

enrolled in AGRI 1003 graduated within six years. Those students who did graduate had a higher ( $P < 0.01$ ) HSGPA than non-graduates (3.4 vs. 3.16, respectively); however, ACT score (mean = 21.4) was not different ( $P > 0.25$ ) for graduates and non-graduates. These data support

previous reports that HSGPA is the best single-quantitative predictor of student graduation rates.

**Key Words:** New Freshman, Graduation Rate, High School GPA

## Undergraduate Research Paper Competition

**114 Evaluation of nutraceutical effects on pig immunity: effects of Promax.** Leslie Dabovich<sup>\*1</sup>, Lindsey Hulbert<sup>1</sup>, Anthony Rudine<sup>1</sup>, Sungwoo Kim<sup>1</sup>, Fei Ji<sup>1</sup>, and John McGlone<sup>1</sup>, <sup>1</sup>*Pork Industry Institute, Dept Animal and Food Science, Texas Tech University.*

Non-traditional feed ingredients may have effects on pig immunity and health. One possible nutraceutical is Promax (Promax<sup>®</sup>, HumaTech, Inc., Houston, TX) which is a natural, carbon-mineral feed supplement that is mined and minimally processed. Carbon compounds include humic acid, fulvic acid, and other organic compounds and minerals, including bioavailable iron and other trace minerals. In this study we evaluated the effects of Promax formula against a standard corn-soybean meal diet. In study 1, treatments included a control, 46162, and 48162, each added at 5% of the diet from weaning (21 d) to market. In study 2, treatments included a control, 4600, and 5600 each added at 5% of the diet from weaning (21 d) to market. Each study involved 8 replicate pens per treatment with each pen containing 8 pigs (192 pigs per study). Immune measures were collected during the late nursery period in study 1 and during the finishing period in study 2. Immune measures included total number of white blood cells (WBC), differential counts, red blood cell numbers, hemoglobin, hematocrit, lymphocyte proliferation under phytohemagglutinin mitogen, and neutrophil chemokinesis and chemotaxis. In study 1, nursery pigs fed 46162 had elevated ( $P < 0.01$ ) neutrophil chemotaxis compared with pigs fed control or 48162 (82.2, 184.5, 119.5, SE<sub>p</sub>=17.2, control, 46162, and 48162, respectively). During study 2, pigs were inadvertently exposed to erysipelas during the early grower phase. All pigs had stimulated immune measures compared with study 1 pigs (e.g., WBC were increased 48%). Immune measures were not different among treatments. However, mortality was influenced by treatment (9.4, 9.4, and 4.7% for control, 4600 and 5600, respectively). In conclusion, Promax has nutraceutical properties in that it stimulates neutrophil activity which may protect against bacterial pathogens and reduce mortality during acute bacterial infections.

**Key Words:** Pigs, Immunity, Nutraceutical

**115 Use of betamethasone to advance fetal maturation in mares with high-risk pregnancies.** G. L. Olsen<sup>\*1</sup>, D. L. Christiansen<sup>1</sup>, J. Smith<sup>1</sup>, R. Hopper<sup>1</sup>, M. LeBlanc<sup>2</sup>, and P. L. Ryan<sup>1</sup>, <sup>1</sup>*Mississippi State University, Mississippi State, MS*, <sup>2</sup>*Rood and Riddle Equine Hospital, Lexington, KY.*

