

GROWTH PERFORMANCE OF NURSERY PIGS FED BIOSAF¹ YEAST, ALONE OR IN COMBINATION WITH AN IN-FEED ANTIMICROBIAL²

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Summary

A total of 280 pigs were used in a 28-d growth study to evaluate the effects of feeding the antimicrobial carbadox, BIOSAF (0.4%), and the combination of carbadox and BIOSAF yeast (0.15%) in nursery pig diets. Over the length of the entire trial, pigs fed the diet containing carbadox alone had greater ADG than did pigs fed the control diet or the diet containing 0.4% BIOSAF. Overall, pigs fed the diet containing both carbadox and 0.15% BIOSAF had greater ADG than did pigs fed the control diet or the diet containing 0.4% BIOSAF ($P < 0.04$), although their growth performance did not differ from that of pigs fed carbadox alone. Antibody titers in response to routine vaccination against *Mycoplasma hyopneumoniae* were not affected by dietary treatment. There was no evidence that BIOSAF improved growth performance of nursery pigs, either alone or in combination with the carbadox. It is possible that the interactive effects of BIOSAF that have been reported for other in-feed antibiotics are not present when BIOSAF is combined with carbadox, or perhaps interactive effects are only observed when carbadox itself exerts a more potent stimulation of ADG in nursery pigs.

(Key Words: Antimicrobials, BIOSAF, Carbadox, Nursery Pig, Pigs.)

Introduction

Dietary antibiotics continue to be used in nursery pig diets to improve growth performance. Because of growing concerns regarding the long-term sustainability of this practice, however, there is an active search for alternatives. Live yeasts are a class of feed additives that may hold promise. Yeasts are hypothesized to alter the intestinal microbiota in the pig by interacting with potential pathogens in the gut. Certain classes of bacteria adhere to yeast cell walls and, in doing so, decrease the likelihood of pathogen binding and colonization of the gut wall.

BIOSAF is a heat-stable yeast product that improved ADG, compared with that of diets without antibiotics when fed in pelleted nursery diets at 0.2% (Kansas State University Swine Day 1998 report). BIOSAF fed at 0.15% in combination with Neo-Terra resulted in greater ADG and ADFI than did a diet without antibiotics, and resulted in numerically greater ADG than that of pigs fed Neo-Terra (Kansas State University Swine Day 2004 report).

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Procedures

A total of 280 weaned pigs (initial BW 12.48 lbs) were used in a 28-d study to evaluate the effect of BIOSAF yeast, alone and in combination with an antibiotic, on pig growth performance. There were four treatments, with seven pigs per pen and ten pens per treatment. Pigs were blocked by weight and sex, and assigned randomly within block to one of four dietary treatments. Phase 1 diets were fed from d 0 to 14, and Phase 2 diets were fed from d 15 to 28 (Table 1). All diets were fed in meal form, were based on corn-soybean meal and were formulated to contain 1.55% total dietary lysine, 15% whey and 3.75% fish meal in from d 0 to 14 after weaning. From d 15 to 28 after weaning, the diets were formulated to contain 1.45% total dietary lysine, with no specialty protein sources. The negative control diet contained no added antibiotic or yeast, and the positive control diet contained the antibiotic carbadox (Mecadox[®] 50 g/ton). The first test diet contained BIOSAF yeast at 0.4 %, and the second test diet contained the combination of 0.15 % BIOSAF and carbadox. All diets were formulated without growth-promoting rates of copper sulfate or zinc oxide.

Growth performance data, including ADG, ADFI, and F/G, were calculated by weighing pigs and feeders at weekly intervals throughout the experiment.

The day before weaning (d -1), all pigs were vaccinated against *Mycoplasma hyopneumoniae* (*M. hyo*; RESPISURE[®]). Two pigs were chosen at random from each pen, and received booster vaccinations at d 13. Serum was collected at the conclusion of the experiment (d 27) and forwarded to the Iowa State University Veterinary Diagnostic Laboratory to be assayed for antibodies to *M. hyo* by employing two widely used diagnostic assays. Titer values from the two pigs within

pens receiving booster vaccinations were averaged to produce pen mean titers for analysis.

