

M100 Efficacy of pantothenic acid as a modifier of body composition in a porcine model of obesity development. C. A. Baldwin* and T. S. Stahly, *Iowa State University, Ames.*

Pantothenic acid (PA) in amounts above that needed to maximize body growth has been determined at our station to effectively reduce fat tissue accretion in growing pigs. In the current study, the efficacy of PA to minimize fatty tissue accretion in a porcine model of obesity development was determined. Heavy weight pigs (154 kg BW, 27% body fat) were allotted to one of four dietary regimens (17 individually penned barrows/treatment) consisting of a basal diet (8 ppm PA) supplemented with 0, 80, 800, 8,000 ppm added PA. The basal diet consisted of a dietary nutrient mix representative of the American diet (34% of calories from fat), and was provided at daily caloric intakes equivalent to 1.8 times each animal's maintenance needs for 144 days. A state of obesity development occurred over the duration of the study. Specifically, pigs accrued 73

kg of body weight, of which 48% was fat tissue (determined by DEXA analysis). BW gains and BW gain/feed ratios were not altered by PA additions. Fat tissue content of BW gain responded quadratically to increasing PA additions. Specifically, fat tissue content was reduced by 3.2 percentage units by a ten fold addition of PA (80 ppm) but was increased by 2.2 and 1.4 percentage units by 100- and 1,000-fold additions (800 and 8,000 ppm) of PA, respectively. The 80 ppm addition is equivalent in dosage (mg PA ingested/kcal of dietary energy expended) to that observed to reduce body fat accretion in growing pigs fed a high starch diet ad libitum. Hepatic ACO, ACC, and FAS mRNA expression (six pigs/treatment) did not differ between the 0 and 8,000 ppm supplemented PA diets. Based on these data, PA is not an efficient modifier of body composition in a porcine model of obesity development induced by a high fat dietary regimen.

Key Words: Pantothenic Acid, Pigs, Obesity

Nonruminant Nutrition: Mannan-Oligosaccharides, Yeast Culture, and Probiotics

M101 Effects of feeding galactomannan oligosaccharides on growth performance, immune response and intestinal microflora in newly-weaned pigs. Z. P. Hou¹, Y. L. Yin^{*1,2}, E. A. Jeaurond², H. Namkung², and C. F. M. de Lange², ¹The Chinese Academy of Sciences, Changsha, China, ²University of Guelph, Guelph, Ontario, Canada.

One hundred and twenty newly-weaned piglets (15-19 days old; four pigs per pen; six pens per treatment) were used to investigate the effect of feeding galactomannan oligosaccharides (GMOS; from sesbania gum, containing 20% galactose and 15% mannose) on growth performance, immune response and intestinal microflora. Five dietary treatments were: basal diet (control), medicated diet (control + 110 ppm lincomycin), and three dietary inclusion levels of GMOS (control + 0.1%, 0.2%, or 0.3%). The inclusion of lincomycin in the diet did not influence any of the response criteria ($P > 0.10$), except for intestinal microflora. During week 1 post-weaning, ADG (80 vs. 45 g/d on control vs. 0.3% GMOS; SE, 29) and ADFI (141 vs. 110 g/d on control vs. 0.3% GMOS; SE, 28) decreased linearly ($P < 0.05$) with increasing dietary GMOS level. After week 1 and over the 4-week experimental period, ADG (290 vs. 286 g/d on control vs. 0.3% GMOS; SE, 43) and ADFI (448 vs. 412 g/d on control vs. 0.3% GMOS; SE, 47) did not differ between treatments ($P > 0.10$). On day 4 post-weaning, blood serum levels of IgA (70 vs. 87 mg/dL on control vs. 0.3% GMOS; SE, 5.6), IgG (285 vs. 401 mg/dL on control vs. 0.3% GMOS; SE, 12.5), and IgM (155 vs. 273 mg/dL on control vs. 0.3% GMOS; SE, 13.6) increased linearly ($P < 0.01$) with dietary GMOS level. On day 14 post-weaning, serum Ig levels were not influenced by feeding GMOS ($P > 0.10$). Based on PCR-DGGE analysis, diversity of microflora in ileal digesta was increased by feeding GMOS and reduced by feeding lincomycin as compared to the control. These results indicate that dietary GMOS increases humoral immunity and microbial diversity in the ileum of newly-weaned pigs but reduces feed intake and growth performance during the first week post-weaning.

