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## **Growth performance of nursery pigs fed BIOSAF yeast alone or in combination with in-feed antimicrobial**

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## GROWTH PERFORMANCE OF NURSERY PIGS FED BIOSAF YEAST ALONE OR IN COMBINATION WITH IN-FEED ANTIMICROBIAL<sup>1</sup>

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### Summary

A total of 210 pigs were used in a 28-d growth study to evaluate the effects of feeding the combination antibiotic neomycin and oxytetracycline (Neo-Terra), different rates of BIOSAF yeast (0.15% or 0.3%), and the combination of Neo-Terra and BIOSAF in nursery diets. Overall, pigs fed the diet containing both Neo-Terra and 0.15% BIOSAF had greater ADG and ADFI than did pigs fed the control diet and pigs fed either concentration of BIOSAF alone ( $P < 0.05$ ). Furthermore, over the entire trial, pigs fed the diet containing both Neo-Terra and BIOSAF also tended to have greater ADG and ADFI than did pigs fed only Neo-Terra ( $P = 0.15$ ). Pigs fed Neo-Terra had greater ADG and ADFI than did pigs fed the control diet and the diet containing 0.15% BIOSAF, but both ADG and ADFI were similar between pigs fed Neo-Terra and pigs fed 0.3% BIOSAF. Whereas BIOSAF fed alone did not significantly improve growth performance over that of control pigs, pigs fed the diet combining both Neo-Terra and 0.15% BIOSAF had a 16% improvement in ADG, compared with that of pigs fed the control diet, and had a trend for an improvement in ADG, compared with that of pigs fed the diet containing Neo-Terra without added yeast. Thus, in nursery settings where Neo-Terra will be added, addition of 0.15% BIOSAF to diets

could enhance growth performance. The overall growth performance of pigs fed 0.3% BIOSAF yeast was intermediate to that of pigs fed the control diet and pigs fed the diet containing Neo-Terra. Additional research will be required to determine definitively if a rate at, or close to, 0.3% BIOSAF can be added to nursery diets to approach growth performance observed with Neo-Terra.

(Key Words: Antimicrobials, BIOSAF, Neomycin, Oxytetracycline, Nursery Pigs, 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 diets without antibiotics when fed in pelleted nursery diets

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<sup>2</sup>Food Animal Health and Management Center.

at 0.2% (Swine Day 1998 report). But the growth response of nursery pigs to BIOSAF has not been evaluated in comparison with added antibiotic, or when added at lower concentrations in combination with antibiotic.

### **Procedures**

A total of 210 weaned pigs (initial BW 13.4 lb) were used in a 28-d study to evaluate BIOSAF yeast alone, and in combination with antibiotic, on pig growth performance. There were five treatments, with seven pigs per pen and six pens per treatment. Pigs were blocked by weight and sex and assigned randomly within block to one of five 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 provide 1.55% lysine, 0.82% calcium, and 0.48% available phosphorus in phase 1 or 1.51% lysine, 0.78% calcium, and 0.38% available phosphorus in phase 2. The negative-control diet contained no added antibiotic or yeast, and the positive-control diet contained the antibiotic combination Neo-terra (140 g/ton neomycin sulfate and 140 g/ton oxytetracycline HCl). Two diets contained BIOSAF yeast at 0.15 or 0.3%, and a fifth diet contained the combination of 0.15% BIOSAF and Neo-Terra. All diets were formulated without growth-promoting concentrations of copper sulfate or zinc oxide.

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

### **Results and Discussion**

Growth-performance data are shown in Table 2. During the first two weeks (d 0 to 14), pigs fed the diet containing the combination of Neo-Terra plus BIOSAF had greater ADG than did pigs fed the control diet or the diet with 0.15% BIOSAF ( $P<0.05$ ). In addition,

ADG was greater for pigs fed Neo-Terra alone than for pigs fed BIOSAF at 0.15% ( $P<0.05$ ). No other differences were detected for ADG, ADFI, or F/G during the first two weeks.

In the final two weeks of the trial (d 15 to 28), pigs fed the diet containing both Neo-Terra and BIOSAF had greater ADG and ADFI than did pigs fed the control diet or pigs fed either rate of BIOSAF alone ( $P<0.05$ ). The ADG of pigs fed the combination diet, though not significantly different, actually tended to be greater than that of pigs fed Neo-Terra ( $P=0.12$ ). During this same period, ADG and ADFI of pigs fed Neo-Terra was greater than those of pigs fed the control diet or of pigs fed the diet with 0.15% BIOSAF ( $P<0.05$ ). No differences among treatments were detected for feed efficiency during the final two weeks of the trial.

