

Table 312.

Variable	Dietary protein source					Pooled SEM
	SPC	SDBP1	SDBP2	SDPP1	SDPP2	
ADG, g ¹	119	176	169	172	175	6.01
ADFI, g ^{1,2}	177	208	211	244	236	6.14
Gain:feed ^{1,2}	0.67	0.84	0.80	0.70	0.73	0.02
Final BW, kg ¹	8.48	9.26	9.20	9.24	9.25	0.14

¹ SPC versus average of all other treatments, $P < 0.05$.² Average of SDBP versus SDPP, $P < 0.05$.

Weaned pigs (average age at weaning, 21 ± 2 d; average BW at weaning, 6.8 ± 0.9 kg) were fed one of five dietary treatments for 14 d after weaning to determine if pig performance variables were affected by diets containing two separate manufacturing lots of either 6.0% spray-dried bovine plasma (SDBP1, SDBP2) or 6.0% spray-dried porcine plasma (SDPP1, SDPP2) compared to a control diet containing 9.65% soy protein concentrate (SPC). All diets were fed ad libitum in mash form and were formulated to contain 1.45% SID lysine and 3.41 Mcal ME/kg. Diets were nonmedicated and contained corn, soybean meal, dried whey, and SPC or the spray-dried plasma source. Pigs were weaned as two separate groups approximately two weeks apart into two different uncleaned nursery rooms to create additional stress at weaning. There were a total of 11 pens (5–6 pigs/pen) assigned per dietary treatment. No pigs died or were removed from the study. Data variables reported in Table 312 are least squares means for dietary treatment. Treatment comparisons of SPC versus average response of all other treatments or average response of pigs fed diets with SDBP versus that of pigs fed diets with SDPP are shown in the table. Pigs fed diets with SDBP or SDPP had higher ($P < 0.05$) ADG, ADFI, gain:feed, and final BW than pigs fed the control SPC diet. ADG and final BW of pigs fed diets with either SDBP or SDPP were not different ($P > 0.10$). Pigs fed diets with SDPP had higher ($P < 0.05$) ADFI than pigs fed diets with SDBP, while gain:feed of pigs fed diets with SDBP was improved compared to pigs fed diets with SDPP. In conclusion, average final BW of pigs fed diets with either SDBP or SDPP for 14 days postweaning was approximately 0.7 kg greater than that of pigs fed the diet with SPC.

Key Words: pigs, spray-dried bovine plasma, spray-dried porcine plasma

- 313 Effect of different levels of fiber and protein on growth performance and fecal characteristics of weaned pigs.** H. L. Li^{1,*}, M. K. Jung¹, M. M. Hossain¹, M. C. Nyachoti², I. H. Kim¹, ¹Department of Animal Resource and Science, Dankook University, Cheonan, South Korea, ²University of Manitoba, Winnipeg, MB, Canada

A total of 96 weanling pigs (7.4 ± 1.2 kg) were used in a 5-wk growth assay to determine the growth performance, fecal score, fecal microbial shedding, and ammonia emissions with dietary manipulation of fiber and protein content. Pigs were

allotted to dietary treatments based on their BW in a 2×2 factorial, with main effects of fiber concentration (low = 65 and 125 g/kg in phases 1 and 2 and high = 100 and 140 g/kg in phases 1 and 2) and CP concentration (low = 170 g/kg vs high = 200 g/kg). There were 6 pigs/pen and 4 pens/treatment. The composite fecal sample (1 g) from each pen was diluted with 9 mL of 1% peptone broth and homogenized. The *E. coli* and lactobacilli colonies were counted immediately after removal from the incubator, and lactobacilli:*E. coli* ratio (L:C) was calculated. A gas sampling pump (Gastec Corp., model GV-100; Gastec detector tube No. 3M and 3La for NH₃) was utilized for gas detection. All data were analyzed according to a 4×4 replicated Latin square design using the GLM procedure of SAS (SAS, Cary, NC), with pen serving as the experimental unit. Treatment differences were considered significant at a level of 0.05. During the first phase of this experiment, pigs fed a high protein and high fiber diet grew faster ($P < 0.05$) than controls, and pigs fed a high fiber and low protein diet consumed more ($P < 0.05$) than control pigs during the second phase. There was no difference ($P > 0.05$) in fecal score among the treatments, but feces taken from pigs fed high fiber had lower ($P < 0.05$) concentrations of *E. coli* and a higher L:C ratio ($P < 0.05$). Ammonia in the feces was increased ($P < 0.05$) continuously from d 1 to 5 and decreased ($P < 0.05$) after d 5 of the experiment. The level of ammonia was higher ($P < 0.05$) in the feces of pigs fed high protein and high fiber diet ($P < 0.05$) compared with control pigs. In conclusion, the results of this study indicate that dietary manipulation influences bacterial counts and ammonia emission in the feces as well as growth performance during the postweaning period. Thus, high protein and moderate fiber content in the diet may have beneficial effects for weaning piglets.