Key Words: Piglet, Galactomannan Oligosaccharides, Immune Response

M102 Effect of adding a mannanoligosaccharide product on performance of nursery pigs fed diets with or without antibiotics. H. Yang^{*1}, J. Less², T. Shipp³, T. Radke¹, M. Cecava¹, and D. Holzgraefe¹, ¹ADM Alliance Nutrition, Quincy, IL, ²ADM Specialty Feed Ingredients, Decatur, IL, ³ADM Animal Health and Nutrition, Quincy, IL.

The objective of this study was to evaluate the effect of a mannanoligosaccharide (MOS) product (CitriStim™) on performance of nursery pigs fed diets with or without antibiotics (AB). Weanling pigs ($n = 144$; 4.56 kg BW) were blocked by initial weight and assigned to one of four dietary treatments (trt), with six pens per trt and six pigs per pen. The trts were a 2 x 2 factorial arrangement, with two levels of MOS (0 vs. 0.2% CitriStim™) and two levels of AB (0 vs. 55

ppm Carbadox). ADG, ADFI and G/F were measured throughout four phases ending at d 7, 14, 28, and 41. Feeds were pelleted in the first two phases and meal thereafter. No interactions (Int) of ADG and ADFI were observed between MOS and AB ($P > 0.05$), indicating they could have an additive effect. MOS improved ADG ($P < 0.05$) and ADFI ($P < 0.05$) from d 0 to 14 and numerically improved ADG and ADFI from d 0 to 41. Although AB did not affect performance from d 0 to 14 ($P > 0.10$), it improved overall ADG ($P < 0.10$) and ADFI ($P < 0.05$). AB did not have a significant effect on G/F from d 0 to 14 and d 0 to 41 ($P > 0.55$). However, MOS tended to improve G/F from d 0 to 14 and d 0 to 41 ($P < 0.11$). MOS dramatically improved G/F in medicated diets but had minimal effects on G/F in non-medicated diets, resulting in an interaction for overall G/F ($P < 0.10$). In summary, MOS and AB improved ADG and ADFI and an interaction of G/F might exist between MOS and AB.

MOS AB						P Value		
		-	+	-	+	SE	MOS	AB
End Weight, kg	21.80	22.01	22.36	23.49	0.51	0.213	0.067	0.390
ADG, g (d 0 to 14)	233	260	233	278	14	0.020	0.519	0.507
ADG, g (d 0 to 41)	419	426	435	462	13	0.201	0.060	0.434
ADFI, g (d 0 to 14)	278	309	289	307	11	0.044	0.735	0.557
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Key Words: Pigs, Mannanoligosaccharide, Antibiotics

M103 Effect of dietary mannan-oligosaccharides and(or) organic zinc on growth performance and prevalence of post-weaning diarrhoea in piglets. M. Castillo^{*1}, G. Ferrini¹, E. G. Manzanilla¹, J. Roquet², J. A. Taylor-Pickard³, J. F. Pérez¹, and S. M. Martín-Orúe¹, ¹Departament de Ciència Animal i dels Aliments, Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain, ²Probasa, Barcelona, Spain, ³Alltech Biotechnology Centre, Summerhill, Sarney, Ireland.

The efficacy of Mannan-oligosaccharide (MOS) and organic zinc (Zn) to enhance performance and prevent diarrhoea in early-weaned pigs was evaluated. A total of 128 piglets, weaned at 20 ± 2 days were housed in 32 pens following a complete randomized design. Animals received four dietary treatments: a control diet (CT) to which 0.2% of a commercial source of MOS (Bio-Mos[®] Alltech Inc, USA; BM), 0.08% organic Zn (Bioplex-Zn™ Alltech Inc, USA; BP) or both additives (BMP) were added. The experiment lasted for 5 weeks including a pre-starter period of two weeks and a starter period of three weeks.

