

The effect of feeding MCFA on performance of nursery pigs raised without antibiotics

D. McManus,¹ DVM; M. Lachmann,¹ Ph.D.; T. Weeden,¹ Ph.D.; B. de Rodas,¹ Ph.D.; S. Crowder,¹ M.S.; S. Petersen,² Ph.D.

¹Purina Animal Nutrition LLC, ²PMI Nutritional Additives

Proceedings from the 48th American Association of Swine Veterinarians Annual Meeting, February 25 -February 28, 2017, Denver, Colorado.

Sunday Concurrent Session #2: Industrial Partners, page 109-122

Introduction

In North America, public concern regarding the use of antibiotics in pork production has grown over the last years. The human medicine segment is looking into animal production practices that can contribute to reducing the risk of proliferation of resistant bacteria in the environment. As result, starting Jan 1, 2017, all medically-important antimicrobials intended for use in swine feed that are currently available “over-the-counter” will require a Veterinary Feed Directive (VFD). Consequently, the swine industry is working on the design and evaluation of feed additives, feeding programs and management practices to support animal growth and health without the use of antibiotics (AB).

Feed additives are not designed to provide nutrient density to the diet; they provide functional components to support production efficiency and pig performance. To be considered an effective feed additive product, it must provide a performance improvement equivalent to the added cost² or to maintain animal performance at a lower cost (improve pig production and profitability).

Medium chain fatty acids (MCFA), acidifiers, prebiotics, probiotics and botanicals in swine diets have been considered as options to support the gut health, the immune system and subsequently, performance. Prior trials (unpublished Purina Animal Nutrition research) have indicated the effectiveness of a commercial blend of MCFA with other functional components (OutPace[®] Feed Additive (OutPace[®] FA) from PMI Nutritional Additives) in improving performance of nursery pigs. Two experiments were conducted to evaluate the effect of feeding OutPace[®] FA on nursery performance of pigs raised with or without AB.

Material and Methods

Experiment 1

Experiment 1 (Exp 1) was conducted with the objective to evaluate the effect of feeding OutPace[®] FA at 3 different levels (0, 2.5 and 5 lbs/ton) within the complete feed on pig performance when pigs were fed diets containing AB during the nursery period. To achieve this objective, a total of 660 pigs were allotted to 1 of 3 dietary treatments (20 pigs per pen with 11 replicates). The AB were used as follows for all Trt groups: a combination of Denagard[®] (Novartis Animal Health, Greensboro, NC) at 35g/ton and chlortetracycline at 400g/ton (Denagard[®]/CTC) in phase 1 and 2, 50g/ton Mecadox[®] (Carbadox – Phibro Animal Health Corporation, Teaneck, NJ) in phase 3 and CTC at 500g/ton in phase 4.

PMI develops innovative combinations of animal feed additives that optimize performance in poultry, swine, dairy and beef cattle by supporting nutrient utilization and gut health. Working with feed nutritionists, manufacturers, veterinarians and producers, PMI products harness the interactions between feed additives to deliver value, efficacy and strong results. Through a comprehensive innovation approach, across component verticals, species, and geographies, PMI leverages the most advanced ingredients and technologies to develop products that perform.

Because of factors outside of PMI's control, individual results to be obtained, including but not limited to: financial performance, animal condition, health or performance cannot be predicted or guaranteed by PMI.



PMI
4001 Lexington Ave N
Arden Hills, MN 55126

www.pmiadditives.com

The effect of feeding MCFA on performance of nursery pigs raised without antibiotics.

All feeding programs were similar in nutrient composition and functional components with the exception of: Treatment (Trt) 1: consisted of a control diet without OutPace® FA, Trt 2: consisted of a similar feeding program as Trt 1 with the exception that OutPace® FA was added at a rate of 2.5 lbs/ton of complete feed and Trt 3: was similar to treatment 1 with the exception OutPace® FA was added at a rate of 5 lbs/ton of complete feed. See Table 1.

