772 Bacteria composition, richness and diversity differ in colon digesta of piglets fed diets with different levels of protein and challenged with *Escherichia coli* K88. F. O. Opapeju*[1], R. L. Payne[2], D. O. Krause[1], and C. M. Nyachoti[1], [1]*University of Manitoba*, *Winnipeg, MB, Canada*, [2]*Evonik-Degussa Corporation*, *Kennesaw, GA*.

Feeding excessive amount of protein to weaned pigs will increase the amount of undigested protein reaching the hindgut and may alter the types and the number of bacteria in the hind gut. Forty piglets (average BW = 5.32 ± 0.24 kg) were used to investigate the effect of dietary CP level on microbial composition, richness and diversity in piglets challenged with enterotoxigenic *Escherichia coli* K88 in a 14-d study. Pigs were housed in groups of 4 pigs per pen and were randomly allotted to 2 diets (5 pens/diet) immediately after weaning. Diet 1 contained 22.5% CP and diet 2 contained 17.6% CP supplemented with amino acids. The diets contained the same amount of ME and standardized ileal digestible Lys, Met + Cys, Thr, Trp, Ile and Val based on the ideal protein ratio. Pigs had unlimited access to feed and water throughout the experimental period. On d 8 after weaning, pigs received 6 mL of *E. coli* K88 suspension (10^{10} cfu/mL) by gavage. Thirty pigs were serially slaughtered on -1, 3 and 7 d post-challenge (5 pigs/diet/day of slaughter). Colon contents were analyzed for microbial profile and diversity indices using terminal restriction fragment length polymorphism. Pigs fed the 17.6% CP diet had a higher ($P < 0.05$) proportion of order Clostridiales (73 vs. 50%), family Lachnospiraceae (43 vs. 18%), and genus Roseburia (13 vs. 3%) 7 d after challenge compared with those fed the 22.5% CP diet. Pigs fed the 17.6% CP diet had lower ($P < 0.05$) richness and diversity compared with those fed the 22.5% CP diet at -1, 3 and 7 d post-challenge. The results show that a reduction in dietary CP level from 22.5 to 17.6% with amino acid supplementation altered the hind gut microbial profile 7 d post-challenge and reduced the microbial richness and diversity before and after challenge.

Key Words: Microbial Profile, Protein, Weaned Pigs

773 Value of spray-dried egg in pig nursery diets. M. Song*[1], B. G. Harmon[2], M. T. Che[1], M. U. Steidinger[3], and J. E. Pettigrew[1], [1]*University of Illinois*, *Urbana*, [2]*Railsplitter Feed Technology*, *Wildwood, MO*, [3]*Swine Nutrition Services, Inc.*, *Forrest, IL*.

A study was conducted to verify the nutrient contributions of a spray-dried egg (SDE) product containing only unfertilized eggs and to assess potential physiological benefits. Weaned pigs (n=1007, 6 kg, 20 d of age) were used in a randomized complete block design with pen as the experimental unit. There were 4 rooms with 12 pens/room and 21 pigs/pen. There were 3 weight blocks within each room and each weight block had 4 pens with the same number of barrows and gilts. The treatments were formulated to the same ME and standard ileal digestible (SID) AA levels and were: 1a) 6% spray-dried animal plasma (SDAP) (CON A), 1b) CON A + 6% SDE (SDE A), 2a) 3% SDAP (CON B), and 2b) CON B + 6% SDE (SDE B). There was a 4-stage feeding program with declining diet complexity and with phases of 1, 1, 2, and 2 wk, respectively. ADFI, ADG, G:F, removal rate (REM), and frequency of medical treatments per pen and day (MED) were measured. During phase 1 only, pigs fed A treatments or SDE treatments had higher ($P<0.01$) ADFI and lower ($P<0.05$) MED than pigs fed B treatments or CON treatments. Pigs fed B treatments had higher ($P<0.05$; phase 3) ADFI and ADG and lower ($P<0.05$; phase 3 and overall) MED than pigs fed A treatments. During the overall experiment, there was a tendency ($P=0.06$) for a reduction in MED with SDE. In conclusion, SDE provides bioavailable nutrients to nursery pig performance and may provide physiological benefits to the health of nursery pigs.