At the end of the pre-starter period, animals were challenged by a controlled stress (room temperature at 17°C and feed deprival for 10 hours). Body weight was individually recorded each week and daily feed intake recorded during the first week, and weekly thereafter (by pen). Faecal consistency was monitored once a day throughout the first 21 days. Feed intake and average daily gain were not different between dietary treatments. All additives improved feed efficiency during the starter period compared to control (0.63, 0.69, 0.67 and 0.68 for CT, BM, BP and BMP, respectively; $P < 0.05$). Differences in faecal consistency between treatments were mostly manifested during the first week. At day four, more than 87% of pens with CT diet showed faecal inconstitence, whereas the rest of diets percentages ranged 37-50%. BM showed the fastest recovery from post-weaning diarrhoea with no animal with faecal inconstitence at the end of the first week ($P < 0.05$). Results suggest that the use of MOS or organic Zn can both improve the adaptation of the weaning pig to the dry food, thus reducing the incidence of post-weaning diarrhoea. This was also manifested by an increase in the feed efficiency ratio.

Key Words: Mannan-Oligosaccharides, Organic Zinc, Weaning Pig

M104 Influence of *Bacillus subtilis* supplementation on egg quality, blood characteristics and fecal $\text{NH}_3\text{-N}$ in laying hens. H. J. Kim*, J. S. Yoo, O. S. Kwon, B. J. Min, K. S. Son, J. H. Cho, Y. J. Chen, and I. H. Kim, *Department of Animal Resource & Science, Dankook University, Cheonan, Korea.*

This study was conducted to investigate the effect of *Bacillus subtilis* on the egg quality, blood characteristics and fecal $\text{NH}_3\text{-N}$ in laying hens. A total of 252 laying hens were randomly allocated to three treatments with seven replications for six weeks. Dietary treatments included: 1) CON (basal diet), 2) BS0.2 (basal diet + 0.2% *Bacillus subtilis*), and 3) BS0.4 (basal diet + 0.4% *Bacillus subtilis*). For overall period, hen-day egg production tended to increase by 0.4% *Bacillus subtilis* in the diets. However, there was no statistically significant difference ($P > 0.05$). Egg weight, egg shell breaking strength, egg shell thickness, haugh unit, yolk color unit and egg yolk index were not significantly different ($P > 0.05$). However, egg weight and egg shell breaking strength in the BS0.2 treatment tend to increase without statistically significant difference ($P > 0.05$). Difference of egg yolk index in laying hens fed *Bacillus subtilis* supplemented diets were different ($P < 0.05$). The concentrations of red blood cell and white blood cell were not different ($P > 0.05$). $\text{NH}_3\text{-N}$ concentration in feces with BS0.4 treatment was lower than control ($P < 0.05$). In conclusion dietary *Bacillus subtilis* could decrease fecal $\text{NH}_3\text{-N}$.

Key Words: *Bacillus Subtilis*, Egg Quality, Ammonia-N

M105 Effect of milk supplementation with *Lactobacillus brevis* 1E1 on immune cell numbers in the small intestine of piglets. E. A. Halbrook*, C. V. Maxwell¹, D. C. Brown¹, M. E. Davis¹, and T. Rehberger², ¹University of Arkansas, Fayetteville, ²Agtech Products, Inc., Waukesha, WI.

An experiment was conducted to determine the effect of milk supplementation with *Lactobacillus brevis* 1E1, a direct-fed microbial, on immune cell numbers in the gastrointestinal tract of pigs. Litters were allotted to two treatments at farrowing: 1) control milk supplement and 2) milk supplement with 1E1. To determine the effect of a direct-fed microbial on the enteric immune system, cells with the following cell surface molecules were quantified in jejunal and ileal sections: CD2 (70% T cells), CD4 (helper T cells), CD8 (cytotoxic and/or natural killer cells), Interleukin-2 receptor (activated T and B cells), Monocyte/Granulocyte, and Major Histocompatibility Complex Class II (MHC II; antigen presenting cells). Tissue sections were collected from four pigs/treatment at 5 d prior to weaning, weaning (22.5 ± 0.42 d of age) and 5 d post-weaning. Tissues were frozen and stained for immunohistochemical evaluation. Positively stained cells were counted within 10 randomly selected villi per section. There were no differences ($P > 0.10$) in the number of immune cells within the ileum due to dietary treatment. However, within the jejunum, the number of cells positive for CD2 were lower in pigs supplemented with 1E1 ($P < 0.05$) than control pigs. Pigs supplemented with 1E1 also tended to have a lower ($P =$

0.07) number of cells positive for MHC II in the jejunum than those fed the control diet. Pigs supplemented with 1E1 had no changes ($P > 0.10$) in the number of cells positive for CD4 in the jejunum over the sampling period, whereas, CD4 positive cells increased ($P < 0.05$) at weaning in control pigs, followed by a decrease 5 d after weaning ($P = 0.10$, treatment x time interaction). These data indicate that supplementation of 1E1 to pigs prior to weaning may reduce the number of antigen presenting cells and T cells (especially T helper cells) within the jejunal section of the intestinal tract, which could lead to decreased activation of the gut immune system.

