1.80, 2.00, 2.20, and 2.40) improved (linear, $P < 0.03$) ADG (808, 818, 857, 864, 868, 877 ± 23 g/day), feed efficiency (0.31, 0.31, 0.32, 0.32, 0.33, 0.34 ± 0.005), and (quadratic, $P < 0.01$) lean percentage (53.9, 53.9, 53.6, 53.6, 54.2, 54.2 ± 0.15 %). Numerical improvements (linear, $P = 0.12$) in IOMFC (1006.64, 106.64, 106.98, 107.09, 107.60, 107.81 ± 1.40/pig) were observed as lysine increased. The equation (lysine/calorie ratio = -0.0133 × BW, kg + 3.6944) describes the lysine/calorie ratio that optimized performance and IOMFC from 40 to 120 kg.

Key Words: Lysine, Pigs, Economics

191 Determining an optimal lysine:calorie ratio for 35 to 120 kg gilts in a commercial finishing environment. R. G. D. Richardson, M. D. Tokach, R. D. Goodband, and J. L. Nelssen, Kansas State University, Manhattan, KS.

Our objective was to determine the optimal lysine:calorie ratio (g total dietary lysine/Mcal ME) for 35 to 120 kg gilts (PIC L337 × C22) in a commercial finishing environment. Four trials were used involving randomized complete block designs (42 pens/trial, 4,520 pigs). Six treatments of increasing lysine:calorie ratio were used in each study. Diets were corn-soybean meal-based with 5% white grease. Lysine:calorie ratios were attained by adjusting the amount of corn and soybean meal. No crystalline lysine was used. As in trial 1 (35 to 60 kg, reported in 2002), increasing lysine:calorie ratio (1.96, 2.24, 2.52, 2.80, 3.08, and 3.36) in trial 2 (60 to 85 kg) increased (quadratic, $P < 0.02$) ADG (1022, 1035, 1048, 1061, 1074, and 1087 g/d), feed efficiency (0.378 vs 0.338, $P < 0.05$) compared to the control trt. Additionally, pigs fed the 1.20% total Lys diet in the TN environment had higher ADG (P < 0.07) than pigs fed 1.20% total Lys in HS. In trial 3, pigs fed RAC had increased ADG (958 vs 872 g/d, $P < 0.05$) compared to the control trt. Additionally, pigs fed trt 2 had greater ADG (990 vs 926 g/d, $P < 0.05$) than trt 3 during wk 0-6. Pigs fed trt 2 also had increased final BW (109.0, 114.0, 110.8 kg; trt 1-3 respectively, $P < 0.05$) compared to the control trt. Real-time ultrasound data indicate that pigs fed RAC had increased loin area (LIA) (42.8, 45.8, 46.0 cm²; trt 1-3 respectively, $P < 0.05$). However, pigs in the CF environment were 11 d older at the start of the experimental BW. Both RAC use programs had increased pig growth rate and feed efficiency with nearly identical LEA and backfat depths over the control. Additionally, the step-up RAC trt had greater final BW and ADG than the constant RAC trt, while utilizing less RAC in the late finishing period.

Key Words: Lysine, Pigs, Environment


Two experiments were conducted to evaluate the lysine requirement of barrows fed ractopamine HCl (Paylean®, RAC) under heat-stress conditions. Exp. 1 was conducted in the Brody environmental chambers at the University of Missouri. Seventy-two barrows (TR-4 × PIC C22) were subjected to a controlled cycling heat stress (cycling from 27 C at 2400 h to 35 C maintained from 1100 to 1900 h; HS) and fed corn-soy meal diets containing 10 ppm RAC and 3.51 Mcal ME/kg. Pigs were fed one of three dietary Lys levels (0.70, 0.95, or 1.20% total Lys) for 25 d to 6 replicate pens of 7 pigs/pen. An additional treatment consisted of pigs housed at thermoneutral conditions (21 C; TN) and fed a diet containing 10 ppm RAC and 1.20% total Lys. There was a linear improvement in ADG (P < 0.05) and feed efficiency (P < 0.05) with increasing Lys level (593, 633, and 782 g/d, respectively; 0.178, 0.189, and 0.256, respectively). Pigs fed the 1.20% total Lys diet in the TN environment had higher ADG (P < 0.01), ADFI (P < 0.01) and tended to be more efficient (0.371 vs 0.340, P < 0.05) compared to pigs fed RAC. Dietary carnitine did not affect (P > 0.05) Lys requirements in HS. In Exp. 2, 210 barrows (TR-4 × PIC C22) were housed in a cycling heat stress environment (28 to 34 C) and fed corn-soy meal diets containing 10 ppm RAC and 3.47 Mcal ME/kg. Pigs were fed one of four dietary Lys levels (0.90, 1.10, 1.30, or 1.50% total Lys) for 25 d to 6 replicate pens of 7 pigs/pen. A fifth treatment consisted of the 0.90% total Lys diet without RAC. There were no differences in ADG or loin eye area accretion among the RAC fed treatments; however, ADFI (P < 0.01) and tenth rib backfat accretion (P < 0.05) decreased linearly with increasing Lys level. Therefore, feed efficiency linearly (P < 0.01) and quadratically (P < 0.05) improved with increasing Lys level (0.399, 0.414, 0.441, and 0.421, respectively). Pigs fed diets with 10 ppm RAC and 0.90% total Lys had greater ADG (P < 0.02), feed efficiency (P < 0.001), and loin eye area accretion (P < 0.03) than non-RAC fed pigs.

