



PorkFACTS™

AN UPDATE OF RECENT SWINE RESEARCH

An Evaluation of BMD® plus Aureomycin® vs Tylan® or Lincomix® for Control of Challenge-Induced Swine Ileitis

► SUMMARY

BMD plus Aureomycin, Tylan, or Lincomix were fed to pigs challenged with *Lawsonia intracellularis* organisms. The pigs were then evaluated for performance and clinical signs of disease. Blood and fecal samples were collected at the start and end of the study. At necropsy, gross intestinal lesions were evaluated and measured, and tissue samples collected for immunohistochemistry and histopathology.

In general, performance improvements and disease control provided by the BMD+Aureomycin treatment regimen were better than or equal to those obtained with the Tylan or Lincomix treatments. Compared to the BMD+Aureomycin program, Tylan treatment cost an extra \$0.05/pig and Lincomix treatment cost an extra \$0.20/pig; yet the results obtained with these higher-cost products were often inferior to those observed with BMD+Aureomycin.

► RATIONALE

- Porcine proliferative enteropathy (PPE), also known as ileitis, is an enteric disease of growing and finishing pigs characterized by a thickening of the mucosa of primarily the small intestine. The disease is clinically manifested by inappetance, diarrhea, poor performance, and mortality.
- The causative agent is an obligate intracellular bacterium, *Lawsonia intracellularis*. Pathognomonic lesions consist of proliferative immature crypt cells in the intestinal epithelium and the presence of free-floating bacteria in the apical cytoplasm.
- Several feedgrade antimicrobials are approved for ileitis treatment and/or control. The combination of BMD® (bacitracin disalicylate) at 30 g/ton plus Aureomycin® (chlortetracycline) at 10 mg/lb body weight is approved for control of PPE (ileitis) caused by *L. intracellularis* (feed for up to 14 days).

**BMD plus
Aureomycin
provides excellent
and economical
control of ileitis
superior to Tylan
or Lincomix.**

BMD plus Aureomycin is approved for ileitis control when fed for 14 days.

High-health pigs free of other enteric or respiratory diseases were challenged with ileitis pathogens.

▶ RATIONALE (CONT.)

- Other approved agents include: 1) Tylan® (tylosin) 100 g/ton, for prevention and/or control of PPE (ileitis) associated with *L. intracellularis* (feed for 3 weeks); 2) Lincomix® (lincomycin) 40 and 100 g/ton, for control of PPE (ileitis) caused by *L. intracellularis* (feed for 3 weeks or until signs of disease disappear).
- A study was conducted to compare the efficacy of BMD+Aureomycin to Tylan or Lincomix for the control of induced ileitis in young pigs.¹

▶ EXPERIMENT DESIGN

- The 25-day study involved 160 commercial crossbred pigs of mixed gender approximately 5 weeks of age (average 26.8 lb). Pigs were purchased from a “high-health” Isowean system free of apparent enteric and respiratory diseases.
- Pigs were blocked by weight and randomly allotted to 4 treatment groups, with 8 pens (replicates) per treatment and 5 pigs per pen. Treatments included:
 - nonmedicated control (18.5% crude protein basal diet);
 - Tylan 100 g/ton fed for 21 days (days -3 through 17) followed by Tylan 40 g/ton for the remaining 4 or 5 days;
 - Lincomix 100 g/ton fed for 21 days (days -3 through 17) followed by Lincomix 40 g/ton for the remaining 4 or 5 days;
 - BMD 30 g/ton plus Aureomycin 10 mg/lb body weight (500 g/ton) fed for 14 days, (days -3 through 10), followed by BMD 30 g/ton for the remaining 11 or 12 days.
- Treatments were administered according to label directions starting 3 days prior to challenge.
- On day 0, all pigs were orally challenged with 50 mL of a mucosal homogenate challenge material containing approximately 4.4×10^8 *L. intracellularis* organisms.
- All pigs were clinically evaluated 3 times per week by an investigator blinded to the treatments. Pigs were individually weighed on days -3, 10, 17, and 21 or 22, and feed weighback was conducted at the same times for determination of feed consumption.
- Blood and fecal samples were collected from 2 pigs/per pen at the start and end of the study. Half of the surviving pigs were humanely euthanized and necropsied on each of days 21 and 22 (the large number of pigs required splitting the necropsy days).
- Parameters assessed included average daily gain (ADG), average daily feed intake (ADFI), feed/gain (F/G), abdominal appearance score, pig attitude score, severity of diarrhea score, PPE intestinal lesion score (0=normal to 3=edema, hyperemia, gross mucosal thickening), PPE lesion length, and mortality. Immunohistochemistry (IHC) was conducted on ileal samples, and serology and fecal PCR analyses were performed.
- Data were statistically analyzed using the general linear model procedure of SAS by a statistician blinded to the treatments.

RESULTS

MORTALITY

- A total of 9 pigs died or were humanely euthanized during the study. Six pigs (15%) of nonmedicated pigs died from ileitis and 3 pigs (1 Tylan pig and 2 Lincomix pigs) died from unrelated causes (Figure 1).
- No pigs from the BMD+Aureomycin group died or required euthanization during the study.
- All medications prevented PPE-related mortality.