Table 1: Exp. 1: Dietary Treatments

Treatment	OutPace® FA	Antibiotics	Feed budget, lbs. of feed/pig
1	0.0 lbs./ton	Phase 1: Denagard® 35 g/ton + CTC 400 g/ton	Phase 1: 2.5
2	2.5 lbs./ton	Phase 2: Denagard® 35 g/ton + CTC 400 g/ton	Phase 2: 5.0
3	5.0 lbs./ton	Phase 3: 50g/ton Mecadox® Phase 4: CTC 500 g/ton	Phase 3: 12.0 Phase 4: 34.0

Experiment 2

Experiment 2 (Exp 2) was conducted to compare the performance of the pigs fed feeding programs containing AB in combination with OutPace® FA at 2.5 lbs per ton vs. the performance of nursery pigs raised without AB in combination with 5 lbs per ton of OutPace® FA (as an alternative AB free program). To achieve this objective, a total of 442 pigs were allotted to 1 of 2 dietary treatments (22 pigs per pen with 11 replicates). Trt 1: consisted of a 4 phase feeding program with the inclusion of 2.5 lbs/ton of OutPace® FA in addition to antibiotics in phase 1, 2 and 4 (based on the best performing Trt from Exp 1). Trt 2: consisted of a similar feeding program as Trt 1 with the exception that OutPace® FA was added at a rate of 5 lbs/ton without the use of AB in the feed (alternative AB free feeding program). The AB protocol use in Trt 1 was Denagard (Novartis Animal Health, Greensboro, NC) at 200g/ton in phase 1, a combination of Denagard at 35g/ton and chlortetracycline at 400g/ton (Denagard/CTC) in phase 2, Non-Medication in phase 3 and repeated the Denagard/CTC combination in phase 4. Both feeding programs were similar in nutrient composition and included other functional components currently used in the Purina Animal Nutrition lactose-free nursery feed program.

The two dietary treatments were designed to be fed in 4 phases during a 43-days period, following a feeding budget of 10 lbs of feed/pig in phase 1 and phase 2, and 20 lbs of feed/pig in phases 3 and 4, respectively. However, not all the feed was consumed by day 43. Therefore, pigs were fed until day 50. The 2 dietary treatments are described in Table 2.

In Exp 1 and 2, Pigs had free access to feed and water. Production performance parameters including initial and final pig body weight, pen feed consumption, pen weight, and mortality were measured and recorded weekly. Weight gain and Feed:Gain (F:G) ratio was calculated. All the collected data was analyzed using the mixed procedure of SAS.³

Table 2: Exp. 2: Dietary Treatments

Treatment	OutPace® FA	Antibiotics	Feed budget, lbs. of feed/pig
1	2.5 lbs/ton	Phase 1: Denagard® 200 g/ton Phase 2: CTC 400 g/ton /Denagard® 35 g/ton Phase 3: No Meds Phase 4: CTC 400 g/ton -Denagard® 35 g/ton	Phase 1: 10.0 Phase 2: 10.0 Phase 3: 20.0 Phase 4: 20.0
2	5 lbs/ton	None	Phase 1: 10.0 Phase 2: 10.0 Phase 3: 20.0 Phase 4: 20.0

The effect of feeding MCFA on performance of nursery pigs raised without antibiotics.

Results and discussion

Experiment 1

In Exp. 1, the best performance and economic return was obtained (Tables 3 and 4) when pigs were fed diets containing 2.5 lbs/ton of OutPace® FA with AB (Trt 2). These pigs were 1.98 lbs heavier ($p=0.09$) when compared to pigs raised with AB and not fed OutPace® FA and 0.98 lbs heavier ($p=0.09$) when compared to pigs fed diets containing AB and OutPace® FA at 5 lbs/ton of complete feed. Additionally, this group of pigs used 0.08 lbs less feed ($p<0.01$) per each pound of body weight gain when compared to the control pigs (7.8 point). These results indicate that the most efficient level of OutPace® FA is 2.5 lbs/ton of feed in combination with AB to improve pig performance.

The next step to identify an effective alternative feeding program was to compare the nursery performance of pigs fed a feeding program with AB and 2.5 lbs of OutPace® FA/ton of complete feed across all nursery diets vs. an alternative feeding program for pigs raised without AB (using OutPace® FA at 5lbs/ton of feed). This was the approach used in Exp 2.

Experiment 2

There were no significant differences in pig performance between pigs fed OutPace® FA at 5 lbs/ton in non-medicated diets compared to feeding a program with AB and 2.5 lbs of Outpace® FA (Tables 5 and 6). Although, these results indicated a strong numerical trend ($p = 0.06$) for improved feed efficiency (F:G) between days 0 to 43 when pigs were fed AB in combination with 2.5 lbs/ton of OutPace® FA.

Conclusions

The results of these studies indicate that adding OutPace® FA at a rate of 2.5 lbs/ton of complete feed improves performance of nursery pigs fed diets containing antibiotic, and that pigs fed diets containing 5 lb/ton OutPace® FA and no antibiotic had similar gains and feed conversion to those fed diets containing antibiotic and 2.5 lb/ton of OutPace® FA during day 0 to 50 postweaning. OutPace® FA should be considered as an efficient tool to improve nursery pig performance when pigs are fed diets with or without antibiotics.

