis that should be considered.

CATTLYST is a potent second-generation ionophore developed specifically for use in high-energy rations with *no step-up* requirement (excellent palatability and full dose from day one). CATTLYST is available as a granular Type A Medicated Article (CATTLYST 50G) containing 50 g laidlomycin/lb, approved for improved feed efficiency and increased rate of weight gain

CATTLYST® is a potent second-generation ionophore developed specifically for use in high-energy rations with no step-up requirement.

in feedlot cattle when fed at 5 to 10 g/ton (30 to 150 mg/head/day). CATTLYST is also approved for feeding in combination with AUREOMYCIN, the reliable broad-spectrum antibacterial approved for feeding to beef cattle at a dose rate of 350 mg CTC/head/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 ('pulse') for treatment of bacterial pneumonia caused by *P. multocida* and bacterial enteritis caused by *Escherichia coli.* Like Rumensin, CATTLYST requires no pre-slaughter withdrawal.

A series of 7 feedlot studies investigated the use of CATTLYST in combination with AUREOMYCIN for enhancing cattle performance and maintaining high health status compared to the traditional Rumensin+Tylan program.[1-7]

Experiment Design

Data (pen means) compiled from 7 individual feedlot finishing studies involving 10,526 beef steers were pooled for statistical analysis by an independent university PhD nutritionist. The individual studies were conducted by Zoetis researchers between 2008 and 2010 at commercial feedlots in Colorado, Idaho, Nebraska, Oklahoma, and the Texas panhandle region (Table 1).

The studies employed similar randomized block designs with 'pen' as the experimental unit. A total of 138 pens were utilized across all 7 studies. At each site, pens of cattle were randomly allotted by block to 2 treatment groups:

- **Rumensin+Tylan (n=69 pens)**
  - Rumensin fed at either 28, 33, or 33.3 g monensin/ton dry matter (DM), or 340 or 350 mg/head/day;
  - Tylan fed at 9 g tylosin/ton DM (providing 90 mg/hd/day).
- **CATTLYST+AUREOMYCIN (n=69 pens)**
  - CATTLYST fed at 11 g laidlomycin/ton DM (providing 110-150 mg/hd/day);
  - AUREOMYCIN fed to provide 350 mg chlortetracycline/head/day (plus 10 mg/lb BW pulses in 2 studies).

Mean body weights (BW) of beef steers at study initiation across all studies ranged from 623 to 852 lb, and pen capacities ranged from 10 to 135 head/pen (Table 1). Compositions of the various finishing diets are detailed by site in Appendix 1.

Data extracted from the various study results included live and carcass-adjusted feedlot performance, as assessed by initial

Table 1 – Description of 7 finishing studies conducted at commercial feedlots.

Study	Location	Year	Initial weight (lb)	Pen capacity (head)	Pens per treatment	Treatments
A[1]	Northeast Colorado	2008	704	10	16	• CATTLYST 11.0 g/ton DM + AUREOMYCIN 350 mg/hd/day[a] • Rumensin 28 g/ton DM + Tylan 90 mg/head/day
B[2]	Northeast Colorado	2008	850	100	6	• CATTLYST 11.0 g/ton DM + AUREOMYCIN 350 mg/hd/day • Rumensin 28 g/ton DM + Tylan 90 mg/head/day
C[3]	Idaho	2009	623	100	8	• CATTLYST 11.0 g/ton DM + AUREOMYCIN 350 mg/hd/day[b] • Rumensin 350 mg/hd/day + Tylan 90 mg/head/day
D[4]	Texas panhandle	2010	774	81-132	12	• CATTLYST 11.0 g/ton DM + AUREOMYCIN 350 mg/hd/day • Rumensin 33 g/ton DM + Tylan 9 g/ton DM
E[5]	Oklahoma	2010	849	135	15	• CATTLYST 11.0 g/ton DM + AUREOMYCIN 350 mg/hd/day • Rumensin 33 g/ton DM + Tylan 9 g/ton DM
F[6]	Nebraska	2010	852	73	6	• CATTLYST 110 mg/hd/day + AUREOMYCIN 350 mg/hd/day • Rumensin 340 mg/hd/day + Tylan 90 mg/head/day
G[7]	Northeast Colorado	2010	785	60	6	• CATTLYST 11.0 g/ton DM + AUREOMYCIN 350 mg/hd/day • Rumensin 33.3 g/ton DM + Tylan 9 g/ton DM

[a] Plus AUREOMYCIN 10 mg/lb BW, 5-day pulses during receiving period
[b] Plus AUREOMYCIN 10 mg/lb BW, days 0-4, 6-10, 12-16, and 5-day pulse each 30 days

and final BW, average daily gain (ADG), DM intake, and feed efficiency (feed/gain), calculated on both a deads-out and deads-in basis. Additional data of interest included carcass characteristics at market, incidence of digestive mortality (bloat), and liver abscess scores.