These experiments demonstrate that feeding Paylean® improves the growth performance of heat-stressed pigs and that the lysine requirement of barrows fed Paylean® may be as high as 1.30% total lysine under heat-stress conditions.

Key Words: Pigs, Ractopamine, Lysine

193 The effects of environmental housing conditions on two ractopamine use programs in finishing pigs. S. A. Trapp*, B. E. Hill, S. L. Hankins, A. P. Schinkell, and B. T. Richter, Purdue University, West Lafayette, IN.

Littermate barrows (93) and gilts (96) were used in a 6-wk study evaluating the effect of environmental housing conditions on two ractopamine use programs for late finishing pigs. All pigs were weaned into an SEW nursery. Following the nursing period, they were sorted into two environments: an all-in-all-out grow/finish facility with high bio-security measures in place (AIAO) or into a continuous flow system for the grow/finish phase (CF). At an average initial BW = 72.1 kg, pigs were allotted by weight, sex and ancestry to one of three ractopamine (RAC) treatments (trt): 1 control, no RAC; 2) 5 ppm RAC wks 0-10, 10 ppm RAC wks 4-6; 3) 10 ppm RAC wks 0-6. Barrows were fed a 1.05% Lys diet wks 0-3 and a 1.00% Lys diet wks 4-6; gilts were fed a 1.15% Lys diet wks 0-3 and a 1.10% Lys diet wks 4-6. Pigs fed RAC had increased ADG (1022 vs 867 g/d; P < 0.05) and increased G:F (0.416 vs 0.359; P < 0.05) compared to the control trt during wk 0-3. Overall, pigs fed RAC had increased ADG (1022 vs 867 g/d; P < 0.05) and G:F (0.378 vs 0.338; P < 0.05) compared to the control trt. Additionally, pigs fed trt 2 had greater ADG (990 vs 926 g/d, P < 0.05) than trt 3 during wk 0-6. Pigs fed trt 2 also had increased final BW (109.0, 114.0, 110.8 kg; trt 1-3 respectively, P < 0.05) compared to the control trt. Real-time ultrasound data indicate that pigs fed RAC had increased loin area (LIA) (42.8, 45.8, 46.0 cm²; trt 1-3 respectively, P < 0.05). No significant housing systems or interactions between grow/finish environments and treatments were found for overall ADG, ADFI, G:F, or carcass characteristics (P > 0.05). However, pigs in the CF environment were 11 d older at the start of the experimental BW. Both RAC use programs had increased pig growth rate and feed efficiency with nearly identical LEA and backfat depths over the control. Additionally, the step-up RAC trt had greater final BW and ADG than the constant RAC trt, while utilizing less RAC in the late finishing period.

Key Words: Ractopamine, Pigs, Environment
(0.36 vs 0.35) compared to pigs not fed carnitine and the response was additive to that of RAC. In analysis of the treatments common to all experiments, pigs fed diets containing RAC had increased (P < 0.01) ADG (1.03 vs 0.93 kg) and G:F (0.40 vs 0.35) compared to pigs not fed RAC. Carnitine tended to increase (P < 0.07) ADG (1.00 vs 0.96 kg) and improved (P < 0.01) G:F (0.38 vs 0.37) compared to pigs not fed carnitine. These results suggest that carnitine and RAC improve growth performance of finishing pigs with the greatest response to carnitine occurring in commercial environments.

Key Words: Carnitine, Ractopamine, Pigs

195 Interactive effects of dietary L-carnitine and ractopamine HCI (Paylean®) on finishing pig carcass characteristics and meat quality. B. W. James1, 2, M. D. Tokach1, R. D. Goodband1, J. L. Nelson1, S. S. Dritz1, K. Q. Owen2, and J. C. Woodworth3, 1 Kansas State University, Manhattan, 2 Lonza, Inc., Fair Lawn, NJ.