All 3 medication programs prevented death losses caused by ileitis.

PERFORMANCE

- ADG was significantly ($P < 0.05$) improved in all 3 medicated treatment groups compared to nonmedicated controls (Figure 2).
- ADG for the BMD+Aureomycin group was 26% and 22% better than the Tylan and Lincomix groups, respectively.
- Pigs fed BMD+Aureomycin consumed significantly more feed than the nonmedicated control and Tylan groups (Figure 3).
- All 3 medicated treatment groups significantly improved F/G compared to the nonmedicated controls (Figure 4).

The BMD plus Aureomycin program improved ADG and ADFI compared to Tylan or Lincomix.

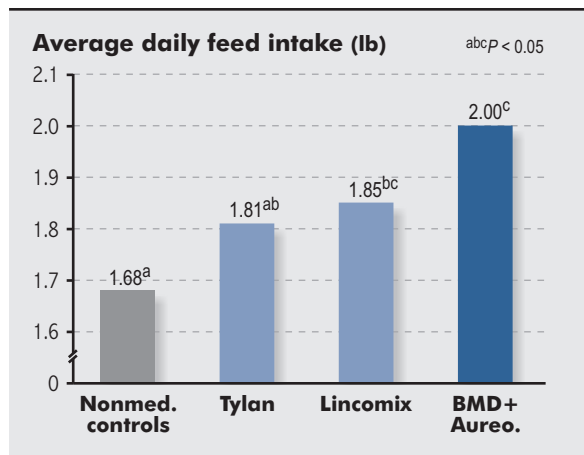


FIGURE 3: Average daily feed intake of ileitis-challenged pigs fed 3 different medications or nonmedicated.

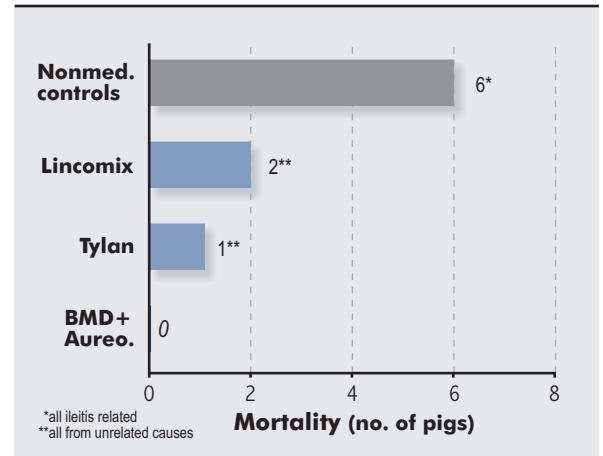


FIGURE 1: Mortality rate of ileitis-challenged pigs fed 3 different medications or nonmedicated.

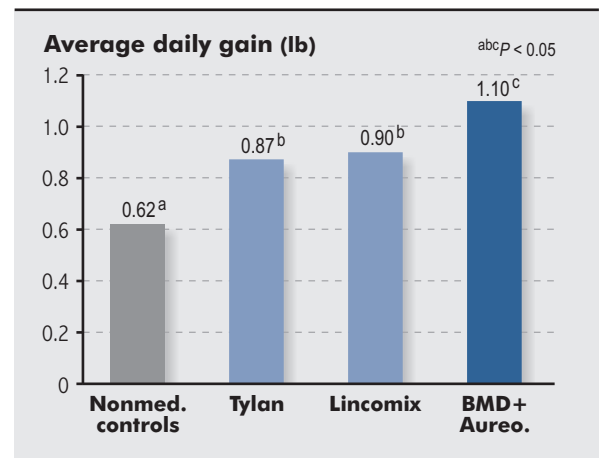


FIGURE 2: Average daily gain of ileitis-challenged pigs fed 3 different medications or nonmedicated.

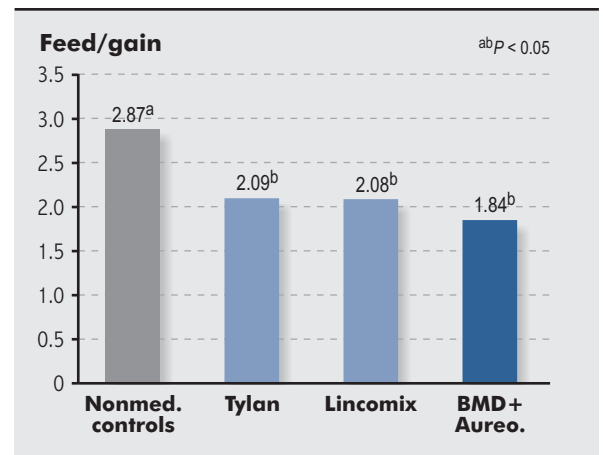


FIGURE 4: Feed/gain of ileitis-challenged pigs fed 3 different medications or nonmedicated.

▶ RESULTS (CONT.)

