

recently been shown to be involved in neuronal plasticity and neuroprotective mechanisms. The precise function of ovoinhibitor in the brain will be a topic for further research.

Key Words: chicken, ovoinhibitor, brain

1944 Vasotocin receptor mRNA expression in the brain and pituitary of broiler breeder hens. K. Shaffer^{*1}, J.A. Vizcarra¹, C.C. Hsu¹, J.Y. Yang¹, M.L. Rhoads¹, L.E. Cornett², D. Baeyens³, N. Ali³, and J.D. Kirby¹, ¹*Department of Poultry Science, University of Arkansas, Fayetteville, AR*, ²*Department of Physiology, University of Arkansas for Medical Sciences*, ³*Department of Biology, University of Arkansas Little Rock, Little Rock, AR*.

Vasotocin receptors (VTR) are members of the seven trans-membrane spanning G-protein associated receptor superfamily. Several members of the vasopressin-oxytocin-mesotocin receptor family have been characterized in vertebrates. We have previously shown that VTR-1 expression occurs primarily in the brain while VTR-2 expression occurs mainly in the pituitary. Our goal was to evaluate the expression of VTR-1 and VTR-2 mRNA in known sites of expression over the ovulatory cycle of

hens. In order to study potential changes in VTR-1 and VTR-2 expression, birds (n=4-5 per time point) were killed at 3 hour intervals relative to oviposition over a 24 hour period. Blood samples were drawn within 2 minutes of handling, prior to cervical dislocation. Brain, pituitary, shell gland, and kidney were immediately removed and frozen in liquid nitrogen. Plasma was stored at -20 C prior to determination of corticosterone levels by RIA. Isolated total RNA from the brains and the pituitaries was transferred to nylon membranes for analysis of receptor steady state mRNA levels by slot blot analysis. Full length cDNAs for VTR-1, VTR-2 and 28-S rRNA were used to make random primed cDNA probes. VTR-1 and VTR-2 mRNA expression levels were normalized relative to 28-S expression for each sample. Corticosterone levels were significantly increased at nine hours post oviposition relative to all other times. Neither VTR-1 nor VTR-2 mRNA levels showed any significant variation over the 24 h cycle, in the brain or pituitary, respectively. Based on these results, we conclude that VTR-1 and VTR-2 steady state mRNA levels do not fluctuate dramatically over the ovulatory cycle of broiler breeder hens. Further work on circadian variations in membrane bound receptor concentrations in the brain and pituitary are currently underway.

Key Words: Vasotocin Receptor, Pituitary and Brain, Corticosterone

ASAS Nonruminant Nutrition: Feed Ingredients and Enzymes

1945 Effect of lactic acid and lactosucrose supplementation in diets for nursery pigs. Acie Murry^{*1}, Susan Sanchez¹, and Marshall Bush¹, ¹*The University of Georgia, Athens*.

Swine producers have been adding organic acids to feed for several years. Acidified feed lower the pH of the pig's stomach, inhibit certain pathogenic bacteria, increases nutrient digestibility and results in faster weight gain and more efficient feed conversion. Lactosucrose is considered a nondigestible trisaccharide produced from lactosucrose and sucrose and may be used as a substrate by intestinal bacteria in humans. The influence of these factors has not been documented in nursery pigs. The objective of this study was to evaluate the effects of lactic acid and lactosucrose supplementation in pig's diet on growth performance, feed efficiency and nutrient digestibility. Two experiments with twenty cross bred nursery pigs, average initial body weight 9.6 kg and age 28 days were conducted. All pigs were fed a corn-soybean meal basal diet (18% CP) for a 7-d adjustment period. On day seven after the adjustment period, ten pigs were randomly assigned to receive the basal diet supplemented with either lactic acid (1.8%) or lactosucrose (0.2%) for a 14-d experimental period. Daily feed intake was held constant at 5% of body weight for all pigs in an attempt to reduce the effects of different levels of feed intake on nutrient digestibility. Pigs were weighed every three days and feeding was adjusted according to the pig's individual weight. Pigs fed the lactosucrose diet were heavier ($P < 0.04$) at d 21 (15.40 vs 14.95 kg), but there was no effect of treatment ($P > 0.50$) on average daily gain (0.45 vs 0.43 kg), average daily feed (0.57 vs 0.56 kg), or gain:feed ratio (0.80 vs 0.78 kg) for lactosucrose and lactic acid, respectively. Treatment had no effect ($P > 0.20$) on apparent digestibility of DM (80.96 vs 82.46%), EE (77.45 vs 79.50%), CP (72.30 vs 74.45%), or GE (69.69 vs 69.33%) for lactosucrose and lactic acid, respectively. However, ash digestibility was greater ($P < 0.05$) for pigs fed the lactic acid diet than for those fed lactosucrose (50.43 vs 43.15%). The results from this study show that growth performance was better in pigs fed the lactosucrose diet, but ash digestibility was lower when compared with pigs fed the lactic acid.