Key Words: Immune System, Lactobacillus, Swine

M106 A quantitative micro-anatomical study to explain the effects of probiotics (*Pediococcus acidilactici*) upon growth performances of weaning piglets. A. Di Giancamillo¹, G. Savoini¹, V. Bontempo*, V. Dell'Orto¹, E. Chevaux², and C. Domeneghini¹, ¹Department of Veterinary Sciences and Technologies for Food Safety, Milan, Italy, ²Lallemand, Blagnac cedex, France.

The gut offers a great potential for the induction of changes in its microhabitat with possible positive effects on health and productivity. Nowadays research interest is focused in the improvement of defined physiological functions by the use of additives, such as probiotics, that can act producing competitive exclusions of pathogens or harmful antigens in the gut. The aim of this study was to determine the effect of dietary supplementation of Bactocell® on some morpho-functional aspects of the gut in post-weaning piglets. Two hundred weaning piglets averaging 25 d of age and 7.0 ± 0.5 kg initial BW were assigned to two dietary treatments to determine the effects of supplementation with *Pediococcus acidilactici* (Pa) on growth. Piglets were fed one of two liquid dietary treatments for 42 d after weaning: 1) Control (C), and 2) Control diet + Pa (1×10^{10} cfu/g; P). Piglets were weighted and faecal samples were collected at 0, 14 and 42 d. At 42 d post-weaning, 16 animals (eight per group) were sacrificed and both small (ileum) and large (caecum) intestine were histologically examined. Histometry was performed by villi and crypts measurements. Histochemical analysis were performed to investigate the mucin profile of the ileum, while immunohistochemical analysis was used to visualize proliferating epithelial cells and to identify mucosal macrophages. No significant difference in growth was observed within groups. Faecal *Lactobacillus* populations were increased by Pa addition compared to C diet (27×10^8 cfu/g vs. 10×10^8 cfu/g; $P \leq 0.05$). Diet affected gut morphometry of the P animals: histometrical analysis resulted in an increase in villi height ($327 \mu\text{m}$ vs. $300 \mu\text{m}$; $P \leq 0.01$) and crypts depth ($287 \mu\text{m}$ vs. $247 \mu\text{m}$; $P \leq 0.01$) of the ileum, as well as an increase in the caecum crypts depth ($423 \mu\text{m}$ vs. $387 \mu\text{m}$; $P \leq 0.05$). A thicker mucous gel layer in the ileum of C piglets was also observed ($2.95 \mu\text{m}$ vs. $2.35 \mu\text{m}$; $P \leq 0.01$). The addition of Pa to piglets diet resulted in greater concentration of beneficial bacteria and in positive effect of gut structure.

Key Words: Gut, Probiotic, Weaning

M107 Effects of dietary *Enterococcus faecium* on growth performance, nutrients digestibility, hematological change and fecal noxious gas content in finishing pigs. Y. J. Chen*, O. S. Kwon, B. J. Min, K. S. Son, J. H. Cho, H. J. Kim, and I. H. Kim, *Dankook University, Cheonan, Korea.*

The objective of this study was to investigate the effects of feeding probiotic (*Enterococcus faecium*, EF) on growth performance, nutrients digestibility, hematological change, and fecal noxious gas content in finishing pigs. A total of eighty Landrace x Yorkshire x Duroc pigs with an initial BW of 50.47 ± 2.13 kg were used in this 8-week experiment. Pigs were allotted to four treatments (five replicates per treatment and four pigs per pen) according to a randomized complete block design. Dietary treatments were: 1) CON (control; basal diet), 2) CTC (control diet + 0.1% antibiotic, CTC), 3) EF1 (control diet + 0.1% probiotic, EF) and 4) EF2 (control diet + 0.2% probiotic, EF). During 0-4 weeks, ADG increased slightly in treatment groups without significant difference ($P > 0.05$). In 4-8 weeks, ADG was increased significantly in EF1 treatment compared to CON treatment ($P < 0.05$). ADFI and gain/feed were not affected in