CLINICAL EVALUATIONS

- All 3 medications significantly ($P < 0.05$) reduced the signs of clinical ileitis (attitude, abdominal appearance, severity of diarrhea) compared to the nonmedicated control pigs.
- The BMD+Aureomycin group had significantly lower abdominal appearance and diarrhea scores than the Tylan group.

All three treatments reduced signs of clinical disease and gut pathology.

LESION SCORES AND LESION LENGTH

- All 3 medicated treatments significantly ($P < 0.05$) improved jejunum lesion scores compared to the nonmedicated controls, and Tylan significantly lowered ileum lesion scores.
- The percentage of pigs with ileal/jejunum scores \geq grade 2 (edema, hyperemia, reticulated serosa and mucosa) was approximately 55% for the nonmedicated controls vs 33% for the medicated treatments.
- All 3 medicated treatments also significantly reduced average jejunum lesion length compared to the nonmedicated controls (but not average ileal lesion length).
- Medicated treatments reduced the total length of lesions in the jejunum and ileum by more than 60% and 20%, respectively.
- Cecum and colon lesions were minimal in all groups.

DIAGNOSTIC EVALUATIONS

- Medicated treatments did not significantly ($P > 0.05$) affect the incidence of pigs that seroconverted, though the BMD+Aureomycin group had significantly ($P < 0.05$) fewer seropositive pigs than the Tylan or Lincomix groups.
- Similarly, medicated treatments did not significantly affect the incidence of IHC-positive pigs compared to nonmedicated controls, though the Tylan group had significantly fewer IHC-positive pigs than the BMD+Aureomycin group.
- Histopathology results indicated that the time-course of *Lawsonia* infection was somewhat delayed by BMD+Aureomycin compared to the other treatments, thus likely delaying seroconversion and also accounting for the relatively higher incidence of IHC-positive pigs in the BMD+Aureomycin group.
- Both the BMD+Aureomycin and Tylan treatments significantly reduced the incidence of fecal shedding compared to nonmedicated controls.

The BMD plus Aureomycin group had fewer seropositive pigs than the Tylan or Lincomix groups.

▶ RESULTS (CONT.)

ECONOMICS

- A partial economic analysis was conducted on trial data (cost assumptions: Tylan \$0.13/g, Lincomix \$0.20/g, BMD \$0.06/g, and Aureomycin \$0.025/g).
- The BMD+Aureomycin treatment program saved \$0.05/pig and \$0.20/pig compared to the Tylan and Lincomix programs, respectively, during the 25-day study (Figure 5).
- In addition, Aureomycin administration at 10 mg/lb body weight also provides control of bacterial pneumonia (*Pasteurella multocida*), a significant value-added advantage for the BMD+Aureomycin treatment program.

Aureomycin also provides pneumonia control, a value-added advantage for the BMD+ Aureomycin program.

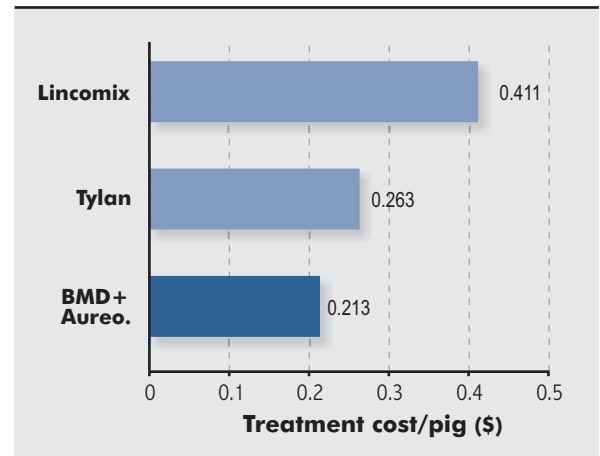


FIGURE 5: Treatment cost/pig of ileitis-challenged pigs fed 3 different medications.

▶ CONCLUSIONS

Results from this study demonstrated the excellent efficacy of a BMD+Aureomycin treatment program for ileitis control. Pigs challenged with *L. intracellularis* and fed BMD+Aureomycin generated the greatest improvements in ADG, ADFI, and F/G compared to challenged pigs fed Tylan or Lincomix. All 3 treatments prevented PPE-related mortality, significantly reduced signs of clinical ileitis, and reduced the incidence and severity of intestinal lesions. While none of the treatments significantly affected seroconversion or the incidence of IHC-positive pigs, pigs medicated with BMD+Aureomycin or Tylan had significantly reduced fecal shedding of *L. intracellularis* organisms. Compared to the BMD+Aureomycin program, Tylan treatment cost an extra \$0.05/pig and Lincomix treatment cost an extra \$0.20/pig; yet performance and disease control results obtained with these higher-cost products were often inferior to those provided by BMD+Aureomycin.

The BMD plus Aureomycin program cost less than Tylan or Lincomix but provided better disease control.

REFERENCES

1. Winkelman N, Gebhart C, Wolff T, Skinner J. An evaluation of BMD® plus Aureomycin® chlortetracycline (CTC), Tylan® or Lincomix® for control of challenge-induced porcine proliferative enteropathy (PPE or ileitis) in swine. *Proc Am Assoc Swine Vet* 2003; 175-179.