Three experiments utilizing 1,356 pigs were conducted to determine the interactive effects of dietary carnitine and ractopamine HCI (Paylean®), RAC on carcass and meat quality. Experiments were arranged as factors with main effects of carnitine and RAC. Carnitine levels were 0, 25, or 50 ppm in Exp. 1 and 0 or 5 ppm in Exp. 2. Ractopamine levels were 0, 10, or 50 ppm in Exp. 1 and 0 or 10 ppm in Exp. 2. and 3. Dietary carnitine was fed from 38 kg to market (Exp. 1 and 3) or for 4 wk before market (Exp. 2). Ractopamine was fed for 4 wk. Experiments 1 and 2 were conducted at university research facilities and Exp. 3 in a commercial research barn. A carnitine × RAC interaction (P < 0.02) was observed for visual color, L, and a*/b* in Exp. 1. In pigs fed RAC, increased visual L* and increased visual color scores and a*/b* compared to pigs not fed RAC. Ultimate pH tended to increase (linear, P < 0.07) with increasing carnitine. Drip loss decreased (linear, P < 0.04) in pigs fed increasing carnitine. In Exp. 2, a carnitine × RAC interaction was observed (P < 0.04) for visual firmness and drip loss. Visual firmness scores decreased in pigs fed increasing carnitine and no RAC, but increased with increasing carnitine when RAC was added to the diet. Drip loss decreased with increasing levels of carnitine when fed with RAC. Percentage lean was higher (P < 0.01) for pigs fed RAC. A carnitine × RAC interaction (P < 0.03) was observed in Exp. 3 for fat thickness and percentage lean. Fat thickness decreased and lean percentage increased in pigs fed carnitine or RAC, but the responses were not additive. Pigs fed carnitine tended (P < 0.06) to have decreased drip loss. Pigs fed RAC had decreased (P < 0.05) 10th rib and average backfat and decreased drip loss compared to pigs not fed RAC. These results suggest that ractopamine increases carcass leanness and supplemental carnitine reduces drip loss when fed in combination with ractopamine.

Key Words: Carnitine, Ractopamine, Pigs

197 Evaluation of a botanical extract in non-medicated diets for pigs 15 to 113 kg body weight. B. V. Lawrence*, K. S. Hahn3, J. M. Hansen1, J. Hedges1, E. Hanssen1, R. Musser1, and J. Corley2, 1 Hubbard Feeds Inc., Mankato, MN, 2 Prince Agri Products, Inc., Quincy IL

A botanical extract (Xtract) addition to antibiotic free diets was evaluated in 3 trials. In Exp. 1, 549 pigs (15.1 ± 0.82 kg) were allotted to 1 of 3 non-medicated diet treatments. The Med group consisted of a rotation of 0.31 vs 0.35) compared to pigs not previously fed 1E-1 and increased with increasing levels of carnitine when RAC was added to the diet. Drip loss decreased with increasing levels of carnitine when fed with RAC. Percentage lean was higher (P < 0.01) for pigs fed RAC. A carnitine × RAC interaction (P < 0.03) was observed in Exp. 3 for fat thickness and percentage lean. Fat thickness decreased and lean percentage increased in pigs fed carnitine or RAC, but the responses were not additive. Pigs fed carnitine tended (P < 0.06) to have decreased drip loss. Pigs fed RAC had decreased (P < 0.05) 10th rib and average backfat and decreased drip loss compared to pigs not fed RAC. These results suggest that ractopamine increases carcass leanness and supplemental carnitine reduces drip loss when fed in combination with ractopamine.

Key Words: Carnitine, Ractopamine, Pigs

198 Effects of fish oil on growth performance, immune, and somatotrophic responses following E. coli lipopolysaccharide (LPS) challenge in a 100-d trial. The main treatments common to all experiments were arranged as factorial arrangement of treatments. The main effects were treatment, sex, and LPS-challenge type. Our results indicated that LPS-challenge depressed ADG (P ≤ 0.05) in the first 14 d postweaning. Small pigs provided milk supplement also had increased ADG (P ≤ 0.05) in the first 5 d postweaning compared to normal-sized pigs. Gain/feed was greater (P ≤ 0.05) from d 0 to 14 after weaning when small pigs were previously fed 1E-1 compared to control pigs, while previous supplementation did not affect performance of normal-sized pigs. Increasing fish oil did not improve ADG and ADFI during the first LPS-challenge period (d 14-21; P ≤ 0.10). No LPS-challenge × oil type interactions were observed for any of the growth performance parameters during the 28 d period (P ≥ 0.10). Fish oil decreased blood lymphocyte proliferation incubated with 16 µg/mL concanavalin A during the first challenge period (P ≤ 0.10); however, no LPS-challenge × oil interaction was observed (P ≥ 0.10). On both d 14 and 21, feeding fish oil decreased plasma CS (P < 0.05) and plasma IL-1β (P ≤ 0.10) in LPS-challenged pigs. Pigs fed fish oil also had higher plasma IGF-1 (P ≤ 0.10) as compared to pigs fed the corn oil diet on both d 14 and 21. No LPS-challenge × oil interaction was observed for plasma GH (P ≥ 0.10). These data suggest that fish oil alters indices of the immune axis that may lead to improved growth performance during an inflammatory challenge.

Key Words: Botanical Extract, Pigs, Antibiotics

199 Effect of milk supplementation with Lactobacillus brevis 1E-1 on intestinal microflora, intestinal morphol-