each 4-week period and entire experimental period ($P > 0.05$). Digestibility of DM was higher in EF2 treatment than CON and CTC treatments ($P < 0.05$). N digestibility also increased in EF2 treatment compared to CTC treatment ($P < 0.05$). Hematology characteristics of WBC, RBC and Lymphocyte were not affected by pigs fed diets with *Enterococcus faecium* ($P > 0.05$). Supplementation of SF in diet decreased fecal ammonia nitrogen ($\text{NH}_3\text{-N}$) concentration ($P < 0.05$). Also, fecal acetic acid, propionic acid and butyric acid concentrations were lower in diets added 0.1% EF than pigs fed diet added antibiotic ($P < 0.05$). In conclusion, dietary EF can increase growth performance, nutrients digestibility and decrease fecal $\text{NH}_3\text{-N}$ and volatile fatty acid (VFA) concentration in finishing pigs.

Key Words: *Enterococcus Faecium*, Performance, Finishing Pigs

M108 Effect of supplemental mixed yeast culture and antibiotics on growth performance of weaned pigs. Y. W. Shin, J. G. Kim*, and K. Y. Whang, Korea University, Seoul, Korea.

The objective of this investigation was to examine the effect of supplemental mixed yeast culture (YC) and antibiotics (AB) on growth performance of weaned pigs. Thirty-six weaned pigs weighing about 5.8 kg were allotted to six dietary treatments with six replications based on sex, litter and body weight. Pigs were adapted to individual crates and dietary treatments before the initiation of the experiment. The experiment was designed in a 2×3 factorial arrangement with two levels of AB and three levels of YC. Dietary treatments were; 1) Basal diet (B, no antibiotics), 2) B + 0.1% YC, 3) B + 0.2% YC, 4) B + 0.2% AB, 5) B + 0.2% AB + 0.1% YC, and 6) B + 0.2% AB + 0.2% YC. Basal diet was formulated to meet the 1998 NRC requirements and contained 3,435 kcal/kg ME, 24.7% CP, 1.7% lysine, 0.95% Ca, and 0.75% P. Diets were offered two times a day (0800 and 1800). After 4 hours, any leftover was collected, dried in a dry-oven at 70°C for 12 h, and weighed to determine the feed intake. Body weights of pig were measured every three days, and feed intake was calculated everyday. The ADG of pigs was not different until six days of experiment, however, pigs in 0.2% AB or 0.1%, 0.2% YC treatments tended to grow faster than pigs in other treatments. During day 7 to 15, ADG was significantly increased as levels of YC and AB were increased ($P < 0.05$). Feed consumption tended to be higher in AB or YC treatments than those in other treatments. The FE was not different for the first six days of experiment. From day 7 to 15, pigs in AB or YC treatments utilized dietary nutrients better than pigs in other treatments ($P < 0.05$). The results of this study demonstrated that supplementation of YC could improve growth and efficiency in weaned pigs, and synergistic effect was also expected when YC was supplemented with AB.

Effect of supplemental mixed yeast culture and antibiotics on growth performance of weaned pigs

AB YC	0%			0.2%			SEM	Effect
	0%	0.1%	0.2%	0%	0.1%	0.2%		
ADG 0-6 (g/d)	232	235	265	228	259	315	14	
ADG 7-15	396 ^{cd}	405 ^c	436 ^d	396 ^{cd}	405 ^{cd}	547 ^a	13	AB, YC, AB × YC
ADG 0-15	359 ^{ab}	344 ^{ab}	383 ^b	329 ^c	347 ^{ab}	446 ^a	11	YC, AB × YC
ADFI 0-6 (g/d)	348	335	347	331	369	436	16	
ADFI 7-15	609	663	705	662	40	748	21	
ADFI 0-15	516	510	568	540	569	631	18	
FE 0-6 (g/kg)	748	762	792	714	678	793	31	
FE 7-15	676 ^{ab}	665 ^{ab}	620 ^{ab}	619 ^{ab}	553 ^b	739 ^a	20	AB × YC
FE 0-15	694	694	694	634	618	761	21	

^{a,b,c,d} $P < 0.05$

Key Words: Yeast Culture, Growth Performance, Weaned Pig

M109 Effect of supplemental mixed yeast culture and antibiotics on nitrogen balance of weaned pigs. Y. W. Shin, J. G. Kim*, and K. Y. Whang, Korea University, Seoul, Korea.