Key Words: Lactosucrose, Lactic Acid, Digestibility, Pigs

1946 The potential for egg by-products to replace spray-dried porcine plasma in early-weaned piglet diets. L.D. Schmidt^{*}, C.M. Nyachoti, D. Boros, and B.A. Slominski, *University of Manitoba Winnipeg, MB, Canada*.

Egg-breaking facilities produce substantial quantities of egg by-products each year that are unsuitable for human consumption. Due to the excellent amino acid profile, the potential for spray-dried egg proteins to replace spray-dried porcine plasma (SDPP) in early-weaned pig diets was investigated in two 3-week performance trials. In both experiments, 5 pens containing four piglets (17 ± 1d old) stratified by sex were assigned to the experimental diets in a completely randomized design. Experiment 1 comprised of four corn-soy diets containing 7% of either SDPP,

spray-dried technical albumen (SDTA), heat treated SDTA (hot room storage at 70°C for 72h) or spray-dried whole egg (SDWE). Average daily gain (ADG), average daily feed intake (ADFI) and feed conversion ratios (FCR) were determined. In addition, five piglets per treatment were euthanized to determine ileal amino acid and energy digestibilities. Relative to the SDPP diet, ADG (266, 219, 199, 194 g/d), ADFI (323, 304, 277, 278 g/d) and FCR (1.22, 1.38, 1.46, 1.44) were poorer ($P < 0.05$) for SDTA, heat treated SDTA and SDWE, respectively. The SDTA diet had numerically better performance parameters than the other diets containing egg proteins. Apparent ileal digestibility of methionine, lysine and threonine in SDPP and SDTA diets ranged from 80-90% and was generally higher ($P < 0.05$) than in the SDWE diet. Ileal digestible energy content was similar ($P < 0.05$) in all diets (3.1-3.2 Mcal/kg). In the second experiment, the effect of substituting SDPP with 25 or 50% SDTA was investigated. Pig performance was not affected by dietary substitution of SDTA for SDPP as values for control (7% SDPP) and the two SDTA diets were similar ($P < 0.05$) for ADFI (380, 402, 376 g/d), ADG (275, 284, 265 g/d) and FCR (1.38, 1.42, 1.45), respectively. The results suggest that technical albumen can replace 25% of SDPP in early-weaned pig diets without compromising performance.

Key Words: Egg by-products, Nutritive Value, Early-weaned pigs

1947 Comparison of edible grade whey, granular whey, and DairyLac 800 as lactose sources for nursery pig diets. J.M. DeRouchey^{*}, M.D. Tokach, J.L. Nelssen, R.D. Goodband, S.S. Dritz, J.C. Woodworth, and B.W. James, *Kansas State University, Manhattan, KS*.

A total of 210 pigs (BW of 5.6 kg and 18 d of age) were used in a 14-d growth assay to determine the ability of granular whey or DairyLac 80[®] to replace a high quality, edible grade whey in nursery diets. Pigs were blocked by weight and allotted to one of seven dietary treatments. Treatments included a negative control without lactose and a 2 x 3 factorial consisting of two lactose levels (9 and 18%) and three lactose sources (Edible whey, Land O' Lakes; Granular whey, International Ingredient Corp.; and DairyLac 80[®], International Ingredient Corp.). There were five pigs/pen and six pens/treatment. All diets were pelleted and contained 3% animal plasma and 2% select menhaden fish meal and were formulated to 1.60% lysine. Either edible whey or granular whey (12.5 and 25%) replaced corn and soybean meal in the control diet. Diets containing DairyLac 80[®] were formulated to replace the lactose provided in the dried whey diets. Fish meal replaced the amino acids provided by dried whey to maintain a constant soybean meal level. Pigs fed additional lactose from d 0 to 14 had greater ADG ($P < .04$) and ADFI ($P < .07$) compared to pigs fed no supplemental lactose. Pigs fed edible whey had greater ADFI (quadratic, $P < .05$) and ADG (linear, $P < .06$) with increasing lactose from 9 to 18%. As granular whey level increased, ADG and ADFI increased (linear, $P < .02$) over the control diet from d

0 to 7, but not overall. For pigs fed Dairylac 80[®], ADG and ADFI were greater (quadratic, $P < .01$) compared to pigs fed the negative control, while gain/feed improved (linear, $P < .02$) as the lactose level was increased from 9 to 18%. Pigs fed 9% granular whey and Dairylac 80[®] had similar performance to pigs fed 18% edible whey. In conclusion, there were no differences in growth performance between sources of lactose used in this study.