Table 1. Growth performance and health

Period	Treat	Pigs	ADFI,g	ADG,g	G:F	REM,%	MED,%
Phase 1	CON A	251	170	117	0.684	0.39	1.02
	SDE A	252	185	124	0.672	0	0.56
	CON B	252	157	110	0.696	0	1.64
	SDE B	251	174	114	0.658	0	0.90
SE			14	21	0.08	0.68	1.21
A vs. B & CON vs. SDE		*P*	<0.01	NS	NS	NS	<0.05
Overall	CON A	237	540	337	0.625	5.95	1.05
	SDE A	236	548	342	0.624	6.34	0.98
	CON B	241	541	338	0.626	4.36	0.95
	SDE B	246	557	344	0.618	2.00	0.68
SE			34	22	0.01	4.43	0.68
CON vs. SDE		*P*	NS	NS	NS	NS	0.06

NS: No significant difference; 12 pens/treatment

Key Words: Spray-Dried Egg, Nursery Pigs, Performance

774 The use of dried bacterial cells in nursery pig diets. R. B. Hinson*[1], J. L. Usry[2], A. M. Gaines[3], and G. L. Allee[1], [1]*University of Missouri*, *Columbia*, [2]*Ajinomoto Heartland LLC*, *Chicago, IL*, [3]*The Maschhoffs Inc.*, *Carlyle, IL*.

Two studies were conducted to evaluate the use of dried bacterial cells (DBC) in nursery pig diets. Dried bacterial cells are yeast cell bodies that remain after the production of synthetic amino acids. In Exp. 1, 528 newly weaned pigs (TR-4 × C22; Initial BW = 5.5 kg) were randomly allotted to treatments consisting of 0, 1, 2, or 3% DBC with 22 pigs/pen. In the diets containing DBC, blood cells and poultry by-product meal were replaced by DBC. Growth performance was evaluated during three dietary phases: Ph. 1 (d 0-7), Ph. 2 (d 7-14), and Ph. 3 (d 14-24). Diets were formulated to contain 1.60, 1.50, and 1.55% total lysine in ph. 1-3, respectively. In Exp. 2, 560 newly weaned pigs (TR-4 x C22; Initial BW = 5.3 kg) were randomly allotted to treatments consisting of 0, 1, 2, or 3% DBC with 22 pigs/pen. In the diets containing DBC, fishmeal was partially replaced by DBC. Growth performance was evaluated during four dietary phases: Ph. 1 (d 0-7), Ph. 2 (d 7-14), Ph. 3 (d 14-21), and Ph. 4 (d 21-42). Diets were formulated to contain 1.43, 1.43, 1.42%, and 1.31% TID lysine in ph. 1-4, respectively. During ph. 4, all treatments received a common diet. In Exp. 1, overall ADG (295, 308, 313, and 299 g/d) and F:G (1.30, 1.28, 1.32, and 1.36) were not affected ($P > 0.05$) by the use of DBC. Overall, a linear increase ($P < 0.03$) in ADFI and a linear improvement ($P < 0.02$) in F:G were observed with increasing DBC inclusion. In Exp. 2, d 0-21 ADG (272, 272, 272, and 259 g/d) and F:G (1.32, 1.34, 1.33, and 1.34) were unaffected ($P > 0.05$) by the inclusion of DBC. Additionally, overall d 0-42 ADG (435, 440, 435, and 435 g/d) and F:G (1.41, 1.41, 1.43, and 1.42) were unaffected by the inclusion of DBC. These data would suggest that at least 3% inclusion of dried bacterial cells can be used in nursery pig

diets replacing other high quality protein ingredients without affecting growth performance..

Key Words: Dried Bacterial Cells, Nursery Pigs

775 Effects of increasing true illeal digestible lysine/metabolizable energy ratios on gilts grown in a commercial finishing environment. N. W. Shelton*, M. D. Tokach, S. S. Dritz, R. D. Goodband, J. L. Nelssen, and J. M. DeRouchey, *Kansas State University*, *Manhattan*.