Key Words: fiber, protein, weanling pigs

- 314 Evaluation of different zinc sources and levels on nursery pig performance.** K. E. Jordan*, M. A. Goncalves, S. Nitikanchana, M. D. Tokach, S. S. Dritz, R. D. Goodband, J. M. DeRouchey, J. C. Woodworth, Kansas State University, Manhattan

Zinco+ (Jefo, Quebec, Canada) is an encapsulated ZnO that when added to diets at 500 ppm is suggested to elicit performance advantages similar to 3,000 ppm Zn from ZnO. To test this hypothesis, 294 pigs (PIC 327 $\times$ 1050, initially 6.4 kg BW) were used in a 31-d trial to evaluate the effects of different Zn sources on nursery pig performance. Pigs were weaned at 21 d of age and fed pelleted diets for 7 d and a mash diet for the remainder of the 31-d trial. Each treatment had 7 replicate pens with 7 pigs per pen. All diets contained 110 ppm Zn from ZnSO₄ from the trace mineral premix. The 6 experimental diets included a control diet, the control with 390 or 1,390 ppm added Zn from Zinco+, and the control with 390, 1,390, or 2,890 ppm added Zn from ZnO. From d 7 to 21, adding dietary Zn from Zinco+ tended to increase (linear; $P = 0.06$) ADG and

Table 314.

Item	Total added Zn, ppm						SEM
	Control	Zinco +			ZnO		
	110	500	1,500	500	1,500	3,000	
d 7 to 21							
ADG, g	261	274	302	271	315	346	21.2
G/F	0.615	0.658	0.682	0.656	0.700	0.694	0.02
d 0 to 31							
ADG, g	303	311	319	318	332	347	10.5
G/F	0.617	0.636	0.634	0.643	0.644	0.642	0.01

improved (linear; $P < 0.01$) G:F. Increasing Zn from ZnO increased (linear; $P < 0.01$) ADG and ADFI and improved (quadratic; $P = 0.02$) G:F. Pigs had greater ($P < 0.01$) ADG and ADFI when 2,890 ppm Zn from ZnO was fed compared with pigs fed 390 ppm Zn from Zinco+. Day 21 BW increased linearly with increasing Zn from Zinco+ ($P < 0.03$) and Zn from ZnO ($P < 0.001$), with pigs fed 2,890 ppm Zn from ZnO having heavier ($P < 0.01$) BW compared with those fed 390 ppm of Zn from Zinco+. Overall (d 0 to 31), increasing Zn from Zinco+ did not affect growth performance, but increasing Zn from ZnO increased ($P < 0.01$) ADG and ADFI. Pigs fed 390 ppm of Zn from Zinco+ had poorer ADG ($P < 0.02$) and ADFI ($P < 0.01$) than pigs fed 2,890 ppm of Zn from ZnO. This study shows the growth promoting benefits of adding high levels of Zn from ZnO in diets fed to newly weaned pigs. Lower levels of Zn from Zinco+ did not elicit the same growth-promoting response as 2,890 ppm of Zn from ZnO.

Key Words: growth performance, nursery pig, zinc

315 Response of weaned pigs to spray-dried porcine plasma and feed-grade antibiotics compared with antibiotic-free vegetarian diet supplemented with 3 different levels of a source of phytonutrients.