An experiment was conducted to determine the effect of supplemental mixed yeast culture (YC) and antibiotics (AB) on the nitrogen retention of weaned pigs. Thirty-six weaned pigs (BW = 11.36 ± 0.94 kg) were allotted to six treatments with six replications. This experiment was designed in a 2×3 factorial arrangement with two levels of AB and three levels of YC. Dietary treatments were: 1) Basal diet (B, no antibiotics), 2) B + 0.1% YC, 3) B + 0.2% YC, 4) B + 0.2% AB, 5) B + 0.2% AB + 0.1% YC, and 6) B + 0.2% AB + 0.2% YC. Basal diet was formulated to meet the 1998 NRC requirements and contained 3,435 kcal/kg ME, 24.7% CP, 1.7% lysine, 0.95% Ca, and 0.75% P. Pigs were adapted to new environment for three days. Feed allowance was 600 g/d that was about 80% of average feed intake for the adaptation period. Pigs were offered 300 g of diet every 12 hours for the experimental period. One volume of water was mixed with feed to reduce feed wastage and to facilitate feed consumption. Chromic oxide, 0.2% of diet, was used as an indicator. Feces, urine, and refused feed were collected and recorded on daily basis. Collected feces and urine were stored at -20°C until the end of trial, and then mixed according to individual pigs. Feces and urine from each pig were sub-sampled and analyzed. Average daily gain of pigs did not differ, however, it was numerically increased as YC supplementation was increased. Dry matter intake, N intake, fecal N excretion, and N digestibility were similar among treatments. Addition of YC tended to decrease the urinary N excretion, and increase the retained N, but these were not significantly different. Retained N over N intake also tended to increase when YC was supplemented. The results of this experiment suggested that YC supplementation to the starter diets could improve N utilization and this improvement could be higher if AB is added.

Effect of supplemental mixed yeast culture and antibiotics on nitrogen balance of weaned pigs

AB YC	0%			0.2%			SEM
	0%	0.1%	0.2%	0%	0.1%	0.2%	
ADG (g/d)	407.7	474.0	487.5	411.1	421.6	501.1	17.7
DMI (g/d)	563.1	564.3	567.5	553.2	590.7	562.1	2.1
N intake (g/d)	23.5	23.6	23.6	23.1	23.6	23.6	0.1
Fecal N (g/d)	1.9	2.1	2.0	2.1	1.9	2.0	0.1
Urinary N (g/d)	3.7	3.1	3.3	3.0	2.9	2.3	0.2
Retained N (g/d)	17.9	18.4	18.2	17.9	18.7	19.2	0.2
Retained N/N intake (%)	76.3	78.1	77.2	78.0	79.6	51.6	0.8
Digestibility (%)	91.8	91.3	91.4	90.9	92.0	91.4	0.5

Key Words: Yeast Culture, Nitrogen Retention, Weaned Pig

M110 Effect of supplemental mixed yeast culture and antibiotics on fecal characteristics of weaned pigs. Y. W. Shin, J. G. Kim*, and K. Y. Whang, Korea University, Seoul, Korea.

This study was done to investigate the effect of supplemental mixed yeast culture (YC) and antibiotics (AB) on the fecal characteristics of weaned pigs. Thirty-six weaned pigs (BW = 5.8 ± 0.51 kg) were used for a 15 day growth trial, and fecal samples were taken from all individual pigs at the end of experiment. The experiment was designed in a 2×3 factorial arrangement with two levels of AB and three levels of YC. Dietary treatments were; 1) Basal diet (B, no antibiotics), 2) B + 0.1% YC, 3) B + 0.2% YC, 4) B + 0.2% AB, 5) B + 0.2% AB + 0.1% YC, and 6) B + 0.2% AB + 0.2% YC. Basal diet was formulated to meet the 1998 NRC requirements and contained 3,435 kcal/kg ME, 24.7% CP, 1.7% lysine, 0.95% Ca, and 0.75% P. Diets were offered twice a day (0800 and 1800). Serial dilution method was used to enumerate the population of coliform and yeast in fecal samples. Ten volume of deionized water was added to measure the fecal pH. Daily collected fecal and urinary samples were proportionally mixed to make artificial slurry. Ammonia concentration was measured by using indophenol method. The population of coliform was not affected by supple-

