Evaluating alternatives to zinc oxide and antibiotics in nursery pig diets

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Introduction

- Carbadox and ZnO are used therapeutically to control swine dysentery and post-weaning diarrhea associated with *E. coli.* These two products are used to improve growth and feed efficiency.
- Disadvantages of these two products include antimicrobial resistance with carbadox and Zn accumulation in the soil with high concentrated use of ZnO.
- Medium chain fatty acids (MCFA) could be a solution to these concerns.

Objective

The objective of this study was to test the results of medium chain fatty acids on growth and feed efficiency in weanling pigs when compared to carbadox and ZnO.

Experimental Procedures

- **Preparatory:** This 35 day study was conducted using 360 weanling pigs (DNA 200×400; 5.4±0.07 kg BW; 21 days old) to evaluate the effects of substituting (MCFA) for carbadox and ZnO.
- **Design structure:** Pig were allotted to pens in a completely randomized design with 6 pigs to a pen and 10 pens per treatment. The experimental unit was the individual pens.
  - This experiment was conducted in three individual phases: Phase 1 was conducted from day 0 to day 7, Phase 2 from day 7 to 19 and Phase 3 from day 19 to 35.
- **Date collection:** At each phase change pigs and feeders were individually weighed to record ADG, ADGI, and the F:G ratio.
  - Treatment diets were fed for 19 days, then pigs were changed to a common diet from day 19 to 35.
- **Data was analyzed using:** Statistical Analysis System (SAS version 9.4 Cary, NC)

Figure 1: Highlighted Phase operations

Phase 1
- Allot pigs to pens, add medicated feed, record data
- Pigs become adjusted to the new location and are fed a pelleted mix to increase consumption

Phase 2
- Weigh pigs and medicated feeders, record data
- Pigs feed changes from pellets to meal

Phase 3
- Weigh pigs and feeders, record data
- Treatment diets were removed and pigs were fed a common corn based diet

Experimental Diets

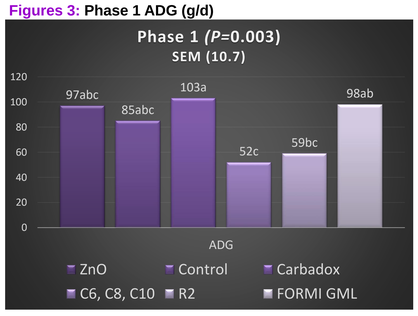
ZnO	• 3,000 ppm Phase 1 • 1,500 ppm Phase 2
Negative Control	• No additives
Carbadox	• 50 g/ton • Mecadox
C6, C8, C10	• 1% Sigma blend • PMI Nutritional Products
Start R2	• 1% • Feed Energy Corp., Des Moines, IA
FORMI GML	• 1% • ADDCON, Bitterfeld-Wolfen, Germany

Figure 2: Treatment Feed Diets

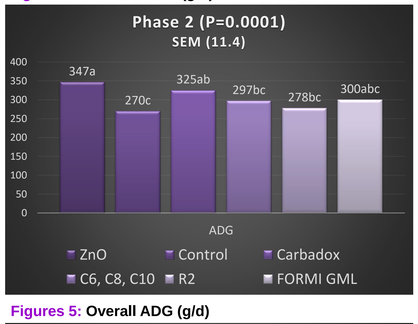
Results

(P<0.05)

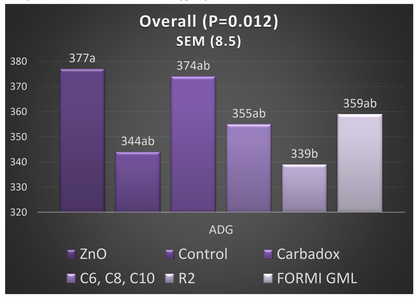
Figures 3: Phase 1 ADG (g/d)



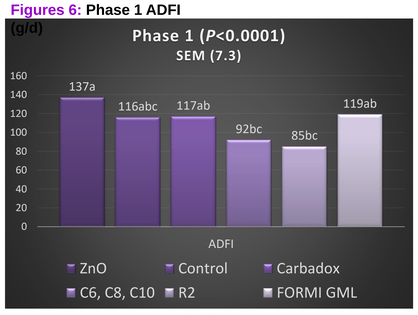
Figures 4: Phase 2 ADG (g/d)



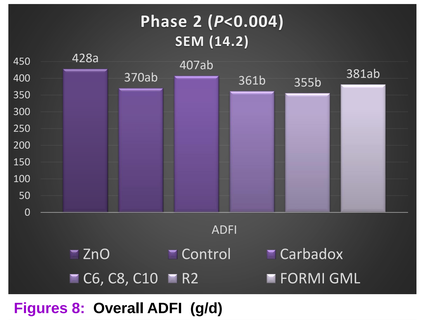
Figures 5: Overall ADG (g/d)



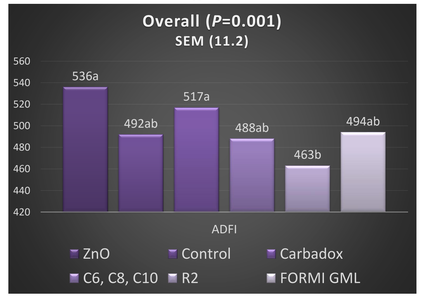
Figures 6: Phase 1 ADFI (g/d)



Figures 7: Phase 1 ADFI (g/d)



Figures 8: Overall ADFI (g/d)



Discussion

Table 1 Interpretation:

- In Phase 1 (d 0 to 7) ADG and ADFI had a greater significant difference (*P*<0.05) between carbadox, C6:C8:C10, and R2.
- Phase 2 (d 7 to 19) observed a significant difference (*P*<0.0001) in ADG with ZnO and FORMI GML having greater ADG than other treatments.
- Overall (d 0 to 35) pigs fed ZnO or carbadox had greater (*P*<0.012) ADG than those fed the control or R2 diets, pigs fed the C6:C8:C10 blend or FORMI had similar (*P*>0.012) ADG as those fed carbadox.
- There proved to be no significant difference (*P*<0.05) in ADG and ADFI in Phase 1, Phase 2, and Overall between ZnO, Carbadox and FORMI GML.

Conclusions

- ZnO and carbadox continue to be good options for producers wanting to maximize growth performance in early weaning.
- During the common period, pigs fed ZnO continued to have greater (P<0.05) ADG than those fed R2, with other treatments being intermediate.
- The MCFA-based products had variable performances throughout the experiment.
- 1% FORMI GML did not have significantly different (*P*<0.05) results in ADG and ADFI in Phase 1, Phase 2 and in the overall treatment period.

Future Directions

- The results of this study suggest that although the MCFA did not improve weanling pig growth over ZnO and Carbadox, 1% FORMI GML may be a promising alternative.
- Additional research regarding concentrations of MCFA is warranted to effectively replace ZnO or antibiotics in pork production.

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Figure 10: Me with Theodor

Figure 9: Weanling experimental pigs