

Table 171. Effect of encapsulated butyric acid and copper on weanling pig performance, d 0 to 42

	N	B	C	BC	BPC	SEM
ADG, g	360 ^b	354 ^b	378 ^{ab}	404 ^a	401 ^a	13
ADFI, g	511 ^b	503 ^b	527 ^{ab}	548 ^a	553 ^a	15
G:F, g/kg	703 ^a	705 ^a	718 ^{ab}	737 ^b	723 ^{ab}	22
D 42 BW, kg	20.5 ^b	20.5 ^b	21.5 ^{ab}	22.5 ^a	22.4 ^a	0.6

^{ab}Means within row differ ($P < 0.05$)

Table 172.

	CTC		Bioplus 2B ¹		Poultry Star ¹		SEM	Probability < P
	-	+	-	+	-	+		CTC
d 0 to 42								
ADG, g	424	469	405	482	445	473	13.16	0.001
ADFI, g	644	726	625	727	687	728	16.22	0.001
G:F	0.658	0.645	0.645	0.664	0.648	0.650	0.0003	0.795
BW, kg								
d 42	24.2	25.6	23.6	26.1	24.8	25.8	0.052	0.001

¹No significant interactive or main effects of BioPlus 2B or Poultry Star ($P > 0.05$).

173 Evaluation of dose response effects of Butipearl C on nursery pig growth performance from d 0 to 42 after weaning. J. A. Loughmiller*, A. L. P. De Souza, J. K. Rubach, H. Feng, D. Sanders, V. Mani, F. R. Valdez, M. J. Poss, Kemin Industries, Des Moines, IA.

A study was conducted to evaluate the effects of a novel encapsulated butyric acid plus copper carbonate product (Buti-Pearl C; Kemin Industries, Des Moines, IA) on weanling pig growth performance. A total of 350 pigs (PIC 280 × 1050; initial BW = 5.86 kg) with 10 pigs/pen and 7 replicate pens/treatment were used in a 42 d study. Pigs were housed in a commercial research nursery and allocated in a randomized, complete block design based on initial BW. Diets were pelleted, corn-soybean meal based and were similar within phase except for the addition of the ButiPEARL C (BPC). All nutrient concentrations met or exceeded NRC (2012) requirement estimates. Treatments were arranged as a dose titration of BPC at 0, 250, 500, 750, and 1000 mg/kg of feed. Data were analyzed using a mixed model with orthogonal contrasts. During d 0-7 after weaning, ADG and G:F tended to increase as pigs were fed diets containing up to 500 and 750 mg/kg of BPC, respectively (quadratic, $P < 0.07$). During the same period, ADFI increased when diets containing up to 500 mg/kg of BPC were fed (quadratic, $P < 0.05$). From d 7 to 21, no linear or quadratic effects were observed for ADG, ADFI, or G:F ($P > 0.40$). During d 21 to 42, ADG and G:F increased as pigs were fed diets containing up to 1000 mg/kg BPC (quadratic, $P < 0.01$). During this same period, ADFI increased as pigs were fed diets containing BPC levels up to 1000 mg/kg (quadratic, $P < 0.05$). Overall results (d 0 to 42) showed improved ADG, G:F, and final BW for pigs fed diets with up to 750

mg/kg BPC (quadratic, $P < 0.05$). Overall ADFI increased in pigs fed diets containing up to 1000 mg/kg BPC (linear, $P < 0.04$). These results indicate that pig growth performance was optimized when they were fed diets containing up to 750 mg/kg BPC from d 0 to 42 after weaning.

Key Words: butyric acid, copper, nursery pigs
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174 Effects of dietary lysine level and amino acid ratios on nursery pig performance. A. B. Clark^{1,*}, M. D. Tokach¹, J. M. DeRouchey¹, S. S. Dritz¹, J. C. Woodworth¹, R. D. Goodband¹, K. J. Touchette², M. Allerson³, ¹Kansas State University, Manhattan, ²Ajinomoto Heartland, Inc., Chicago, IL, ³Holden Farms Inc., Northfield, MN.

A total of 2268 pigs (PIC 327×L42, initially 7.3 kg BW) were used in a 28-d growth study with 54 pigs/feeder (experimental unit) and 6 replications/treatment. Pigs were randomly allotted to pens at weaning and fed a common starter diet for 8 d. Pens were then blocked by BW and allotted to 1 of 7 dietary treatments in a randomized complete block design. Treatments were arranged in a [2 × 3]+1 factorial with 2 levels of standardized ileal digestible (SID) Lys, low (1.25%) and high (1.35%), and 3 SID amino acid (AA) ratios relative to Lys (industry, 95% of maximum performance, and maximum performance), as well as a control (1.35% SID Lys). Industry ratios were 55% Met+Cys:Lys, 62% Thr:Lys, 18% Trp:Lys, 65% Val:Lys, and 52% Ile:Lys. Maximum diet ratios were 60% Met+Cys:Lys, 65% Thr:Lys, 21% Trp:Lys, 72% Val:Lys, and 52% Ile:Lys. The 95% ratios were formulated to target 95% of maximum performance and were 56% Met+Cys:Lys, 62% Thr:Lys, 19% Trp:Lys, 67% Val:Lys, and 52% Ile:Lys. Diets

Table 173. Effect of increasing BPC supplementation on pig performance, d 0 to 42 after weaning

	Dietary ButiPEARL C, mg/kg					SEM	Contrast ($P <$)	
	0	250	500	750	1000		Linear	Quadratic
ADG, g	389	397	408	414	417	9	0.01	0.01
ADFI, g	546	547	564	563	567	12	0.04	0.11
G:F, g/kg	710	725	721	737	735	15	0.01	0.01
D 42 BW, kg	22.1	22.5	23.0	23.3	23.4	0.4	0.01	0.01

Table 174.