mentation of AB or YC, but slightly decreased in AB added treatments. Supplemental of YC increased the population of yeast and AB was also helpful to increase the population of yeast in feces ($P < 0.05$). Fecal pH was lower in AB added treatments than other treatments ($P < 0.05$). The AB added treatments also had a lower ammonia concentration than other treatments in an artificial slurry ($P < 0.05$). The more ammonia reduction was observed when AB and YC were supplemented together ($P < 0.05$). These results indicated that supplement of AB and YC could increase the population of yeast and decrease pH in feces. They were also helpful to reduce the ammonia emission from slurry.

Effect of supplemental mixed yeast culture and antibiotics on fecal characteristics of weaned pigs

	0%	0%	0.2%	0%	0.1%	0.2%	SEM	Effect
AB								
YC	0%	0%	0.2%	0%	0.1%	0.2%		
Microflora (CFU/g of feces)								
Coliform	11.6	11.2	10.3	9.7	10.1	10.1	0.2	
Yeast	6.9 ^b	7.2 ^b	7.6 ^b	7.1 ^b	8.3 ^a	8.3 ^a	0.2	AB, YC
Fecal pH	8.3 ^a	8.2 ^a	8.2 ^a	7.6 ^b	8.0 ^{ab}	7.8 ^{ab}	0.1	AB
Ammonia concentration (mM/g of artificial slurry)								
0 h	21.3 ^a	21.1 ^{ab}	19.8 ^{ab}	19.5 ^{ab}	19.4 ^{ab}	16.1 ^b	0.7	AB
8 h	70.2 ^a	58.8 ^b	59.1 ^b	58.1 ^b	35.0 ^c	56.8 ^b	3.0	AB, YC, AB × YC
24 h	91.1 ^a	67.5 ^b	70.6 ^b	79.2 ^{ab}	47.0 ^c	66.6 ^b	4.0	AB, YC

^{a,b} $P < 0.05$

Key Words: Yeast Culture, Feces, Weaned Pig

M111 Evaluation of yeast culture concentrates in weaning pig diets. A. Balfagon^{*1}, M. D. Lindemann¹, G. L. Cromwell¹, and G. Keller², ¹University of Kentucky, Lexington, ²Varied Industries Corporation (Vi-Cor), Mason City, IA.

Two experiments involving a total of 78 crossbred weaning pigs were conducted to compare two yeast culture concentrates (YCC) in nursery diets. A basal diet was formulated in both Phase I (Wk 1 & 2) and Phase II (Wk 3 & 4) to which the products (YCC-1: Diamond V XPTM, Diamond V Mills Inc., Cedar Rapids, IA and YCC-2: A - MaxTM concentrate, Varied Industries Corp., Mason City, IA) were included at 1%. In Exp. 1, six pens of pigs (21 d of age and 7.6 kg BW) were used in a preference test. The feeder location was switched three times each week to obviate behavioral or pen location effects on feed selection. The ratio of diets consumed during each phase and for the total experiment was calculated and analyzed using an unpaired t-test with Welch's correction procedure. While there was a slight numerical favor for the YCC-2 during Phase I (53.0% vs. 47.0%, respectively) and for the YCC-1 during Phase II (55.9% vs. 44.1%), there was no difference ($P > 0.10$) between treatments, with each yeast

product accounting for about 50% of the feed intake for the individual and overall periods (YCC-1: 52.7%; YCC-2: 47.3%). In Exp. 2 (the performance test), 50 pigs (21 d of age and 7.1 ± 0.7 kg BW) were allotted in a randomized complete block basis (five pens/trt with five pigs/pen). The performance for the total experiment was: ADG - 410 and 425 g/d; ADFI - 621 and 619 g/d; and F/G - 1.514 and 1.467, respectively, for YCC-1 and YCC-2. There were no significant differences ($P > 0.10$) between products for any weekly period or for the total experimental period. In conclusion, there were no manifest preference or performance differences between the two YCC products.