Item	Control			Edible			Granular			Dairylac 80 [®]			SEM
	Lactose, %	0	9	18	9	18	9	18	9	18	9	18	
Day 0 to 14													
ADG, g	238	243	283	263	257	291	265	11					
ADFI, g	248	242	294	261	270	296	256	13					
G/F, g/kg	960	1000	963	1001	952	983	1004	24					

Key Words: Pig, Lactose, Growth

1948 Productive performance and carcass characteristics of growing and finishing pigs fed different level of oat groats with and without enzymatic compound. F. Salvador, C. Rodriguez*, F. Nunez, J. Jimenez, O. Ruiz, and A. Alarcon, *Universidad Autonoma de Chihuahua, Chihuahua, Chih. Mexico.*

An experiment was carried out to determine the optimum level of oat groats and the effect of the addition of the enzymatic compound Allzyme Vegpro[®] in growing and finishing pig rations on the productive response and carcass characteristics. Thirty two Yorkshire X Landrace-Duroc pigs distributed in individual metabolic cages with a completely randomized design of a 4x2x2 factorial arrangement were used. Pigs were fed a ration containing 0, 15, 30 and 45% oat groats during the growing (26.0 to 54.5 kg of BW) and finishing period (54.5 to 84.7 kg of BW), with and without one kg Allzyme Vegpro[®] per ton of feed. A tendency to improve ($P < .01$) feed conversion during the whole feeding period by including oat groats in the ration (3.73, 3.46, 3.32 and 3.17 for 0, 15, 30 and 45% oat groats in the ration, respectively) was observed, with a reduction up to 17.9% with the highest oat groats level in the diet. Males showed higher feed intake (9.1%) and daily weight gain (6.3%) than females. Multivariate analysis showed a true effect during the last phase of the finishing period, with a decrease in pig feed intake of up to 250 g/d and an extra daily weight gain of 21 g per pig in animals fed 45% oat groats plus enzymatic compound rations. A tendency to improve cold carcass yield was detected as the ration oat groat level increased but only when the enzyme was added. Males showed 4 mm higher dorsal fat than females. Those animals eating diets with the enzymatic compound showed 3 mm higher dorsal fat than those without enzyme. With higher levels of oat groats in the ration there was a tendency to decrease ($P < .05$) the fat content in muscle. It was concluded that the addition of oat groats to diet of growing and finishing pigs improves the animal productive response showing an increase of up to 9.5% in economic return for every 15% addition of oat groats.

Key Words: Pigs, Oat groats, Enzymes

1949 The effects of pretreating soybean meal with fiber-degrading enzymes on ileal and total tract digestibility by growing pigs. K. L. Saddoris*, M. R. Smiricky, D. M. Albin, V. M. Gabert, and M. R. Murphy, *University of Illinois, Urbana.*

Soybean meal (SBM) contains fibrous components that are poorly digested by pigs. Pigs do not produce the endogenous enzymes necessary to digest the fibrous components of SBM, so fiber-degrading enzymes such as arabinase, cellulase, alpha-galactosidase, hemicellulase, pectinase, and xylanase can be used in an attempt to degrade these components. Four barrows (avg. BW = 75 kg) were surgically fitted with a prececal simple-T cannula and randomly assigned to a 2 x 2 crossover design to evaluate the influence of pretreating SBM with fiber-degrading enzymes on nutrient digestibility. The cornstarch-soybean meal-based diets were formulated to contain 17% CP. Chromic oxide (0.3%) was added as an indigestible marker for determination of nutrient digestibilities. A control cornstarch-soybean meal diet was compared to a diet containing SBM pretreated with enzymes. The pretreatment consisted of dilution with deionized, distilled water at a 1:4 ratio and incubation at 50C, pH 5 for 18 hr with 8.5 g each of the following enzymes/kg of SBM: arabinase, cellulase, alpha-galactosidase, hemicellulase, pectinase,

and xylanase. Pigs were fed 2.28 and 2.44 kg/d for periods 1 and 2, respectively, in 2 equal feedings at 0800 and 2000 h. The experimental period lasted 7 d, with 5 d of diet adaptation, fecal collection on d 6, and ileal digesta collection on d 7. Diets, feces, and digesta samples were analyzed for DM, OM, CP, AA, and chromic oxide concentrations. Enzyme pretreatment increased ($P < 0.08$) ileal digestibility of DM, OM, Asp, Glu, Lys, and total tract digestibility of OM, N, Asp, Thr, Ser, Gly, Val, Phe, His, Lys, Ile, and Tyr. Enzyme pretreatment tended ($P < 0.15$) to increase ileal digestibility of Pro, Val, Ile, Leu, and total tract digestibility of DM, Glu, Pro, and Leu. In conclusion, enzyme pretreatment of SBM increased DM and AA digestibilities of cornstarch-soybean meal diets fed to growing pigs.