Data were compiled and analyzed using the MIXED procedure of SAS (v. 9.3, Cary, NC) for continuous variables, and the NPAR1WAY and GLM procedures of SAS for percentage variables. Percentage variables were converted to ranks using the Wilcoxon Rank Sum Correlation. The Satterthwaite Method was used to determine the appropriate error degrees of freedom for each individual variable evaluated. Probabilities (P) ≤ 0.05 were considered significant. Because not all relevant parameters were measured in all studies, the number of experimental units (pens) varied among individual variables of interest.

Results

Performance

Performance results for the 7-study pooled analysis are summarized in Table 2 and Figure 1. Though average initial body weight was similar between treatment groups (P = 0.76), final live deads-out BW was significantly heavier in the CATTLYST+AUREOMYCIN group by 11.4 lb/head (P = 0.01) compared to the Rumensin+Tylan group. This benefit was further reflected by a 2.1% significant improvement (P < 0.01) in ADG for the CATTLYST+AUREOMYCIN group (0.8 lb). On a carcass-adjusted/deads-out basis, these significant advantages for CATTLYST+AUREOMYCIN were even greater (14.9 lb heavier final BW, 0.09 greater ADG, $P \leq 0.03$). Similar favorable growth responses for CATTLYST+AUREOMYCIN steers were detected for deads-in calculations.

The superior growth rate observed for the CATTLYST+AUREOMYCIN group was likely due to the significant 0.62 lb/head (2.8%, P < 0.01) improvement in daily DM intake. Feed efficiency was similar ($P \geq 0.14$) between treatment groups regardless of how outcomes were calculated.

Table 2 – Summary of steer performance (live and carcass-adjusted performance, deads-out and deads-in basis).[a]

Item	Pens/ treatment (n)	Treatment		SEM[b]	*P* value
		Rumensin+ Tylan	CATTLYST+ AUREOMYCIN		
Initial body weight (lb)	69	777.8	776.6	3.83	0.76
Final body weight (lb)					
Live, deads out	69	1404.6	1416.0	4.48	0.01
Live, deads in	38	1388.9	1404.2	4.70	<0.01
Carcass adjusted, deads out	54	1397.6	1412.5	6.48	0.03
Carcass adjusted, deads in	38	1383.2	1400.8	5.42	<0.01
ADG (lb)					
Live, deads out	69	3.89	3.97	0.025	<0.01
Live, deads in	53	3.78	3.89	0.022	<0.01
Carcass adjusted, deads out	54	3.91	4.00	0.038	0.01
Carcass adjusted, deads in	38	3.78	3.92	0.037	<0.01
DM intake (lb/day)					
Live, deads out	69	21.87	22.49	0.198	<0.01
Feed/Gain					
Live, deads out	69	5.74	5.81	0.047	0.14
Live, deads in	53	5.96	5.93	0.053	0.49
Carcass adjusted, deads out	54	5.76	5.82	0.066	0.37
Carcass adjusted, deads in	38	6.04	5.95	0.075	0.25

[a] Least squares means [b] Standard error of mean

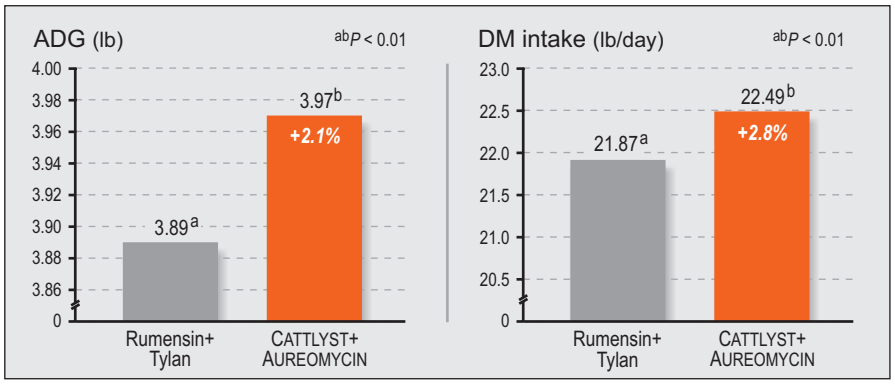

Figure 1 – Overall live performance benefits of CATTLYST+AUREOMYCIN vs Rumensin+Tylan across 7 pooled finishing studies (deads-out basis).