Overall (d 0 to 28), pigs fed the diet containing the combination of Neo-Terra and BIOSAF had greater ADG and ADFI than did pigs fed the control diet or pigs fed either rate of BIOSAF alone ( $P<0.05$ ). Furthermore, over the entire trial, pigs fed the diet containing both Neo-Terra and BIOSAF also tended to have greater ADG and ADFI than pigs fed only Neo-Terra had ( $P=0.15$ ). Pigs fed Neo-Terra had greater ADG and ADFI than did pigs fed the control diet and the diet containing 0.15% BIOSAF. Over the entire trial, however, ADG and ADFI did not differ for pigs fed Neo-Terra and pigs fed 0.3% BIOSAF.

As expected, the addition of Neo-Terra increased ADG and ADFI in weanling pigs. Unexpectedly, Neo-Terra and BIOSAF seemed to act synergistically to enhance ADG and ADFI when combined in weanling pig diets. Thus, in production settings in which the decision has been made to include Neo-Terra in nursery diets, pig growth performance might be enhanced by addition of 0.15% BIOSAF. At present, it is not clear whether

the trend we observed for synergism between BIOSAF and Neo-Terra will be observed with other antibiotics. The overall growth performance of pigs fed 0.3% BIOSAF yeast was intermediate between that of pigs fed the control diet and pigs fed the diet containing Neo-

Terra. Additional research will be required to determine definitively if a concentration at, or close to, 0.3% BIOSAF can be added to nursery diets to approach growth performance observed with Neo-Terra.

**Table 1. Basal Diet Composition (As-fed Basis)<sup>a</sup>**

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	---
Select manhaden fish meal	5.00	---
Choice white grease	3.00	3.00
Monocalcium phosphate, 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	0.125
Calculated Analysis		
Lysine, %	1.55	1.45
Isoleucine:lysine ratio, %	74	64
Leucine:lysine ratio, %	146	129
Methionine:lysine ratio, %	40	33
Methionine & cystine:lysine ratio, %	69	59
Threonine:lysine ratio, %	79	65
Tryptophan:lysine ratio, %	21	18
Valine:lysine ratio, %	82	71
ME, kcal/lb	1,478	1,506
Crude protein, %	26.4	21.4
Ca, %	1.09	0.85
Available P, %	0.63	0.42

<sup>a</sup>Corn was removed from the basal diet and replaced with neomycin and oxytetracycline (0.7 %) to provide 140 g/ton of each antimicrobial and BIOSAF yeast (0.15 % or 0.3 %) to achieve the experimental diets detailed in the Procedures.

**Table 2. Growth Performance of Nursery Pigs<sup>a</sup>**

	Dietary Treatments <sup>b</sup>						
	Control	Neo-Terra	BIOSAF 0.15 %	Neo+BIOSAF 0.15 %	BIOSAF 0.3 %	SEM	P value
Weeks 1 to 2							
ADG, lb	0.48 <sup>c,d</sup>	0.54 <sup>d,e</sup>	0.44 <sup>c,g</sup>	0.57 <sup>e,f</sup>	0.50 <sup>d,f,g</sup>	0.03	0.05
ADFI, lb	0.56	0.58	0.51	0.63	0.59	0.03	0.08
F/G	1.16	1.08	1.18	1.09	1.17	0.03	0.13
Weeks 3 to 4							
ADG, lb	1.13 <sup>c</sup>	1.24 <sup>d,e</sup>	1.10 <sup>c</sup>	1.30 <sup>d</sup>	1.18 <sup>c,e</sup>	0.05	0.01
ADFI, lb	1.49 <sup>c</sup>	1.65 <sup>d,e</sup>	1.48 <sup>c</sup>	1.71 <sup>d</sup>	1.58 <sup>c,e</sup>	0.07	0.01
F/G	1.32	1.33	1.32	1.32	1.33	0.02	0.79
Weeks 1 to 4							
ADG, lb	0.81 <sup>c</sup>	0.88 <sup>d,e</sup>	0.78 <sup>c</sup>	0.94 <sup>d</sup>	0.84 <sup>c,e</sup>	0.04	0.01
ADFI, lb	1.03 <sup>c,d</sup>	1.11 <sup>e,f</sup>	1.00 <sup>c</sup>	1.17 <sup>e</sup>	1.08 <sup>d,f</sup>	0.05	0.01
F/G	1.27	1.25	1.27	1.25	1.29	0.02	0.43

<sup>a</sup>A total of 210 pigs (seven pigs per pen and six pens per treatment).

<sup>b</sup>Control = diet containing no added antibiotic or yeast; Neo-Terra = diet with 140 g/ton neomycin sulfate and 140g/ton oxytetracycline HCl; BIOSAF 0.15 = diet with BIOSAF yeast at 0.15 %; Neo+BIOSAF 0.15 = Neo-Terra diet with BIOSAF at 0.15 %; BIOSAF 0.3 = diet with BIOSAF yeast at 0.3%.

<sup>c,d,e,f,g</sup>Means having different superscript letters within a row differ (P<0.05).