

Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 10 *Swine Day (1968-2014)*

Article 1216

2013

Evaluation of antibiotics and benzoic acid on growth performance of nursery pigs

J E. Nemechek

Michael D. Tokach

Steven S. Dritz

See next page for additional authors

Follow this and additional works at: <https://newprairiepress.org/kaesrr>



Part of the [Other Animal Sciences Commons](#)

Recommended Citation

Nemechek, J E.; Tokach, Michael D.; Dritz, Steven S.; Goodband, Robert D.; DeRouchey, Joel M.; and Bergstrom, J R. (2013) "Evaluation of antibiotics and benzoic acid on growth performance of nursery pigs," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 10. <https://doi.org/10.4148/2378-5977.7056>

This report is brought to you for free and open access by New Prairie Press. It has been accepted for inclusion in Kansas Agricultural Experiment Station Research Reports by an authorized administrator of New Prairie Press. Copyright 2013 Kansas State University Agricultural Experiment Station and Cooperative Extension Service. Contents of this publication may be freely reproduced for educational purposes. All other rights reserved. Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. K-State Research and Extension is an equal opportunity provider and employer.



Evaluation of antibiotics and benzoic acid on growth performance of nursery pigs

Abstract

A total of 240 weanling pigs (PIC 327 \times 1050, initially 16.1 lb, 3 d postweaning) were used in a 28-d trial to evaluate the effects of benzoic acid and antibiotics on growth performance. Treatments were arranged as a 2 \times 2 factorial (with or without 0.5% Vevovital, a source of benzoic acid; DSM Nutritional Products, Parsippany, NJ), and with or without carbadox (Mecadox; Philbro Animal Health Corp., Ridgefield Park, NJ). The 4 dietary treatments included a control (1) without Mecadox or Vivovital, (2) without Mecadox and with Vevovital, (3) with Mecadox and without Vevovital, and (4) with Mecadox and Vevovital. No interactions ($P > 0.57$) were observed between Mecadox and Vevovital on growth performance. From d 0 to 14, there were no differences ($P > 0.12$) in ADG or ADFI between pigs fed diets with or without Mecadox, but pigs fed Mecadox tended to have poorer ($P < 0.07$) F/G than pigs fed diets without Mecadox. From d 14 to 28, pigs fed Mecadox had improved ($P < 0.01$) ADG, ADFI, and F/G compared with pigs fed diets without Mecadox. Overall (d 0 to 28), pigs fed Mecadox had increased ($P < 0.02$) ADG and ADFI. For the main effect of Vevovital, there were no differences ($P > 0.11$) in ADG, ADFI, or F/G during either phase or for the overall data. In conclusion, feeding Mecadox increased ADG and ADFI, but no improvements in growth were found when benzoic acid was included in the diets.; Swine Day, Manhattan, KS, November 21, 2013

Keywords

Swine day, 2013; Kansas Agricultural Experiment Station contribution; no. 14-044-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1092; Benzoic acid; Carbadox; Nursery pig

Creative Commons License



This work is licensed under a [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/).

Authors

J E. Nemecek, Michael D. Tokach, Steven S. Dritz, Robert D. Goodband, Joel M. DeRouchey, and J R. Bergstrom

Evaluation of Antibiotics and Benzoic Acid on Growth Performance of Nursery Pigs¹

J.E. Nemecek, M.D. Tokach, S.S. Dritz², R.D. Goodband, J.M. DeRouchey, and J.R. Bergstrom³