Table 3 – Summary of carcass characteristics.[a]

Item	Pens/ treatment (n)	Treatment		SEM[b]	*P* value
		Rumensin+ Tylan	CATTLYST+ AUREOMYCIN		
Hot carcass weight (lb)	57	878.8	887.5	3.56	0.02
Dressing percentage (%)	69	63.55	63.69	0.109	0.22
Back fat (in)	49	0.50	0.49	0.008	0.64
Ribeye area (in^2)	48	14.31	14.43	0.083	0.16
Marbling score[c]	49	405	406	4.2	0.85
Yield grade, calculated	48	2.88	2.84	0.035	0.31
Yield grade, USDA	28	2.69	2.67	0.061	0.84
Quality grade, USDA	22	2.49	2.48	0.049	0.83
USDA quality grades (%)					
Prime+Choice	61	49.5	51.2	2.25	0.38
Select	61	47.4	45	2.30	0.27
No roll	61	2.8	3.5	0.67	0.79
USDA yield grades (%)					
Yield grade 1+2	61	49.8	49.7	2.0	0.88
Yield grade 3	61	39.8	39.5	2.0	0.48
Yield grade 4+5	61	10.7	11.0	1.2	0.34

[a] Least squares means
[b] Standard error of mean
[c] Marbling score: 300=slight; 400=small; 500=modest

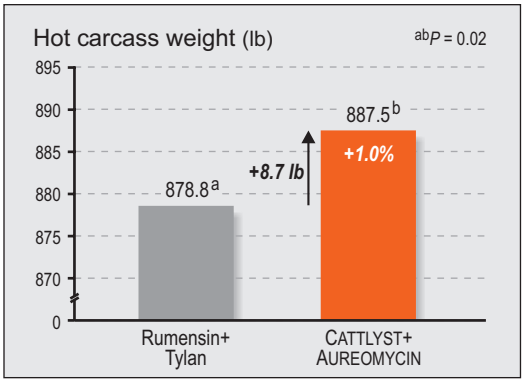

Figure 2 – Hot carcass weight of CATTLYST+ AUREOMYCIN vs Rumensin+Tylan.

Carcass characteristics

Table 3 reports results of carcass evaluations at processing. Notably, steers fed CATTLYST+AUREOMYCIN generated significantly ($P = 0.02$) heavier hot carcass weights than animals finished on Rumensin+Tylan. As noted in Figure 2, an average benefit of 8.7 lb/head (1.0%) was realized for the CATTLYST+AUREOMYCIN group. No significant differences ($P \geq 0.16$) between dietary treatments were observed for any other carcass parameters, including dressing percent or quality/yield grades.

Table 4 – Mortality and prevalence of liver abscesses.[a]

Item	Pens/ treatment (n)	Treatment		SEM[b]	*P* value
		Rumensin+ Tylan	CATTLYST+ AUREOMYCIN		
Digestive mortality (%)	18	0.37	0.48	0.156	0.72
Total mortality (%)	39	0.78	0.57	0.222	0.43
Total liver abscesses (%)	49	13.4	14.8	1.3	0.17
Liver abscess scores (%)[c]					
0	49	85.6	85.0	1.30	0.20
1+2	37	11.7	12.0	1.20	0.66
3	49	2.7	3.0	0.59	0.84

[a] Least squares means
[b] Standard error of mean
[c] Liver abscess scores: 0=no active or healed abscess present; 1=1-2 abscesses or scars of previously active abscesses ≤ 4 cm in diameter; 2=3-4 active abscesses ≤ 4 cm in diameter; 3=1 or more abscesses > 4 cm in diameter, or > 4 abscesses > 2 cm in diameter.

Mortality / Abscesses

The rate of digestive mortality (as well as overall mortality for any cause) was similar for the dietary treatment groups ($P = 0.72$, Table 4). In addition, no differences between groups were detected in either the total percent of animals with liver abscesses ($P = 0.17$) or cattle with severe liver abscesses ($P = 0.84$).