References

OutPace® is a registered trademark of Land O'Lakes Inc.

Jacela JY, DeRouche JM, Tokach MD, et al. Feed additives for swine: Fact sheets – acidifiers and antibiotics. J Swine Health Prod. 2009;17(5):270–275.

SAS Institute Inc., Cary, NC



The effect of feeding MCFA on performance of nursery pigs raised without antibiotics.

Table 3: Exp 1: Effect of feeding 3 level of OutPace® FA in nursery pig diets on the performance of nursery pigs raised with antibiotics during a 41-day period.

Variable	Trt 1: Control No OutPace® FA + AB	Trt 2: OutPace® FA 2.5 lbs./ton + AB	Trt 3: OutPace® FA 5 lbs./ton + AB	p-value
Start weight, lbs	14.31	14.44	14.44	> 0.1
D 14 Wt, lbs	18.39	18.32	18.32	> 0.1
D 21 Wt, lbs	23.79	24.22	24.00	> 0.1
D 27 Wt, lbs	29.88d	30.92e	30.48de	= 0.1
D 41 Wt, lbs	49.63d	51.61e	50.69de	= 0.09
Day 0-14				
ADG, lb	0.472	0.469	0.471	> 0.1
ADFI, lb	0.603	0.596	0.601	> 0.1
F:G	1.29	1.28	1.28	> 0.1
Day 0-21				
ADG, lb	0.578d	0.604e	0.600ed	= 0.1
ADFI, lb	0.798	0.788	0.802	> 0.1
F:G	1.39	1.34	1.31	
Day 0-27				
ADG, lb	0.656	0.692	0.683	> 0.1
ADFI, lb	0.932	0.930	0.931	> 0.1
F:G	1.43f	1.35d	1.37e	= 0.1
Day 0-41				
ADG, lb	0.893f	0.944d	0.930e	= 0.06
ADFI, lb	1.135	1.320	1.326	> 0.1
F:G	1.48f	1.40d	1.43e	< 0.01
Mortality, %	2.727a	0.455b	1.818a	< 0.05

a, b, c means within a row with different superscripts are significantly different, P<0.05
d, e, f means with different superscripts indicate a trend to be different, P≤0.10

Table 4: Exp 1: Economics from the experimental period (Summer 2016).

Variable	Trt 1: Control No OutPace® FA+ AB	Trt 2: OutPace® FA 2.5 lbs./ton + AB	Trt 3: OutPace® FA 5 lbs./ton + AB
Total Feed Cost	\$8.6324	\$8.6393	\$8.7686
Difference		\$0.0069	\$0.1362
Cost per/lb gain	\$0.2291	\$0.2168	\$0.2252
Cost of 40 lbs of gain	\$9.164	\$8.672	\$9.008
Savings/pig/40 lbs gain		-\$0.492	-\$0.1560



The effect of feeding MCFA on performance of nursery pigs raised without antibiotics.

Table 5: Exp 2: Performance of nursery pigs fed diets containing AB and 2.5 lbs/ton OutPace® FA vs. pigs fed non-medicated diets containing 5.0 lbs/ton of OutPace® FA during a 43-day period.

Variable	Trt 1: 2.5 lbs/ton of OutPace® with AB phase 1,2 and 4	Trt 2: 5.0 lbs/ton of OutPace® without AB	p value
Start Wt, lb	11.992	11.958	0.92
D 22 Wt, lb	23.89	23.49	0.58
D 43 W, lb	49.84	48.05	0.40
Day 0-22			
ADG	0.528	0.524	0.81
ADFI	0.628	0.640	0.43
F/G	1.19	1.22	0.37
Day 0-43			
ADG	0.87	0.84	0.07
ADFI	1.20	1.18	0.40
F/G	1.38 ^c	1.41 ^d	0.06

Table 6: Exp 2: Overall performance of nursery pigs fed diets containing AB and 2.5 lbs/ton OutPace® FA vs. pigs fed non-medicated diets containing 5.0 lbs/ton of OutPace® FA (day 0-50).

Variable	Trt 1: 2.5 lbs/ton of OutPace® with AB phase 1,2 and 4	Trt 2: 5.0 lbs/ton of OutPace® without AB	P value
Start Wt, lb	11.992	11.958	0.92
D 50 Wt, lb	60.12	59.04	0.40
Day 0-50			
ADG	0.95	0.94	0.47
ADFI	1.39	1.39	0.74
F/G	1.47	1.47	0.48
Mortality, %*	2.90	0.83	0.13
Savings**, \$/pig		0.45	