Summary

A total of 240 weanling pigs (PIC 327 × 1050, initially 16.1 lb, 3 d postweaning) were used in a 28-d trial to evaluate the effects of benzoic acid and antibiotics on growth performance. Treatments were arranged as a 2 × 2 factorial (with or without 0.5% Vevovitall, a source of benzoic acid; DSM Nutritional Products, Parsippany, NJ), and with or without carbadox (Mecadox; Philbro Animal Health Corp., Ridgefield Park, NJ). The 4 dietary treatments included a control (1) without Mecadox or Vevovitall, (2) without Mecadox and with Vevovitall, (3) with Mecadox and without Vevovitall, and (4) with Mecadox and Vevovitall. No interactions ($P > 0.57$) were observed between Mecadox and Vevovitall on growth performance. From d 0 to 14, there were no differences ($P > 0.12$) in ADG or ADFI between pigs fed diets with or without Mecadox, but pigs fed Mecadox tended to have poorer ($P < 0.07$) F/G than pigs fed diets without Mecadox. From d 14 to 28, pigs fed Mecadox had improved ($P < 0.01$) ADG, ADFI, and F/G compared with pigs fed diets without Mecadox. Overall (d 0 to 28), pigs fed Mecadox had increased ($P < 0.02$) ADG and ADFI. For the main effect of Vevovitall, there were no differences ($P > 0.11$) in ADG, ADFI, or F/G during either phase or for the overall data. In conclusion, feeding Mecadox increased ADG and ADFI, but no improvements in growth were found when benzoic acid was included in the diets.

Key words: benzoic acid, carbadox, nursery pig

Introduction

Vevovitall, a source of benzoic acid, has been included in European swine diets and may become available for use in the North American swine industry. This experiment is the second in a series of trials that were conducted at K-State to evaluate Vevovitall in nursery pig diets. In the previous experiment, the effect of Vevovitall in simple and complex diets was tested. Although no significant improvements in growth were observed when Vevovitall was fed, the response was not influenced by diet complexity; therefore, complex diets, which are more representative of a typical diet fed in the U.S., were used in the current experiment to further test the effects of Vevovitall.

Weaning and early nursery phases are often associated with higher stress, particularly with regards to intestinal health and development. Antibiotics are most commonly fed during this time in an attempt to lessen any negative effects on growth, but acidifiers also have been investigated as beneficial feed additives due to the potential for antibiotic-

¹ Appreciation is expressed to DSM Nutritional Products (Parsippany, NJ), for providing the Vevovitall used in diet formulation and partial financial support.

² Department of Diagnostic Medicine/Pathobiology, College of Veterinary Medicine, Kansas State University.

³ DSM Nutritional Products (Parsippany, NJ).

like effects. The objective of the current experiment was to determine the effect of antibiotics on the response to Vevovital in nursery pig diets.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved the protocol used in this experiment. The study was conducted at the K-State Swine Teaching and Research Center in Manhattan, KS.

A total of 240 weanling pigs (PIC 327 × 1050, initially 16.1 lb, 3 d postweaning) were used in a 28-d trial. Pigs were weaned at approximately 21 d of age and allotted to pens by initial BW to achieve the same average pen weight. Pigs were fed a common pelleted transition diet for 3 d. On d 3 postweaning, pens were allotted to 1 of 4 dietary treatments, arranged as a 2 × 2 factorial. Thus, d 3 after weaning was d 0 of the experiment. There were 7 pigs per pen and 7 pens per treatment. Each pen contained a 4-hole, dry self-feeder and a nipple waterer to provide ad libitum access to feed and water. Pigs and feeders were weighed on d 0, 7, 14, 21, and 28 to calculate ADG, ADFI, and F/G.

A 2-phase diet series was used. All diets were corn-soybean meal-based. From d 0 to 14, all diets contained 10% dried whey, 1.25% select menhaden fish meal, 1.25% spray-dried blood cells, and 2,000 ppm of Zn from zinc oxide (Table 1). From d 14 to 28, no specialty protein sources or additional zinc oxide were included in any diets. There were 4 dietary treatments, including a control (1) without Mecadox or Vivovital, (2) without Mecadox and with Vevovital, (3) with Mecadox and without Vevovital, (4) with Mecadox and Vevovital. For treatments 3 and 4, Mecadox was included at 50 g/ton from d 0 to 14 and 25 g/ton from d 14 to 28. Vevovital was included in treatments 2 and 4 at 0.5%

Experimental data were analyzed as a completely randomized design using the MIXED procedure of SAS (SAS Institute, Inc., Cary, NC) with pen as the experimental unit. Treatments were arranged as a 2 × 2 factorial (with or without Mecadox and with or without Vevovital). Differences between treatments were determined using the PDIFF statement in SAS. Significant differences were declared at $P < 0.05$ and trends at $P < 0.10$.

Results and Discussion

No interactions ($P > 0.57$) were observed among pigs fed Mecadox and Vevovital on growth performance (Table 2).

