and represented 35.8, 0.96, and 2.1% relative abundance, respectively, in pigs fed CON; 23.6, 15.8, and 2.1% relative abundance, respectively, in pigs fed FM; and 9.39, 14.6, and 11.5% relative abundance, respectively, in pigs fed MEPRO. Even at relatively minor dietary inclusion, alterations in protein source can lead to microbial composition shifts in the ileum of weaned pigs.

Key Words: *Lactobacillus*, microbiome, weaned pigs
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301 Evaluation of the lysine requirement of eleven- to twenty-three-kilogram nursery pigs. A. Graham[1,*], B. Knopf[1], L. Greiner[1], M. A. D. Goncalves[2], U. A. D. Orlando[2], J. Connor[3], *[1]Carthage Innovative Swine Solutions, LLC, Carthage, IL, [2]Genus PIC, Hendersonville, TN, [3]Carthage Veterinary Service, Ltd, Carthage, IL*.

A total of 1,200 PIC 337 × 1050 barrows and gilts (11.4 ± 1.4 kg) were placed in a wean-to-finish facility. The 5 dietary treatments were 1.10, 1.20, 1.30, 1.40, and 1.50% SID lysine. Dietary treatments were randomly allotted to pens (25 pigs/pen) blocked by gender and average pen BW. Pigs were started on experimental diets at approximately 11.4 kg BW. Prior to the study, pigs were placed on a common diet that met the lysine requirement based on BW. All diets were corn–soy based and were formulated to meet or exceed NRC (2012) requirements. Pen weights and feed intake information were collected at each phase for calculation of ADG, ADFI, and G:F. Mortalities and removals were weighed and recorded. Data were analyzed as a RCBD using the PROC MIXED procedure of SAS (SAS Inst. Inc., Cary, NC) with pen as the experimental unit, treatment as the fixed effect, and BW block as the random effect. Results were considered significant at $P \leq 0.05$ and a trend at $P > 0.05$ and $P \leq 0.10$. Competing requirement estimation models were quadratic polynomial (QP), broken-line linear (BLL), and broken-line quadratic (BLQ) using PROC NLMIXED. Models that differed in their Bayesian information criterion values by at least 2 points were considered to have meaningful differences in their data fit (Raftery, 1996). There were no significant differences detected in BW at the conclusion of the 21-d study ($P > 0.16$). There were no differences detected in ADG based on dietary treatment ($P > 0.12$). Feed intake was linearly reduced ($P < 0.003$) as SID Lys level increased. Consequently, G:F was linearly improved ($P < 0.02$) as SID Lys increased. For ADG, the QP model was determined to be the best fit ($15.5 + 153.3 \times \text{SID Lys} - 60.6 \times \text{SID Lys}^2$) with an estimated SID Lys requirement of 1.26%. The G:F was best modeled by the linear broken line model ($1/(145.7 + 19.1 \times [1.40 - \text{SID Lys}])$) with an estimated requirement of 1.40% SID Lys. In conclusion, the SID Lys requirement for ADG is 1.26% and G:F is 1.40% in 11- to 23-kg BW pigs.

Key Words: lysine, nursery, pig
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Table 300. Relative abundance of genera (% of total reads) representing >1% of total reads in the ileal digesta of pigs fed ME-PRO or fishmeal

Genus	CON	FM	ME-PRO	SEM	*P*-value
Actinobacillus	4.61	2.39	2.39	2.22	0.687
Campylobacter	10.05	1.76	0.33	4.37	0.234
Escherichia/*Shigella*	0.24	2.32	9.14	4.97	0.421
Lactobacillus	49.71	49.20	36.74	14.06	0.752
Prevotella	8.92	8.16	8.43	6.42	0.996
Unclassified Pasterurellaceae	2.27	3.70	1.36	2.73	0.806

302 Evaluation of Elarom SES in nursery pig diets with or without the inclusion of high zinc oxide or feed antimicrobials. H. E. Williams[1,*], J. C. Woodworth[1], J. M. DeRouchey[1], S. S. Dritz[1], M. D. Tokach[1], K. Hogan[2], S. R. Webster[2], *[1]Kansas State University, Manhattan, [2]Trouw Nutrition USA, LLC., Highland, IL*.

Weaned pigs ($n = 360$; initially 5.2 ± 0.04 kg BW) were used in a 42-d study evaluating the effects of feeding Elarom SES in combination with high levels of ZnO and/or antimicrobials on nursery pig performance and fecal consistency. Elarom SES (Trouw Nutrition USA, Highland, IL) is a commercially available blend of short- and medium-chain fatty acids and slow-release organic acids designed to enhance growth performance and gut health. Pigs were weaned at approximately 21 d and allotted to pens with 9 replications/treatment based on initial BW in a completely randomized design. Experimental treatments were arranged as a 2 × 2 × 2 factorial. The 8 treatment diets included Elarom SES (none vs. 0.2%), additional ZnO (none vs. 3,000 ppm in phase 1, 2,000 ppm in phase 2, and none in phase 3), and antimicrobial regimen (none vs. 440 ppm CTC and 38.5 ppm Denagard in phase 1 and 55 ppm Mecadox in phases 2 and 3). Experimental diets were fed in meal form in 3 phases (Phase 1, d 0 to 7; Phase 2, d 7 to 21; and Phase 3, d 21 to 42). Overall, an Elarom SES × ZnO × antimicrobial interaction was observed for ADG ($P = 0.043$) and G:F ($P = 0.010$). Adding antibiotics to the diet increased ($P < 0.013$) ADG and ADFI, but there were no main effects of ZnO or Elarom SES observed. There were no individual or overall treatment effects ($P > 0.100$) or treatment × day interactions ($P = 0.53$) observed for fecal consistency. In summary, some benefits in performance were observed when adding certain combinations of feed additives in the diet compared with including them alone or when all 3 were fed together.