Two four-week experiments were conducted to determine the effects of increasing true illeal digestible (TID) Lys:ME ratio on performance of growing and finishing gilts. All diets were corn-soybean meal based and contained 0.15% L–Lysine HCl and 3% added fat. Desired Lys levels were achieved by altering the corn and soybean meal level in the diet. Each experiment consisted of six treatments with seven replications per treatment and approximately 27 pigs per pen. In Exp. 1, 1,085 gilts (PIC, initially 38.2 kg) were fed TID Lys:ME ratios of 2.01, 2.30, 2.58, 2.87, 3.16, or 3.45 g/Mcal. Both ADG (0.82, 0.87, 0.93, 0.95, 0.97, and 0.97 kg/d) and G:F (0.42, 0.45, 0.48, 0.49, 0.51, and 0.51) improved (quadratic, P<0.003) with increasing the TID Lys:ME ratio and optimal performance was reached at the TID Lys:ME ratio of 3.16 g/Mcal. Increasing the TID Lys:ME ratio resulted in increased daily TID Lys intake (linear, P<0.001) and TID Lys intake per kg of gain (16.8, 18.0, 18.9, 20.3, 21.8, and 23.5 g, quadratic, P<0.001). In Exp. 2, 1,080 gilts (PIC, initially 84.1 kg) were fed TID Lys:ME ratios of 1.55, 1.75, 1.95, 2.05, 2.35, or 2.55 g/Mcal. As TID Lys:ME ratio increased, ADG (0.83, 0.87, 0.87, 0.93, 0.95, and 0.98 kg/d) and G:F (0.33, 0.34, 0.35, 0.37, 0.37, and 0.39) improved (linear, P<0.001) through the highest lysine/ME level of 2.55 g/Mcal. Increasing TID Lys:ME ratio also increased (linear, P<0.001) daily TID Lys intake and TID Lys intake per kg of gain (16.58, 18.08, 19.65, 20.44, 22.05, and 22.98 g). It appears that the optimal Lys level to meet the biological needs of the pig may have increased compared to previous research conducted in the same facility (Main et al., 2002).

Key Words: Lysine, Finishing Pigs, Growth

776 Effects of feeding excess crude protein on growth performance and carcass traits in finishing pigs. S. M. Williams*, J. D. Hancock, C. Feoli, S. Issa, and T. L. Gugle, *Kansas State University*, *Manhattan*.

A total of 176 pigs (88 barrows and 88 gilts with an average initial BW of 95 kg) were used in a 33-d experiment to determine the effects of excess dietary CP on growth performance and carcass measurements in finishing pigs. The pigs were sorted by ancestry and blocked by BW with 11 pigs/pen and four pens/treatment. Treatments were corn-soybean meal-based and formulated to 12, 14, 16, and 18% CP. Feed and water were consumed on an ad libitum basis until the pigs were slaughtered (average final BW of 125 kg) at a commercial abattoir. Increasing CP concentration in the diet had no effect on ADG ($P > 0.41$), ADFI ($P > 0.20$), G:F ($P > 0.24$), and hot carcass weight ($P > 0.20$). With hot carcass weight used as a covariate, there were linear decreases in dressing percentage ($P < 0.02$) and loin depth at the last rib ($P < 0.05$) as crude protein concentration in the diet was increased from 12 to 18%. However, fat thickness at the last rib and percentage carcass lean were not affected ($P > 0.34$) as crude protein concentration in the diet was increased. For diets with 12, 14, 16, and 18% CP, ADG was 944, 927, 921, and 936 g/d, ADFI was 2.86, 2.85, 2.83 and 2.79 kg/d, G:F was 330, 325, 325, and 336 g/kg, hot carcass weight was 92.6, 91.6, 91.0, and 91.7 kg, dressing percentage was 73.6, 73.3, 73.1, and 73.2%, loin depth was 6.4, 6.2, 6.2, and 6.1 cm, last rib backfat thickness was 19, 19, 19, and 19 mm, and percentage carcass lean was 55.0, 54.5, 54.5, and 54.4, respectively. Our results indicate that increasing CP in diets for pigs during late finishing from 12 to 18% does not affect growth performance or carcass leanness with only a small negative effect on dressing percentage.