Induction of parturition is often utilized in the high-risk (HR) pregnant mare to secure a viable foal if a history of dystocia or a concurrent, life-threatening condition is present. However, induction of parturition can be problematic because equids exhibit variable gestation lengths and final fetal maturation occurs late in gestation. The incidence of fetal loss in HR pregnancies could be reduced if fetal maturation were advanced to facilitate pre-term delivery. In humans, fetal maturation can be accelerated successfully with dexamethasone (DEX) or betamethasone (BMS). DEX is only effective in equids when injected intrafetally, which can lead to abortion. Therefore, the objective of this study was to ascertain whether fetal maturation could be advanced by maternal injection with BMS at minimal risk to dam and fetus. Quarterhorse mares ( $n = 13$ ) received (i.m.) either 12 mg (low dose, LD,  $n = 3$ ), 24 or 30 mg (high dose, HD,  $n = 5$ ) BMS or saline (SAL,  $n = 5$ ) at 305, 306 and 307 d of gestation. Delivery was clinically induced (20 IU oxytocin) on d 320 in five mares (two LD and three HD). Foal serum samples at 0, 24 and 48 h were analyzed for cortisol, P4, T4 and T3 concentrations. Foal birth and placental weights and blood cell counts at 0 h were determinants of foal maturity. Of the five BMS-treated mares induced, two foals survived while three were euthanized within 48 h due to negative outcome of induction. Consequently, mare data was analyzed as saline non-induced (SAL,  $n = 5$ ), treated non-induced (TNI,  $n = 3$ ) and treated induced (TI,  $n = 5$ ). Serum cortisol was undetectable in four of five TI foals while P4 values were greater ( $12.5 \pm 3.1$  ng/ml,  $P < 0.2$ ) at 0 h compared to SAL and TNI foals ( $9.1 \pm 1.9$ ,  $8.7 \pm 1.7$  ng/ml, respectively). White blood cell counts at 0 h were greater in TI than TNI ( $P$

$< 0.05$ ) and SAL ( $P < 0.1$ ) foals. Birth weight was greater ( $P < 0.2$ ) in SAL compared to TNI and TI foals (55.8, 49.8 and 46.6 kg, respectively) while placental weight was greater in TI compared to TNI and SAL foals (6.4, 4.3 and 5.5 kg, respectively). SAL and TNI treated mares foaled at term without complications, with BMS treatment advancing delivery by 7-14 days in TNI mares. In conclusion, maternal BMS treatment did not accelerate fetal maturation adequately to successfully induce pre-term delivery of foals.

**Key Words:** Equine, Fetal Maturation, Betamethasone

**116 Rearing pigs indoors or outdoors: effects on pig growth, and behavior.** Anthony Rudine<sup>\*1</sup>, Leslie Dabovich<sup>1</sup>, Lindsey Hulbert<sup>1</sup>, Jeff Dailey<sup>2</sup>, Julie Morrow<sup>2</sup>, and John McGlone<sup>1</sup>, <sup>1</sup>*Pork Industry Institute, Dept Animal and Food Science, Texas Tech University*, <sup>2</sup>*Livestock Issues Research Unit, USDA-ARS.*

Pig performance, health and behavior may be influenced by the production system. A conventional indoor system was compared with an outdoor system for system effects on pig growth, performance, and behavior. Contemporary litters were born indoors in standard farrowing crates with woven wire flooring or outdoors on alfalfa pasture in the spring and summer months. Indoor pigs were weaned into a conventional nursery with slatted flooring or outdoors into pastures with alfalfa and a straw-bedded hut. After weaning, pigs were kept with 2 littermates per pen. A total of 6 replicate pens were evaluated per treatment. Pig dominance order was determined by a feed competition test during the post-weaning period. Pig behavior was recorded for 24 h using a scan sample technique which included walking, standing, sitting, feeding, waterer manipulation (apparent drinking), rooting, oral-nasal-facial chewing/manipulating (ONF), and lying down behaviors. Performance data were analyzed as a randomized complete block design with effects of production system, dominance status (dominant or submissive) and their interaction. Behavior data were analyzed as a randomized complete block design with a split plot over time. Pig performance measures (ADG, feed intake, feed:gain ratio) were not different ( $P > 0.10$ ) among treatments. Indoor and outdoor pigs were similarly inactive during the evening, but they differed in the level and distribution of active behaviors. The production system by time effect was significant ( $P < 0.05$ ) for walking, drinking, ONF, and lying down. Outdoor born and reared pigs were more active overall and showed increased walking, ONF, and reduced lying compared with pigs born and reared indoors. Indoor pigs expressed more apparent drinking during most times of the day. In conclusion, pigs born and reared indoors and outdoors had generally similar performance but very different behavioral profiles.