Key Words: feed additive, growth performance, nursery pig
doi:10.2527/asasmw.2017.302

Table 301. Evaluation of lysine requirement in 11- to 23-kg nursery pigs

	Trt 1	Trt 2	Trt 3	Trt 4	Trt 5		Probability, *P*-value <	
	SID Lys							
	1.1	1.2	1.3	1.4	1.5	SEM	Linear	Quadratic
ADG	0.50	0.52	0.50	0.51	0.49	0.01	0.34	0.12
ADFI	0.76	0.77	0.75	0.74	0.72	0.02	0.003	0.18
G:F	0.663	0.671	0.671	0.695	0.687	0.010	0.02	0.85

Table 302.

	Elarom SES								
	−	+	−	−	+	+	−	+	
	ZnO								
	−	−	+	−	+	−	+	+	
	Antimicrobial								
	−	−	−	+	−	+	+	+	SEM
d 0 to 21									
ADG, g[a,b]	206	195	224	240	242	243	258	268	7.03
G:F[b,c]	0.826	0.808	0.816	0.886	0.859	0.858	0.885	0.890	0.014
d 21 to 42									
ADG, g[a,d]	532	526	478	549	533	507	539	475	15.01
G:F[a,b,d]	0.709	0.706	0.676	0.676	0.698	0.668	0.684	0.631	0.008
d 0 to 42									
ADG, g[b,d,e]	369	360	351	391	388	373	397	372	9.05
G:F[d,e]	0.738	0.731	0.716	0.730	0.741	0.720	0.739	0.705	0.006

[a]ZnO ($P < 0.05$).
[b]Antimicrobial ($P < 0.05$).
[c]Elarom × ZnO ($P < 0.05$).
[d]Elarom SES × antimicrobial ($P < 0.05$).
[e]Elarom SES × ZnO × antimicrobial ($P < 0.05$).

303 Effect of natural feed additives as alternatives to in-feed antibiotics on the performance of nursery pigs.
S. M. Mendoza[1,*], G. R. Murugesan[1], E. Hendel[1], E. Kadas-Toth[2], A. Kovacs[2], *[1]BIOMIN America Inc., San Antonio, TX, [2]BIOMIN Holding GmbH, Getzersdorf, Austria*.

This study was designed to evaluate natural feed additives as alternatives to in-feed antibiotics on nursery pig performance. Natural feed additives used in the present study consist of 1) Biotronic Top3 (a blend of formic, propionic, and acetic acids combined with cinnamaldehyde and permeabilizing complex; BIOMIN Holding GmbH) and 2) Digestarom P.E.P. (a phytogenic blend of oregano, anise, and citrus oil and fructooligosaccharide; BIOMIN Holding GmbH). Weaned pigs (PIC 280 × 1050; $n = 480$; 6.22 ± 1.4 kg BW; 22 d) were housed 10 pigs per pen for a total of 48 pens and assigned within weight blocks to 1 of 4 dietary treatments (12 pens/diet). Pigs were fed 2 phases of experimental diets (0–8 d and 8–22 d after weaning). Diets were corn–soybean meal–dry whey based and contained 4.35 and 4.10 g SID lysine/Mcal ME for phases 1 and 2, respectively. The dietary treatments were 1) basal diet with no additive (NC), 2) NC + 50 ppm carbadox in phase 1 and 50 ppm neomycin + 50 ppm oxytetracycline in phase 2 (PC), 3) NC + 50 ppm carbadox in phase 1 and 0.1% of Biotronic Top3 in phase 2 (C+OA), and 4) NC + 0.1% of Biotronic Top3 + 0.0125% of Digestarom P.E.P. (OA+EO) in both phases. Body weight and feed disappearance were measured weekly. A mixed model was used to examine the effect of diet, weight block was used as the random effect, and multiple comparisons were evaluated using a *t* test. Pigs receiving PC had greater BW (11.19 kg; $P = 0.001$) compared with pigs receiving NC (10.53 kg) but did not differ from pigs receiving C+OA (11.03 kg; $P = 0.382$) and OA+EO (10.85 kg; $P = 0.074$) whereas BW did not differ between pigs receiving OA+EO and pigs receiving NC ($P = 0.100$). Pigs fed PC (226 g/d) and C+OA (215 g/d) had higher ADG compared with pigs fed NC (193 g/d; $P \leq 0.024$), but they did not differ from pigs fed OA+EO (210 g/d; $P \geq 0.101$). Feed intake was not significantly different among groups ($P = 0.242$). The G:F was increased with the addition of antibiotics and/or natural antimicrobials compared with NC (0.805 for PC, 0.771 for C+OA, 0.774 for OA+EO, and 0.722 for OA+EO; $P \leq 0.01$). The present study suggests that Biotronic Top3 can be an effective tool to replace neomycin and oxytetracycline when pigs were previously fed carbadox during the first phase. In addition, the combination of Biotronic Top3 and Digestarom P.E.P. provided a viable natural