Key Words: Pig, Protein, Growth

777 Effects of organoleptic properties of the feed and diet complexity on nursery pig performance. R. C. Sulabo*[1], J. M. DeRouchey[1], M. D. Tokach[1], C. D. Risley[2], R. D. Goodband[1], S. S. Dritz[1], and J. L. Nelssen[1], [1]*Kansas State University*, *Manhattan*, [2]*Lucta USA Inc.*, *Northbrook, IL*.

A total of 480 weanling pigs (6.6 kg and 20 ± 2 d, PIC) were allotted to one of eight treatments using a randomized complete block design with exposure to the flavor in the creep feed (no vs. yes), diet complexity (complex vs. simple), and flavor in the nursery diets (no vs. yes) as treatment factors. Each treatment had six pigs per pen and ten replications. Experimental diets were the combinations of complex or simple diets with or without the flavor for Phase 1 (d 0 to 10) and 2 (d 10 to 28). Diets with the flavor were supplemented with Luctarom® at 1500 and 1000 ppm in Phase 1 and 2 diets, respectively. A tendency for a three-way interaction for ADG from d 5 to 10 ($P<0.11$), d 10 to 28 ($P<0.09$), and d 0 to 28 ($P<0.06$) were observed. Post-weaning ADG of pigs exposed to the flavor in creep feed and fed flavored-complex diets were greater than any other treatment combination. Increasing diet complexity increased ($P<0.01$) ADG, ADFI, and G:F during both phases. Adding flavor in the creep feed had no effect on G:F ($P>0.34$) and pig BW ($P>0.45$) in both periods post-weaning. Adding Luctarom to starter diets tended to improve ADFI ($P<0.06$; 163 vs. 154 g) during d 0 to 5. In conclusion, pre-weaning exposure to Luctarom® improved post-weaning daily gain of pigs fed complex diets supplemented with the same flavor, but did not influence performance of pigs fed simple diets.

Table 1. Interactive effects of flavors and diet complexity on nursery performance.

Flavor in Creep:	No				Yes				
Diet Complexity:	Simple		Complex		Simple		Complex		
Flavor in Nursery:	No	Yes	No	Yes	No	Yes	No	Yes	SED
D 0 to 10									
ADG, kg	0.18	0.19	0.24	0.24	0.17	0.17	0.24	0.27	0.01
ADFI, kg	0.20	0.20	0.25	0.25	0.18	0.18	0.24	0.26	0.01
G:F	0.95	0.96	0.99	0.99	0.95	0.94	0.98	1.04	0.03
D 0 to 28									
ADG, kg	0.37	0.38	0.43	0.42	0.38	0.37	0.42	0.44	0.01
ADFI, kg	0.48	0.49	0.57	0.56	0.48	0.47	0.55	0.57	0.02
G:F	0.77	0.79	0.76	0.76	0.79	0.78	0.77	0.77	0.01

Key Words: Flavor, Nursery, Diet Complexity

778 Effects of adding an enhanced flavor to the creep feed on the proportion of piglets consuming creep feed and pre-weaning performance. R. C. Sulabo*[1], J. M. DeRouchey[1], M. D. Tokach[1], C. D. Risley[2], R. D. Goodband[1], S. S. Dritz[1], and J. L. Nelssen[1], [1]*Kansas State University*, *Manhattan*, [2]*Lucta USA Inc.*, *Northbrook, IL*.