**Key Words:** Pig, Environment, Behavior

**117 Toxicity in mares consuming *C. paspali*-infected dallisgrass hay.** M.A. Seitz<sup>\*1</sup>, B.J. Rude<sup>1</sup>, N.M. Filipov<sup>2</sup>, and P.L. Ryan<sup>1,2</sup>, <sup>1</sup>*Mississippi State University, Mississippi State, MS*, <sup>2</sup>*College of Veterinary Medicine, Mississippi State, MS.*

Livestock consuming dallisgrass (DG, *Paspalum dilatatum*) infected with the fungus *Claviceps paspali* often develop the condition known as dallisgrass staggers (DGS). Sclerotia produced by *C. paspali* contain the mycotoxin paspalanine, a GABA receptor antagonist that induces symptoms common to DGS such as tremors, ataxia, recumbency, and hyper-excitability. Although symptoms of DGS are well documented, its etiology in the equine species is poorly understood. Thus, the objective of this study sought to examine the affects of *C. paspali*-infected DG hay consumption on the endocrine, hematological and immune parameters of exposed horses. To this end, 12 non-pregnant Quarterhorse mares were given *ad libitum* access to one of four dietary treatment groups: 1) 14 d non-infected hay; 2) 7 d non-infected hay followed by 7 d infected hay; 3) 7 d infected hay followed by 7 d non-infected hay; 4) 14 d infected hay. Mares were randomly re-assigned and the design repeated following a 16 d interval on bermudagrass pasture. Diets were supplemented with

~1.5-kg/d horse feed (10% CP). Mares were given access to dry lots for 6 h/d for exercise. Respiration rates (RR) and rectal temperatures (RT) were recorded daily at 0700 and 1600. Blood samples were collected on d 0, 3, 7, 10 and 14 for blood chemistry, CO<sub>2</sub>, catecholamines (3,4-dihydroxyphenylacetic acid (DOPAC)) and cortisol analyses while BW was recorded on d 0, 7 and 14. There was a significant ( $P < 0.001$ ) change in BW where mares on infected hay lost weight while mares on non-infected hay gained weight (-4.0 vs  $3.7 \pm 1.9$  kg). There were no marked differences in blood chemistry, hematology, and serum cortisol concentrations between treatment groups. Also, there were no significant differences in RR or RT. However, catecholamine metabolism was affected in that the dopamine metabolite DOPAC decreased ( $P < 0.05$ ) with increased length of exposure to infected hay. In conclusion, DG exposure did not cause significant hormonal or blood chemistry changes in mares, but did result in altered catecholamine metabolism and reduced body weight.

**Key Words:** Dallisgrass Staggers, Paspalinine, Equine

**118 Somatogenic hormone effects on immunoglobulin M (IgM) production by pig splenocytes *in vitro*.** C.A. Davila\*, L.A. Solis, and J.C. Laurenz, <sup>1</sup>Texas A&M University-Kingsville.

This study investigated the effect of insulin-like growth factor-1 (IGF-1) and growth hormone (GH) on concanavalin (ConA)-induced IgM production. Pig splenocytes were isolated from fresh spleen by sequential homogenization through stainless steel screens (20, 40 and 80 mesh) and density gradient centrifugation. Splenocytes were plated at  $1 \times 10^5$  cells/well in DME/F12 containing 10% FBS, 2 mM L-glutamine, ConA (0-10 ug/mL), a synthetic glucocorticoid, dexamethasone (0 to  $10^{-6}$  M; DEX), IGF-1 (0-400 ng/mL) and/or GH (0-400 ng/mL). Cells were incubated for 96 h and IgM production determined using an ELISA specific for pig IgM. ConA induced a dose-dependent increase ( $P < .01$ ) in IgM production with maximal effects occurring at 1.25 ug/mL (287 49 vs. 2436 107 ng/mL for 0 vs. 1.25 ug/mL ConA, respectively). Co-treatment of splenocytes with IGF-1 enhanced ( $P < .05$ ) ConA-induced (0.3 ug/mL) IgM production with a maximal 70.2% increase in IgM production apparent at 25 ng/mL IGF-1. However, IGF-1 did not effect ( $P > .05$ ) IgM production when cells were stimulated with higher concentrations of ConA (1.25 ug/mL). Regardless of the ConA concentration, co-treatment with GH (0-400 ng/mL) did not influence ( $P > .05$ ) IgM production. Consistent with previous research with peripheral blood lymphocytes, when splenocyte cultures were stimulated with low concentrations of ConA (0.3 ug/mL), DEX dose-dependently suppressed ( $P < .02$ ) IgM production with maximal effects occurring at  $10^{-7}$  M. In contrast, DEX dramatically augmented ( $P < .01$ ) IgM production in splenocytes treated with higher concentrations of ConA (1.25 ug/mL) with maximal effects occurring at  $10^{-8}$  M DEX (1220 125 vs. 6362 506