Key Words: Preference, Weaning Pig, Yeast Culture

M112 Digestibility of CP, AA, and energy in a novel yeast product by pigs. H. H. Stein^{*1}, M. L. Gibson², M. G. Boersma¹, and C. Pedersen¹, ¹South Dakota State University, Brookings, ²Dakota Gold Research Association, Sioux Falls, SD.

Two experiments were conducted to measure the digestibility of CP, AA, and energy in a novel yeast product that was produced by extraction from ethanol by-product streams. In Exp. 1, eight barrows that were equipped with a T-cannula in the distal ileum were randomly allotted to a 2-period switch-back design and fed a yeast-based diet and a N-free diet. Both diets were provided in daily amounts equivalent to three times the energy requirement for maintenance. Ileal digesta were collected from the cannulae and the standardized ileal digestibility coefficients (SID) for CP and AA were calculated. Results of this experiment showed that the SID for CP was 74.8%. The SID for Lys, Met, Thr, Trp, Ile, Leu, and Val were 82.2, 88.6, 71.1, 82.2, 79.5, 84.0, and 74.5%, respectively. The average SID for all indispensable AA was 81.4% while the average for the dispensable AA was 75.5%. Exp. 2 was designed to measure the concentration of DE and ME in the yeast product. Six growing barrows were placed in metabolism cages and randomly allotted to a 2-period switch-back design. A corn-based diet (98% corn, 2% vitamins and minerals) was formulated. A second diet consisting of 40% yeast and 60% of the corn-based diet was also formulated. Both diets were supplied in a daily amount equivalent to 2.5 times the energy requirement for maintenance. Collections of feces and urine were performed and the energy balance for each of the two diets was calculated. The energy concentration in the corn was calculated from the corn-based diet while the energy concentration in the yeast was calculated from the corn-yeast diet using the difference method. Results of this experiment showed that the concentration of DE and ME in yeast (5,600 and 5,350 kcal per kg DM, respectively) is higher ($P \leq 0.001$) than in corn (4,071 and 3,992 kcal per kg DM, respectively). It is concluded that the yeast product extracted from ethanol by-product streams has a high digestibility of AA and a high concentration of energy. This product may be well suited as an energy and AA source in diets for swine.

Key Words: AA Digestibility, Pigs, Yeast

Physiology and Endocrinology I

M113 Desert climatic effects on freezability and some biochemical constituents of Barki ram semen. M. Zeitoun^{*1} and K. El-Bahrawy², ¹Alexandria University, Alexandria, Egypt, ²Mariout Research Station, Desert Research Center, Ministry of Agriculture, Alexandria, Egypt.

This study utilized 12 mature fertile Barki rams located in the Maryout Research Station. Semen was collected during June â€• August (summer season, 1999) and during December â€• March (winter season, 1998). Semen was collected using an artificial vagina with 0.5 ml Tris buffer in the collection tubes (1:1 dilution). Semen sampler were diluted and packed in straws (0.25ml) and frozen (-196°C) in liquid nitrogen. Data on physical characteristics of semen were recorded (volume, motility, % crsosome integrity, % dead and live, pH, concentration and % abnormality). In addition, seminal plasma of both seasons was harvested and Na⁺, K⁺, free amino acids and total protein were determined. Also, SDS-PAGE was conducted to characterize the peptide fractions of

seminal plasma of both seasons. Results indicated higher ($p < 0.05$) post-thaw (0h) motility in winter (44.1%) than in summer (17.2%) ejaculates, whereas at 4 hrs. post-thaw the percent intact acrosome approached 72.3% and 65.9% for summer and winter ejaculates, respectively. Moreover, percent dead and abnormal spermatozoa were higher ($p < 0.05$) in post-thaw spermatozoa of summer than winter ejaculates. Sodium concentration was not different between summer and in winter, however K⁺ concentrations was higher ($p < 0.05$) in winter (71.7 ppm) than in summer (47.3 ppm) ejaculates. This resulted in different K⁺/Na⁺ ratio between the two seasons. Total protein was found to be as much twice (14.0g/dL) in summer as in winter (7.7g/dL). The glutamic acid and glycine were higher in winter than summer semen. The SDS-PAGE exhibited two more peptide fractions (330 and 24 kDa) in winter than summer seminal plasma. The total number of peptide fractions was 14 in winter and 12 in summer.

Key Words: Climate, Semen, SDS-PAGE Protein