Table 1. Basal Diet Composition (As-fed Basis)^a

Ingredient, %	Days of Experiment	
	0 to 14	15 to 28
Corn	47.50	55.95
Soybean meal (46.5% CP)	27.00	37.40
Spray dried whey	15.00	---
Menhaden fish meal	5.00	---
Choice white grease	3.00	3.00
Monocalcium P (21% P)	0.80	1.40
Limestone	0.50	1.00
Salt	0.20	0.30
Vitamin premix	0.25	0.25
Trace mineral premix	0.15	0.15
L-Threonine	0.15	0.15
Lysine-HCl	0.30	0.30
DL-methionine	0.15	0.13
Total	100.00	100.00

^aCorn was removed from the basal diet and replaced with carbadox (Mecadox[®], PhiBro Animal Health) to provide 50 g/ton and BIOSAF yeast (0.4 %) to achieve the experimental diets.

Results and Discussion

During the first two weeks of the experiment (d 0 to 14 after weaning), no differences were detected for ADG, ADFI, or F/G among the four diets (Table 2). During the last two weeks (d 15 to 28 after weaning), pigs fed the diet containing carbadox, with and without BIOSAF, had greater ($P < 0.04$) ADG and ADFI than did pigs fed the diet containing 0.4% BIOSAF. There were no differences detected in F/G during the final two weeks.

Overall (d 0 to 28), pigs fed the diet containing carbadox, with and without BIOSAF,

had greater ($P < 0.03$) ADG than did pigs fed the diet containing 0.4% BIOSAF, and pigs fed carbadox alone had greater ADG ($P < 0.03$) than did control pigs. Pigs fed the diet containing carbadox and BIOSAF 0.15% had a greater ADFI than did pigs fed either the control diet or 0.4% BIOSAF ($P < 0.04$). There was no difference in F/G among the four diets for the overall trial. Antibody titers to *M. hyo* were not affected by dietary treatment, regardless of the assay used (Table 2).

There was no evidence that BIOSAF improved growth performance of nursery pigs, either alone or in combination with the carbadox. It is possible that the interactive effects of BIOSAF that have been reported for other in-feed antibiotics are not present when BIOSAF is combined with carbadox, or perhaps interactive effects are only observed when carbadox itself exerts a more potent stimulation of ADG in nursery pigs.

Table 2. Growth Performance and Serum Titers to *Mycoplasma hyopneumoniae* (*M. hyo*) Vaccination^a

	Dietary Treatment ^b				SE	Probability P <
	Control	Carbadox	BIOSAF 0.4 %	Carbadox+ BIOSAF 0.15 %		
d 0 to 14						
ADG, lb	0.29	0.34	0.31	0.30	0.02	0.18
ADFI, lb	0.37	0.38	0.37	0.37	0.02	0.94
F/G	1.26	1.12	1.21	1.23	0.04	0.30
d 15 to 28						
ADG, lb	1.11 ^{c,d}	1.16 ^c	1.07 ^d	1.16 ^c	0.03	0.01
ADFI, lb	1.30 ^c	1.44 ^d	1.35 ^c	1.46 ^d	0.04	0.01
F/G	1.22	1.25	1.27	1.26	0.01	0.07
d 0 to 28						
ADG, lb	0.70 ^{c,d}	0.75 ^e	0.69 ^c	0.73 ^{d,e}	0.02	0.03
ADFI, lb	0.86 ^c	0.91 ^d	0.86 ^c	0.92 ^d	0.03	0.04
F/G	1.22	1.22	1.25	1.25	0.01	0.10
Titer ^f						
IDEXX	0.32	0.46	0.35	0.36	0.05	0.29
Dako, %	40.6	34.3	32.2	29.4	5.8	0.57

^aA total of 280 pigs (seven pigs per pen and tens per treatment). Titers to *M. hyo* represent serum antibodies present at d 27 to vaccination with RESPISURE® at weaning (d -1) and again at d 13.

^bControl = diet containing no added antibiotic or yeast; Carbadox = diet with 50 g/ton carbadox; BIOSAF 0.4% = diet with BIOSAF yeast at 0.4%; carbadox+BIOSAF 0.15% = Carbadox diet with BIOSAF at 0.15%.

^{c,d,e}Means having different superscript letters within a row differ ($P < 0.05$).

^fIDEXX and Dako are separate, but widely used, diagnostic assays for pig serum antibodies to *M. hyo*. IDEXX means are expressed as a ratio of sample to positive, and values generally greater than 0.4 are considered positive for antibodies to *M. hyo*. Dako means are expressed as a percentage of absorbance values in negative control wells, with lower percentages corresponding to higher titers. For this assay, values generally less than 50% are considered positive for antibodies to *M. hyo*.