

Swine Species: Grow-Finish Pigs

W438 Ractopamine hydrochloride on performance of heavy weight pigs. G. Borbolla-Sosa, I. E. Avila-Arres*, A. Pineda-Mejía, R. Martínez-Gamba, P. Arriaga-Montero, and A. Rodríguez, *National University of Mexico (UNAM), School of Veterinary Medicine, Department of Swine Medicine and Zootechnics, Mexico City, Mexico.*

Ractopamine hydrochloride (RAC) has been used to increase lean growth in finishing pigs. In South American countries, RAC is supplied between 70 – 100 kg BW due to the smaller slaughter weights used in these countries. However, small profits and higher feed costs have pushed producers into heavier market weights, and therefore more pressure from buyers regarding the fat content of the carcass. The aim of this study was to evaluate the use of RAC in heavy market pigs. A total of 54 barrows and gilts with an average weight of 96 ± 4 kg were randomly assigned to diets with (RAC), or without (C) ractopamine hydrochloride at a dose of 10 ppm per 1000 kg of feed. ADFI, ADG, G:F, backfat depth (BF), longissimus dorsi muscle depth (LMD) and Lean Meat percentage (LMP) were evaluated in this study. BF and LMD were evaluated with a Real Time Ultrasound device; and LMP by means of a mathematical equation. Experimental period lasted 28 d, and data was analyzed by a Student's *t*-test. ADFI decreased ($P < 0.001$) 7% in RAC barrows. ADG was increased ($P > 0.05$) by 4.4% in barrows and 5.5% in gilts compared with controls (950 vs. 910 g/d in RAC and C barrows, and 960 vs. 910 g/d in RAC and C gilts, respectively). RAC barrows and gilts had a 13 and 7% reduction ($P > 0.05$) in G:F compared with controls. Control barrows had a BF 19% larger ($P < 0.02$) than their RAC counterparts (17.33 vs. 14.56 mm, respectively). In gilts BF was only 3% different ($P > 0.05$), between treatment groups (12.63 vs. 12.27 mm; in C and RAC groups). LMD was increased ($P > 0.05$) 2.5% in RAC barrows (48.8 vs. 49.3 mm), and 4.7% in RAC gilts (49.6 vs. 52.1 mm) compared with C. LMP was 1.6% larger ($P > 0.05$) in RAC gilts compared with C gilts, and 5.8% larger ($P < 0.03$) in RAC barrows than C barrows. RAC in heavy barrows and gilts showed an improvement in the major productive parameters of market pigs.

Key Words: ractopamine, lean deposition, fat deposition

W439 The effect of body weight at feed change timing on carcass, meat and fat quality of heavy gilts. J. Suárez-Belloch¹, M. A. Sanz², M. Bellés¹, and M. A. Latorre*¹, ¹*IUCA. Facultad de Veterinaria, Universidad de Zaragoza, Spain,* ²*Centro de Investigación y Tecnología Agroalimentaria de Aragón, Zaragoza, Spain.*

A total of 60 Duroc × (Large White × Landrace) gilts of 54.1 ± 0.14 kg BW and 82 ± 3 d of age, were used to study the effect of BW at feed change timing from growing to finishing period (100 vs. 90 vs. 80 kg) on carcass and meat quality and fatty acid (FA) profile of subcutaneous fat. Each treatment was replicated 4 times and the experimental unit was the pen constituted by 5 pigs allocated together. Commercial diets based on maize, barley and vegetable meals and containing 3,200 kcal NE/kg, were provided ad libitum through the trial (17% CP and 0.9% Lys for growing phase and 15.7% CP and 0.7% Lys for finishing phase). Pigs were slaughtered at 120 kg BW because were intended for dry-cured ham industry. Therefore, minimum fat depth at gluteus medius muscle (m. GM) and fresh ham weight are required to pass the hams for being dry-cured. Data were analyzed by GLM of SAS. Bringing forward the feeding change did not modify carcass yield or ham size ($P > 0.10$). However, the change of diet at lighter BWs tended to increase linearly the fat depth at m. GM ($P = 0.06$) which suggests a lower lean yield; in

fact, a reduction of the loin weight ($R^2 = 0.76$; $P = 0.03$) was observed although no decrease in the weight of other main cuts such as hams or shoulders was detected. In addition, treatment did not affect water holding capacity, color, tenderness or chemical composition of meat ($P < 0.10$). However, bringing forward the feeding change reduced the total monounsaturated FAs ($P < 0.05$), due to C18:1 ($P < 0.05$), and increased the total polyunsaturated FAs ($P < 0.05$) due to C18:3 ($P < 0.001$). It is concluded that, under our experimental conditions, the change of the diet from growing to finishing period at 80 kg BW had no effect on meat quality but could be interesting, taking into account the improvements in carcass and fat variables, in the case of pigs intended for dry-cured ham industry.

Key Words: feeding change, carcass and fat quality, heavy gilt

W440 Nitrogen balance of immunocastrated pigs receiving diets with or without ractopamine. L. R. Silva, E. Lanferdini, L. G. M. Amaral, C. A. P. Garbossa, H. Silveira, and V. S. Cantarelli*, *Federal University of Lavras, Lavras, Minas Gerais, Brazil.*