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The objective of this study was to compare growth promoting properties of dietary spray-dried porcine plasma (SDPP) and feed grade antibiotics (Chlortetracycline and Denagard) as a positive control (PC), with a vegetarian diet without any antibiotics or SDPP as a negative control (NC), with NC that had three levels of a blend of phytonutrients Natures Fuel (NF) added: the dietary levels were NF1 = 2,270 g/t, NF2 = 4,540 g/t, and NF3 = 6,810 g/t. Experiment 1 involved 1,334 pigs weighing 4.8 kg and lasted for 49 days; Experiment 2 involved 1,270 21-d old pigs weighing 5.1 kg and lasted for 37 days. In Experiment 1 pigs were diagnosed with *E. coli* scours 3 weeks on trial, which required water medication (Amoxicillin) on day 21, and in Experiment 2 pigs had therapeutic water medication (Amoxicillin) from day 0. A commercial wean-finish barn was used (33 pigs/pen, 8 pens/treatment) with a FANCOM feed system. Mixed model equations methods in SAS v9.3 PROC MIXED for repeated measurements

Table 315. Summary of performance from Experiments 1 and 2

	Experiment 1					
	PC	NC	NF1	NF2	NF3	SEM
ADG, g/d	413 ^a	358 ^b	367 ^b	359 ^b	341 ^b	9
ADFI, g/d	636 ^a	563 ^b	568 ^b	563 ^b	536 ^b	9
FCR	1.64 ^a	1.63 ^a	1.56 ^b	1.57 ^b	1.47 ^b	0.07
	Experiment 2					
	PC	NC	NF1	NF2	NF3	SEM
ADG, g/d	313 ^a	295 ^{a,b}	291 ^{a,b}	273 ^b	263 ^b	9
ADFI, g/d	468 ^a	440 ^{a,b}	468 ^a	431 ^{a,b}	390 ^c	18
FCR	1.50 ^a	1.54 ^a	1.57 ^a	1.57 ^a	1.43 ^a	0.06

was used, and the results are in Table 315. In Experiment 1 PC consumed more feed and grew faster than all other treatments ($P < 0.05$). NF1 had a numerically greater ADG than NC, and NF treatments improved FCR ($P < 0.05$), but NF3 reduced ADFI, which caused reduced ADG. In Experiment 2 there was no difference in ADG or ADFI between PC and NC. ADFI was numerically increased by NF1 over NC, and being equal to PC, but ADFI were numerically reduced by NF2 and significantly by NF3 ($P < 0.05$). Careful use of phytonutrients can improve performance in antibiotic free diets, but high levels can negatively affect performance.

Key Words: feed grade antibiotics, pigs, plant extracts, plasma

316 Response of weaned pigs to spray-dried porcine plasma and feed-grade antibiotics compared with antibiotic-free diets supplemented with polyclonal IgY antibodies (Wean Right) and plant extracts (Natures Fuel).

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The objective of this study was to compare growth promoting properties of dietary spray-dried porcine plasma (SDPP) and feed grade antibiotics (Ab = Chlortetracycline and Denagard as a positive control PC) with a negative control diet (NC) without SDPP or Ab. The experiment involved 2,651 twenty-one-d-old weaned pigs housed in two commercial wean-finish barns (33 pigs/pen, 8 pens/treatment) with FANCOM feed weighing system. Feed treatments were added to a NC diet consisting of polyclonal IgY antibodies derived from hyperimmunized whole eggs (WR = Wean Right™) and plant extracts (NF = Natures Fuel™) to 21 d postweaning. Ten experimental diets in an incomplete factorial design were arranged in a 2 × 3 factorial (3 levels of WR and 3 levels of NF added to the NC diet), and two treatments were tested for additivity of WR and NF. Due to veterinarian diagnosed *E. Coli* scour in both barns, Barn 2 was water medicated with Amoxycillin from d 8 to 18. Data were analyzed using Proc. GLM from Minitab. Summary results from days 7 to 21 are shown in Table 316. There was no effect of treatment from d 0 to 7 on ADG and ADFI ($P > 0.05$). Water medica-