Implications

Study outcomes suggest that CATTLYST and AUREOMYCIN should be considered as alternatives to Rumensin+Tylan for inclusion in finishing rations for feedlot cattle. Steers fed CATTLYST+AUREOMYCIN generated 2.1% greater ADG, 2.8% increased feed intake, and 1% heavier hot carcass weights, all with equivalent feed/gain as cattle fed Rumensin+Tylan.

The greater feed intake observed for the CATTLYST+ AUREOMYCIN group apparently led to greater carcass weight accumulation at equal days on feed through slaughter. Furthermore, the greater feed intake by CATTLYST+AUREOMYCIN steers did *not* increase the incidence of digestive mortality (similar low rate between groups). Thus, only positive consequences resulted from the increased feed intake demonstrated by CATTLYST+AUREOMYCIN steers across these 7 studies. Compared to Rumensin+Tylan, CATTLYST+AUREOMYCIN allowed feedlot managers to optimize finishing performance during the feeding period.

Also noteworthy was the similarity of liver abscess incidence and severity between treatment groups. These outcomes suggest that Tylan did not provide any advantage over AUREOMYCIN in regard to liver abscesses control, further supporting the rationale for using CATTLYST+AUREOMYCIN as an alternative to Rumensin+Tylan for finishing feedlot cattle.

Conclusions

This pooled analysis comparing CATTLYST+ AUREOMYCIN to Rumensin+Tylan included data from 7 individual feedlot studies conducted in 5 states, utilizing 69 pens/ treatment and 10,526 steers. Outcomes revealed that feeding CATTLYST+AUREO MYCIN resulted in greater feed intake, daily gain, final weight, and hot carcass weight, with no differences between treatments in the incidence or severity of liver abscesses or the incidence of digestive or total mortality.

Feeding protocols that include CATTLYST and AUREOMYCIN represent valuable tools that can help optimize the performance of feedlot cattle. Study results support combination feeding of CATTLYST and AUREOMYCIN in finishing rations for feedlot cattle as an alternative to Rumensin+Tylan.

Study results support combination feeding of CATTLYST® and AUREOMYCIN® as an alternative to Rumensin®+Tylan®.

Do not allow horses or other equines access to feeds containing CATTLYST. Do not use in animals intended for breeding.

Do not use AUREOMYCIN in calves to be processed for veal.

Appendix 1 – Ingredient composition of finishing diets for 7 studies included in the pooled analysis (percentage, DM basis).

Ingredients	Study (year, state)						
	A (2008 CO)	B (2008 CO)	C (2009 ID)	D (2010 TX)	E (2010 OK)[a]	F (2010 NE)	G (2010 CO)
Steam-flaked corn	41-77	59.2	—	55.3		—	59.2
Dry-rolled corn	—	—	28	—		24	—
Dry-rolled wheat	—	—	25	—		—	—
High-moisture corn	—	—	—	—		30	—
Wet distiller's grains with solubles	0-45	25	—	—		35	25
Wet corn gluten feed/ distiller's dried grains blend	—	—	—	20		—	—
Distiller's dried grains	—	—	11	—		—	—
Corn cob silage	—	—	20	—		—	—
Alfalfa hay	5.9	8.1	—	—		6.5	8.1
Corn silage	2.0-2.1	—	—	20		—	—
Whey	—	—	3	—		—	—
Alfalfa-grass hay	—	—	1.9	—		—	—
Wheat straw	—	—	1.9	—		—	—
Animal fat	0.4-3.9	2.5	2.8	1.2		—	2.5
Supplement	7.2-12.9	5.3	5.5	2		4.5	5.3
Nutrients							
DM	49.2-76.0	60.0	69.0	66.4		64.1	60.0
NE_m (Mcal/lb)	0.95-1.01	0.98	—	0.987		—	0.98
NE_g (Mcal/lb)	0.63-0.67	0.66	—	0.676		—	0.66
CP	14-21	16.8	13.8	13.63	13.5	—	16.8
NPN	2.82	2.8	2.5	2.39	3.5	—	2.8
Ether extract	7.0	7.5	6.9	5.98		—	7.5
NDF	4.2-16.9	22.1	14.3	16.7		—	22.1

[a] Confidential, not disclosed

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2. Data on file, Study Report No. MC021-08-LOA13, Zoetis LLC.
3. Data on file, Study Report No. MC032-09-LOAUMO, Zoetis LLC.
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5. Data on file, Study Report No. MC031-09-LOAUMO, Zoetis LLC.
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