From d 0 to 14, there were no differences ($P > 0.12$) in ADG and ADFI between pigs fed diets with or without Mecadox, but pigs fed Mecadox tended to have poorer ($P < 0.07$) F/G than those fed diets without Mecadox (Table 3). The inclusion of dietary Vevovital had no effect ($P > 0.33$) on ADG, ADFI, or F/G from d 0 to 14.

Although the addition of Mecadox in Phase 1 had little effect on growth, from d 14 to 28, pigs fed Mecadox had improved ($P < 0.01$) ADG, ADFI, and F/G compared with pigs fed diets without Mecadox. Similar to the previous period, feeding Vevovital from d 14 to 28 did not affect ($P > 0.11$) ADG, ADFI, or F/G.

SWINE DAY 2013

For the overall trial (d 0 to 28), the inclusion of Mecadox increased ($P < 0.02$) ADG and ADFI but did not influence ($P > 0.21$) F/G. Consistent with the previous periods, no differences ($P > 0.14$) were observed in ADG, ADFI, or F/G when Vevovital was fed for the overall experiment.

In conclusion, no interactive effects of feeding Mecadox and Vevovital to nursery pigs were observed. The inclusion of Mecadox alone improved ADG, ADFI, and F/G, which was driven primarily by improvements observed in pigs from d 14 to 28 of the trial (25 to 45 lb). Feeding acidifiers has resulted in improved growth performance in several trials, but the current experiment showed only numerical improvements in growth.

Table 1. Phase 1 diet composition (as-fed basis)^{1,2}

Item	Phase 1	Phase 2
	Negative control ³	Negative control ⁴
Ingredient, %		
Corn	59.93	64.50
Soybean meal (46.5% CP)	26.39	32.15
Select menhaden fish meal	1.25	---
Spray-dried blood cells	1.25	---
Spray-dried whey	10.0	---
Monocalcium phosphate (21% P)	0.85	1.05
Limestone	0.80	1.00
Salt	0.30	0.35
Zinc oxide	0.25	---
Trace mineral premix	0.15	0.15
Vitamin premix	0.25	0.25
L-lysine HCl	0.295	0.325
DL-methionine	0.140	0.100
L-threonine	0.125	0.110
Phytase ⁵	0.019	0.019
Diatomaceous earth ⁶	1.00	---
Total	100.00	100.00

continued

Table 1. Phase 1 diet composition (as-fed basis)^{1,2}

Item	Phase 1	Phase 2
	Negative control ³	Negative control ⁴
Calculated analysis		
Standardized ileal digestible amino acids (SID), %		
Lysine	1.30	1.26
Isoleucine:lysine	56	62
Leucine:lysine	129	130
Methionine:lysine	33	31
Met & Cys:lysine	56	56
Threonine:lysine	62	62
Tryptophan:lysine	17.0	17.5
Valine:lysine	69	68
Total lysine, %	1.43	1.39
ME, kcal/lb	1,480	1,504
SID lysine:ME, g/Mcal	3.99	3.80
CP, %	20.7	20.9
Ca, %	0.71	0.70
P, %	0.63	0.63
Available P, %	0.47	0.47

¹ A total of 240 weanling pigs (PIC 327 × 1050) were used in a 28-d trial to evaluate the effects of benzoic acid and antibiotics on growth performance.

² Vevovital was used as the source of benzoic acid (DSM Nutritional Products, Parsippany, NJ). Mecadox 2.5 was used as the source of antibiotic (Philbro Animal Health Corp., Ridgefield Park, NJ).

³ Pigs were fed Phase 1 diets from d 0 to 14. Diets contained 0 or 0.5% Vevovital and 0 or 50 g/ton of Mecadox.

⁴ Pigs were fed Phase 2 diets from d 14 to 28. Diets contained 0 or 0.5% Vevovital and 0 or 25 g/ton of Mecadox.

⁵ Ronozyme CT (10,000) (International Nutrition, Omaha, NE) provided 840 phytase units (FTU)/lb, with a release of 0.10% available P.

⁶ Indigestible marker (Perma-Guard, Inc., Corrales, NM).