Key Words: Pigs, Enzymes, Soybean meal

1950 Evaluation of a carbohydrase combination on performance in growing-finishing pigs. M. D. Lindemann¹, G. A. Apgar², T. Guthrie², G. L. Cromwell¹, H. J. Monegue¹, K. E. Griswold², and N. Inocencio¹, ¹University of Kentucky, Lexington, ²Southern Illinois University, Carbondale.

Arabinoxylans increase digesta viscosity and decrease digestibility. A bacterial enzyme product which contained endo-1,4- β -xylanase and β -glucanase (105 and 50 IU/g) was used to evaluate its potential for improvement of performance of growing-finishing pigs fed a fortified corn-soy diet (which typically contains 4-5% arabinoxylans). A total of 192 pigs were used in two experiments (Exp. 1: SIU, n=112 crossbred pigs, 45.6 kg BW; Exp. 2: UK, n=80 crossbred pigs, 34.7 kg BW) to evaluate graded levels of the product (0, 80, 100, and 120 mg/kg) on growth performance and carcass characteristics to a market weight of 112.8 kg. Pigs were housed seven/pen at SIU for a total of four replicates and four/pen at UK for a total of five replicates. The diet was formulated to 0.86% lysine; lysine levels were reduced to 0.68% and 0.55% at 58 and 82 kg, respectively. Diets were fed in meal form. All pigs were scanned by real-time ultrasound at 110 kg. There were no experiment x diet interactions for any criteria ($P = .20$). Performance for the initial grower period was improved (linear, $P < .02$) for ADG (940, 982, 962, and 1,022 g) but not ($P = .10$) for ADFI (2.24, 2.26, 2.31, and 2.31 kg) or F/G (2.37, 2.30, 2.39, and 2.26). For the total study, ADG (856, 896, 866, and 875 g), ADFI (2.67, 2.77, 2.74, 2.74 kg), and F/G (3.12, 3.10, 3.16, and 3.13) did not differ ($P = .10$) due to enzyme inclusion. Carcass characteristics (adjusted to 104 kg) did not differ ($P = .10$) with regard to backfat depth (20.8, 21.8, 21.1, and 20.8 mm), longissimus area (39.7, 40.6, 40.6, and 40.2 cm²), or scanned lean (52.4, 51.8, 52.4, and 52.5%). Lean gain (352, 360, 356, and 359 g/d) did not differ ($P = .10$) among dietary treatments. The greatest potential for a product directed at arabinoxylans would appear to be in the earlier stages of the grow-finish period.

Key Words: Pigs, Performance, Enzymes

1951 Amino acids ileal digestibility of hullless barley, barley and sorghum grains in growing pigs. G. Mariscal-Landin^{*1} and J. E. Rodriguez², ¹C. N. I. Fisiologia y Mejoramiento Animal, INIFAP, ²Nutrientes Basicos de Monterrey, S.A. de C.V. NL, Mexico.

Nutritive value of grain sorghum, barley and hullless barley was assessed in 2 experiments. In Exp. 1, 4 barrows of initial BW of 40 kg were fitted with simple T cannulae at the terminal ileum. In a 4x4 Latin square arrangement, pigs were fed 4 diets formulated to 16% CP: corn-starch+soybean meal (SBM); sorghum+SBM (SSB); hullless barley+SBM (HBS) and barley+SBM (BAS). Amino acids apparent digestibility was measured using the difference method. A 6-d adaptation period was followed by a 48-h phase, sampling digesta in 2-h intervals. Pigs were fed in 2 meals (0800 and 1700 h) at 2.5x their DE maintenance requirement (110 Kcal of DE/kg^{.75}). Lys apparent digestibility was greater ($P < .05$) for SBM, 86.3 > SSB, 51.6 = HBS, 49.7 and BAS, 55%. Similar differences were found for Thr, SBM, 80.2 > SSB, 55.5 = HBS, 55.5 and BAS, 54.8%; Met, SBM, 87.9 > SSB, 64.6 = HBS, 70.0 and BAS, 66.9% and for most of the amino acids. Experiment 2 was a growth performance trial, in which sorghum grain was substituted by hullless barley at 0, 34, 66 and 100% of the total cereal grains in the diet (i.e., 4 experimental diets). Initial weight of the pigs was 39.3 \pm 4.8 kg and the observation period was of 77-d. Barrows ate more ($P < .001$) than gilts: 2.57 vs 2.31 kg/d. Avg. of daily gain was similar ($P > .05$), a mean response of .751 kg, but gain:feed ratio was progressively improved