A total of 50 sows (PIC Line 1050) were used in the study to determine the effects of adding an enhanced flavor to the diet on the proportion of piglets consuming creep feed within litters and pre-weaning performance. Sows were blocked according to parity and date of farrowing and were allotted to two experimental treatments using a randomized complete block design. Treatment 1 was a creep diet with no flavor (Control) and Treatment 2 was the Control diet with the enhanced flavor (Luctarom®) included at 1500 ppm. Both creep diets contained 1.0% chromic oxide and were offered *ad libitum* from d 18 until weaning (d 21) using a rotary creep feeder with hopper. A single lactation diet (3,503 kcal ME/kg, 0.97% TID Lys) was used, and sows were allowed free access to feed throughout lactation. Fecal samples from all piglets were taken twice using sterile swabs between 3 and 12 h before weaning. Piglets were categorized as ′eaters′ when the fecal sample was colored green at least once on any of the two samplings. Litter weaning weights (66.7 vs. 66.5 kg; *P*>0.94), total gain (8.9 vs. 8.8 kg; *P*>0.77), and daily gain (3.0 vs. 2.9 kg; *P*>0.77) were not different between litters fed creep with and without the enhanced flavor. For individual pigs, weaning weight (6.5 vs. 6.6 kg; *P*>0.53), total gain (0.87 vs. 0.88 kg; *P*>0.89), and average daily gain (0.29 vs. 0.29 kg; *P*>0.89) between the two treatments also were not different. Flavor added to the creep feed did not influence both total (0.60 vs. 0.63 kg; *P*>0.66) and daily (202 vs. 211 g; *P*>0.66) creep feed intake of litters and the proportion of creep feed eaters (73 vs. 69%; *P*>0.41) in whole litters. When creep was provided for 3 d before weaning, adding the enhanced flavor to the creep feed did not affect litter creep feed intake, the proportion of piglets consuming creep feed, and pre-weaning performance.

Key Words: Flavor, Creep Feed, Piglet

779 Diet preference and growth performance in weanling pigs fed diets with *Morinda citrifolia* (noni). C. Feoli*[1], J. D. Hancock[1], K. C. Behnke[1], and R. G. Godbee[2], [1]*Kansas State University*, *Manhattan*, [2]*Morinda Agricultural Products*, *Orem, UT*.

Two experiments were conducted to determine the effects of adding 5% *Morinda citrifolia* (Tahitian Noni International, Orem, UT) to diets for weanling pigs. In the first experiment, 48 pigs (average initial BW of 4.2 kg) were used in a 29-d preference study. There were six pigs/pen and eight pens total. The pens were equipped with two identical feeders (for diets without and with noni puree) and each afternoon position of the feeders was switched to prevent feeder location from affecting diet consumption. The diets were corn-soy-based, pelleted, and had 1.8% Lys for d 0 to 5, 1.6% Lys for d 5 to 15, and 1.4% Lys for d 15 to 29. Feed and water were consumed on an ad libitum basis. No differences were noted among diets without and with noni for pelleting ease and(or) pellet durability index. Feed intake was increased for d 0 to 5 (50 vs 102 g/d, P < 0.05) and d 0 to 15 (66 vs 167 g/d, P < 0.006) when noni was added to the diets. However, this effect disappeared for d 15 to 29 so that overall feed intake was not different (183 vs 227 g/d, P > 0.39) for d 0 to 29. In a second experiment, 96 pigs (average initial BW of 6.7 kg) were used in a 29-d growth assay. There were six pigs/pen and eight pens/treatment. The diets were the same as those used in the first experiment. Results indicated no differences (P > 0.16) in ADG, ADFI, and G:F for d 0 to 5 and 0 to 15 among pigs fed diets without and with noni. However, for d 15 to 29 and overall (d 0 to 29) ADG and ADFI were decreased (P < 0.04) for pigs fed diets with noni compared to the control. In conclusion, there was a preference for diets with noni for the first 15 d of the preference study. In the growth assay, prolonged feeding of diets with noni resulted in reduced feed intake and, ultimately, decreased rate of gain. Thus, it seems likely that any advantages to inclusion of noni will be in the early portions of the nursery phase.

Key Words: Pig, *Morinda citrifolia*, Noni

780 Effects of *Morinda citrifolia* (noni) and diet complexity on growth performance in weanling pigs. C. Feoli*[1], J. D. Hancock[1], K. C. Behnke[1], and R. G. Godbee[2], [1]*Kansas State University*, *Manhattan*, [2]*Morinda Agricultural Products*, *Orem, UT*.