Table 2. Effect of benzoic acid and antibiotics on growth performance of nursery pigs¹

Benzoic acid: ²	---	Vevovital		---	Vevovital	Probability, <i>P</i> <			
		---	---			Mecadox	Mecadox	SEM	Benzoic acid × antibiotic
d 0 to 14									
ADG, lb	0.64	0.65	0.64	0.64	0.67	0.026	0.61	0.33	0.57
ADFI, lb	0.87	0.88	0.91	0.91	0.95	0.033	0.60	0.51	0.12
F/G	1.38	1.36	1.42	1.42	1.41	0.026	0.95	0.46	0.07
d 14 to 28									
ADG, lb	1.20	1.24	1.31	1.31	1.36	0.026	0.79	0.11	0.001
ADFI, lb	1.87	1.91	1.97	1.97	2.01	0.037	0.99	0.23	0.01
F/G	1.56	1.55	1.51	1.51	1.49	0.018	0.75	0.32	0.003
d 0 to 28									
ADG, lb	0.92	0.94	0.97	0.97	1.01	0.022	0.72	0.14	0.01
ADFI, lb	1.37	1.39	1.44	1.44	1.48	0.032	0.86	0.32	0.02
F/G	1.50	1.48	1.48	1.48	1.46	0.016	0.76	0.28	0.21
Weight, lb									
d 0	16.1	16.1	16.1	16.1	16.1	0.153	0.96	0.98	0.96
d 14	25.0	25.2	25.0	25.0	25.6	0.447	0.67	0.43	0.63
d 28	41.9	42.5	43.3	43.3	44.7	0.748	0.57	0.20	0.02

¹A total of 240 weanling pigs (PIC 327 × 1050, initially 16.1 lb) were used in a 28-d trial to evaluate the effects of benzoic acid and antibiotics on growth performance. There were 6 pigs per pen and 10 pens per treatment.

² Vevovital (DSM Nutritional Products, Parsippany, NJ) was included in from d 0 to 14 and d 14 to 28 at 0.5% of the diet.

³ Mecadox (Philbro Animal Health Corp., Ridgefield Park, NJ) was added at 50 g/ton from d 0 to 14 and 25 g/ton from d 14 to 28.

SWINE DAY 2013

Table 3. Main effect of Mecadox and Vevovital on growth performance of nursery pigs¹

	Antibiotic ²			Benzoic acid ³			Probability, <i>P</i> <	
	None	Mecadox	SEM	None	Vevovital	SEM	Antibiotic	Benzoic acid
d 0 to 14								
ADG, lb	0.64	0.66	0.018	0.64	0.66	0.018	0.57	0.33
ADFI, lb	0.87	0.93	0.024	0.89	0.91	0.024	0.12	0.51
F/G	1.37	1.42	0.018	1.40	1.38	0.018	0.07	0.46
d 14 to 28								
ADG, lb	1.22	1.33	0.019	1.25	1.30	0.019	0.001	0.11
ADFI, lb	1.89	1.99	0.026	1.92	1.96	0.026	0.01	0.23
F/G	1.56	1.50	0.013	1.54	1.52	0.013	0.003	0.32
d 0 to 28								
ADG, lb	0.93	0.99	0.016	0.94	0.98	0.016	0.01	0.14
ADFI, lb	1.38	1.46	0.023	1.40	1.44	0.023	0.02	0.32
F/G	1.49	1.47	0.011	1.49	1.47	0.011	0.21	0.28
Weight, lb								
d 0	16.1	16.1	0.109	16.1	16.1	0.109	0.96	0.98
d 14	25.1	25.3	0.316	25.0	25.4	0.316	0.63	0.43
d 28	42.2	44.0	0.529	42.6	43.6	0.529	0.02	0.20

¹A total of 240 weanling pigs (PIC 327 × 1050, initially 16.1 lb) were used in a 28-d trial to evaluate the effects of benzoic acid and antibiotics on growth performance. There were 6 pigs per pen and 10 pens per treatment.

²Pigs were fed diets without or with Mecadox (Philbro Animal Health Corp., Ridgefield Park, NJ) from d 0 to 28.

³Pigs were fed diets without or with 0.5% Vevovital (DSM Nutritional Products, Parsippany, NJ) from d 0 to 28.