Item:	Control	Low Lys			High Lys			SEM	Probability, $P <$
		Industry AA	95% AA	Max AA	Industry AA	95% AA	Max AA		Low vs. High Lys
d 0 to 14									
ADG, g	369 ^{ab}	346 ^c	361 ^{b,c}	370 ^{a,b}	379 ^a	384 ^a	362 ^b	6.9	0.001
ADFI, g	451 ^b	451 ^b	467 ^{a,b}	465 ^{a,b}	461 ^{a,b}	472 ^a	456 ^{a,b}	9.2	0.692
G:F	0.819 ^{ab}	0.769 ^c	0.774 ^c	0.797 ^{a,b,c}	0.823 ^a	0.814 ^{ab}	0.794 ^{b,c}	0.0099	0.001

^{ab,c} Means within a row with differing superscripts differ $P < 0.05$.

were formulated to Ile requirement with feed-grade Lys, Met, Thr, Trp, and Val added. The control contained less feed-grade AA (0.39% L-Lys HCl vs. 0.50-0.55% in other diets) and 5% fermented soy protein to achieve similar soybean meal level to high SID Lys diets. Experimental diets were formulated using analyzed AA for corn, soybean meal, and dried distillers grains with solubles and fed for 14 d in meal form. Pigs were weighed and feed disappearance was measured on d 0, 7, and 14. Data were analyzed using PROC GLIMMIX. From d 0 to 14, feeding high Lys diets increased ($P < 0.001$) ADG and G:F compared with low Lys diets with no evidence for differences in ADFI between Lys level. Furthermore, for ADG, maximum AA ratios improved ($P < 0.05$) performance compared to industry ratios at low Lys, but not at high Lys levels. In conclusion, higher AA ratios were more critical in diets formulated below the Lys requirement of the pig.

Key Words: AA ratios, lysine, nursery pigs
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175 Evaluation of dietary phytonics on growth performance, carcass characteristics, and economics of grow-finish pigs housed under commercial conditions. J. A. Soto^{*1}, M. D. Tokach¹, G. R. Murugesan², S. S. Dritz¹, J. C. Woodworth¹, J. M. DeRouche¹, R. D. Goodband¹, ¹Kansas State University, Manhattan, ²BIOMIN America Inc., San Antonio, TX.

A total of 1245 pigs (PIC 327 × 1050, initially 22.1 kg) were used in a 125-d trial to determine the effects of 2 dietary essential oil mixtures on growth performance, carcass characteristics, and economics of finishing pigs. Pens of 27 or 28 pigs were randomly assigned to 1 of 5 dietary treatments with 9 replications/treatment with treatments fed in 6 phases. Treatment 1 was the control with no feed additives. Treatment 2 contained essential oil mixture 1 (EOM 1) in all phases.

Treatment 3 contained EOM 1 fed from phase 3 to 6 and essential oil mixture 2 in all phases (EOM 1+2). Treatment 4 contained EOM 1 in all 6 phases. Treatment 5 contained Ractopamine HCl (RAC) in phase 6. Treatments 1–3 and 4–5 had 12% and 16% CP (0.66 and 0.90% Standardized ileal digestible Lys, respectively) in phase 6 diets, respectively. Overall (d 0 to 125), pigs fed diets with EOM 1+2 had increased ($P = 0.003$) ADFI compared with pigs fed the control diet. Pigs fed EOM 1 + 16% CP had increased ($P = 0.032$) ADFI compared with pigs fed RAC. Pigs fed RAC had increased ($P = 0.027$) G:F compared with pigs fed EOM 1 + 16% CP. Pigs fed EOM 1+2 had heavier ($P < 0.05$) HCW compared with pigs fed the control treatment or EOM 1 + 12% CP. Pigs fed RAC had reduced ($P = 0.001$) backfat thickness and increased ($P = 0.001$) percentage lean, and greater ($P < 0.030$) income over feed cost (IOFC) compared with pigs fed EOM 1 + 16% CP. In summary, while ADG was not affected in this study, pigs fed RAC had the greatest G:F and IOFC. The addition of EOM 1+2 increased HCW similar to those fed RAC with EOM 1 + 16% CP being intermediate. Additional research to confirm these responses to essential oil additions is warranted.

Key Words: essential oils, feed additives, phytonics
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176 Effect of feeding varying levels of *Lactobacillus plantarum* on nursery pig performance.

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A total of 360 pigs (PIC C-29 × 359, initial BW 5.95 ± 0.007 kg) were used in a 42-d trial evaluating the effects of feeding varying levels of *Lactobacillus plantarum* on nursery pig performance. Pigs were weaned at 18 to 20 d and allotted to pens based on initial BW and gender to 1 of 4 dietary treatments in a completely randomized design with 10 pigs