Two experiments were conducted to determine the effects of concentration (none, 0.75, 1.5, 3.0, and 6.0%) of *Morinda citrifolia* (Tahitian Noni International, Orem, UT) and diet complexity in weanling pigs. In Exp. 1, 210 pigs (average initial BW of 6.1 kg) were used. There were seven pigs/pen and six pens/treatment during the 35-d growth assay. Diets were corn-soy-based and had 20% whey, 10% lactose, and 5% plasma protein for d 0 to 7 and 15% whey and 2.5% plasma protein for d 7 to 21. Lysine concentrations were 1.8% for d 0 to 7, 1.6% for d 7 to 21, and 1.4% for d 21 to 35 with feed and water consumed on an ad libitum basis. Average daily gain (quadratic effect, P < 0.03) and G:F (quadratic effect, P < 0.08) for d 0 to 7 and G:F for d 0 to 21 (quartic effect, P < 0.03) increased as noni concentration in the diet was increased from none to 0.75%. However, no treatment effects were observed overall (d 0 to 35). For Exp. 2, 168 pigs (average initial BW of 6.3 kg) were used. There were six pigs/pen and seven pens/treatment in the 35-d growth assay. Treatments were arranged as a 2 x 2 factorial with main effects of diet formulation (simple vs complex) and noni addition (none vs 3%). Complex diets were those used in Exp. 1. Simple diets had the same minimum nutrient specifications as complex diets but had no added lactose or plasma protein for d 0 to 7 and only 10% added whey for d 7 to 21. Pigs fed simple diets had lower ADG and G:F (P < 0.07) for d 0 to 7 and lower ADG and ADFI (P < 0.06) for d 0 to 21 than pigs fed complex diets. During d 0 to 35 for ADG and d 0 to 21 for G:F, addition of noni to the simple diets had negative effects and addition of noni to the complex diets had positive effects (diet complexity x noni interaction, P < 0.02). In conclusion of the two experiments, noni tended to improve growth performance early in the nursery phase but those positive responses were observed only with complex diet formulations.

Key Words: Pig, *Morinda citrifolia*, Noni

781 Cloning of Ningxiang porcine growth hormone gene and its construction respectively of prokaryotic and eukaryotic expression vector. W. C. Wang[1], W. Y. Chu[1], W. T. Gu[1], M. M. Geng[1], T. J. Li[1], Y. L. Yin*[1], and G. Y. Wu[1,2], [1]*The Chinese Academy of Sciences*, *Changsha, Hunan, P. R. China*, [2]*Texas A&M University*, *College Station*.

The Ningxiang pig (a Chinese swine breed) has a relatively small body size but its meat has a special flavor of economic importance. To elucidate the mechanisms responsible for the slow rate of growth in this swine breed, we decided to clone the Ningxiang porcine growth hormone

(nxGH) gene and obtain its prokaryotic and eukaryotic expression vectors for future studies. The nxGH gene was cloned from the porcine pituitary gland. Its entire open reading frame (ORF) was 651 bp and encoded 216 amino acid residues. The identity of nucleotide sequences between the nxGH and the reported porcine GH genes was 99.85 %. Subsequently, the nxGH gene was inserted into a prokaryotic expression vector (pET-32) to generate a recombinant vector pET-GH. In addition, we constructed a eukaryotic expression vector for the nxGH gene. The gene encoding an enhanced green-fluorescence protein (EGFP) and the nxGH cDNA (amplified by RT-PCR using RNA from the Ningxiang pig pituitary gland as the template) were cloned, respectively, into an eukaryotic expression pCI vector, resulting in the construction of pCI-GH-EGFP that encoded a fusion protein (GH-EGFP). Vero cells were transfected with pCI-GH-EGFP and Lipofectaine 2000 to express the GH-EGFP protein, which was observed under a fluorescent microscope. The fluorescence of the protein remained for 48 h after cell fusion. Collectively, these results indicate that the nxGH gene can be expressed in vero cells and provide a foundation for further studies of growth physiology in Ningxiang pigs

Key Words: Ningxiang Pig, Eukaryotic Expression, Growth Hormone Gene-Prokaryotic Expression