ng/mL for 0 vs.  $10^{-8}$  M DEX, respectively). Neither IGF-1 nor GH were able to overcome the suppressive effects of DEX ( $10^{-8}$  M) at low ConA concentrations. However, IGF-1 did dose-dependently enhance ( $P < .05$ ) the ability of DEX to augment IgM production at higher concentrations of ConA (1.25 ug/mL) with maximal effects occurring at 25 ng/mL IGF-1. Collectively, these results demonstrate that IGF-1 can enhance splenocyte function *in vitro*.

**Key Words:** Spleen, Pig, Immunity

**119 Rearing pigs indoors or outdoors: effects on immunity and Salmonella shedding.** Anthony Rudine\*<sup>1</sup>, Leslie Dabovich<sup>1</sup>, Scot Dowd<sup>2</sup>, Julie Morrow<sup>2</sup>, and John McGlone<sup>1</sup>, <sup>1</sup>Pork Industry Institute, Dept Animal and Food Science, Texas Tech University, <sup>2</sup>Livestock Issues Research Unit, USDA-ARS.

Pig performance, health, and behavior may be influenced by the production system. A conventional indoor system was compared with an outdoor system for effects on pig immunity and Salmonella shedding. Contemporary litters were born indoors on slatted floors in farrowing crates or outdoors in spring and summer months. Indoor pigs were weaned into a conventional nursery with slatted flooring while outdoor pigs were weaned into pastures with alfalfa and a straw-bedded hut. After weaning, pigs were kept with 2 littermates per pen. A total of 6 replicate pens were evaluated per treatment for immune measures. Pig dominance order was determined by a feed competition test during the post-weaning period. At 9 weeks of age, pigs were moved to a controlled facility where they were individually housed in biocontainment bubbles and dosed with Salmonella enterica typhimurium (SALM). Fecal samples were collected every 12 hours for 4 days and cultured for SALM. Performance data were analyzed as a randomized complete block design with effects of production system, dominance status (dominant or submissive) and their interaction. Outdoor born and reared pigs had higher hemoglobin concentrations ( $P < 0.01$ ), neutrophil phagocytosis of latex beads ( $P < 0.05$ ) and increased secondary antibody titer to sheep red blood cells ( $P = 0.05$ ), but less primary antibody titer compared with indoor born and reared pigs. Dominant pigs had elevated lymphocyte proliferation to phytohemagglutinin ( $P < 0.01$ ), background titers to sheep red blood cells ( $P < 0.02$ ) and lower ( $P < 0.05$ ) increase in antibody titer to sheep red blood cells than submissive pigs. The interaction between production system and dominance status was not significant for any measure. Pigs born and reared outdoors had reduced ( $P < 0.05$ ) SALM shedding compared with indoor born and reared pigs (2.4 vs. 5.7, SEp=1.03, log colony forming units SALM). In conclusion, pigs in the outdoor production system had enhanced immunity and reduced bacterial shedding of Salmonella compared with pigs in the conventional indoor system.

**Key Words:** Pig, Environment, Immunity