The trial was conducted in the Experimental Swine Center at UFLA. A metabolic assay was conducted to evaluate the effect of ractopamine (RAC) on the nitrogen balance of immunocastrated male pigs (IMP) in 2 periods of the finishing phase. Twelve IMP with initial BW of 88.38 ± 7.27 kg were housed in metabolic cages for total collection of feces and urine. The experimental design was a 2×2 factorial, with 2 levels of RAC (0 and 10 ppm), and 2 periods of the use of RAC (14 and 28), with 6 replicates of one animal per experimental unit. Diets with RAC had a higher amino acid concentrations (0.65% and 0.75% digestible lysine, in diets with and without RAC) and crude protein (14.61% and 15.31%, in diets with or without RAC), due to higher demand for protein synthesis. The experiment lasted 28 d, separated into 2 14 d periods, with 10 d of adaptation and 4 collection days per period. Nitrogen intake (NI), excreted in feces (NF), and eliminated by urine (NU) were determined and the percent of dietary nitrogen absorbed (NA%), and retained (NR%); and the percent of absorbed nitrogen that was retained (NR/A%) at 14 and 28 d were calculated. All variables were subjected to Tukey test (5%). There were no interactions ($P < 0.05$) between any variables. Due to the fact that RAC diets had a higher amount of nitrogen (amino acids), addition of RAC increased ($P < 0.05$) NI by 3%, but also increased ($P < 0.05$) NR% by 7.5% and NR/A% by 6.6%. These results indicate that RAC alters metabolism, by increasing the efficiency of utilization of amino acids, even in IMP. When we compared the use of RAC between periods, due to the downregulation process that occurs during prolonged use of RAC in the last 14 d, RAC supplementation resulted in increased amount of NU and consequently decreased ($P < 0.05$) by 6.5% the amount of NR% and 6% NR/A% compared with the first 14 d. In conclusion, the use of RAC in the diets of IMP results in better utilization of nitrogen and consequently lower N excretion, but it is more pronounced in the first 14 d of supplementation.

Key Words: immunocastration, ractopamine, nitrogen balance

W441 Effects of lysine and ractopamine on performance, carcass characteristics and economic viability of male pigs immunocastrated during the growing and finishing phases. L. R. Silva, P. B. Faria, L. G. M. Amaral, M. L. T. Abreu, E. Lanferdini, and V. S. Cantarelli*, *Federal University of Lavras, Lavras, Minas Gerais, Brazil.*

An experiment was conducted in the Experimental Swine Center, in the Animal Science Department, of Federal University of Lavras, with the objective of evaluating the effect of lysine concentrations and ractopamine (RAC) in the diets of immunocastrated male pigs (IMP), in growing and finishing phases on performance, carcass characteristics and economic viability. A 56-d experiment was conducted with 48 IMP with an initial BW of 59.22 ± 3.39 kg. The experiment was designed as a 2×2 factorial, with 2 concentrations of digestible lysine (DL: 0.9 and 1.0%) in the growing (d0–18) phase followed by the addition or not of RAC in the finishing (d 29–56) phase (0 ppm of RAC and 0.65% of DL, and 10 ppm of RAC and 0.75% DL). Pigs were separated for performance evaluation into 6 replicates and 2 animals per pen. For carcass evaluation and economic feasibility, there were 12 replicates and plot of one animal. Pigs were weighed at the beginning, 14, 28, 42 and 56 d of experiment. At the end of the trial pigs were slaughtered to evaluate carcass characteristics and economic feasibility. All variables were subjected to Tukey test (5%). Changes in performance were observed only in the final 14 d of the study, in which pigs supplemented with RAC had lower ($P < 0.05$) feed intake (4%) and better ($P < 0.05$) feed efficiency (5%). There were positive interactions ($P < 0.05$) only on carcass meat yield between concentrations of DL and RAC, in which the best result was obtained with 1.0% DL followed by the addition of 10 ppm of RAC. Carcass length decreased ($P < 0.05$) 3% while the compactness of carcass increased ($P < 0.05$) 5% when given diets supplemented with RAC. Regarding the economic feasibility study, the results indicated that concentrations of 0.9% DL during the growing phase and 10 ppm of RAC in the finishing phase resulted in higher ($P < 0.05$) rate of bonus (2%). In conclusion nutrition programs meet the nutritional needs of IMP, being economically feasible only if there is a bonus at the slaughter.

Key Words: immunocastration, ractopamine, pig

W442 Influence of ractopamine on the diets of swine stressed by heat. R. Philomeno², C. A. P. Garbossa¹, M. R. Junqueira¹, L. G. M. Amaral¹, R. A. Ferreira¹, and V. S. Cantarelli*¹, ¹Federal University of Lavras, Lavras, Minas Gerais, Brazil, ²Agroceres Multimix, Rio Claro, São Paulo, Brazil.

An experiment was conducted in the House's Climate Room Metabolism at the Experimental Swine Center (ESC) at the Animal Science Department, Federal University of Lavras (UFLA). We used 144 barrows (high potential for lean gain) with an average initial BW of 65 kg, with the objective of evaluating the effect of heat stress on the use of ractopamine (RAC) in the finishing phase. The design was a 4×2 factorial with 4 levels of RAC (0, 5, 10 and 15 ppm), and 2 rearing conditions (thermal comfort at 20°C, and heat stress at 32°C) in 6 replicates with experimental unit represented by 3 animals. Experimental diets were formulated based on corn and soybean meal, meeting the nutritional requirements of the phase and genetic line. The diets with and without ractopamine had the levels of 0.76% and 0.9% of lysine respectively. The experimental period was 28 d and the variables analyzed were: ADG, ADFI, feed conversion (FC), respiratory rate (RR), rectal temperature (RT), hormonal parameters (serum concentration of triiodothyronine - T3), loin eye area, loin depth, backfat thickness and organ weights (heart, kidney and lung). All the variables were subjected to the F test (5%). The use of RAC improved ($P < 0.05$) performance variables, with no significant interaction ($P < 0.05$) with ambient temperature. Similar results were observed for serum concentrations of T3 ($P < 0.05$). Temperature influenced ($P < 0.05$) RR and RT without and interaction with RAC levels. Heart and lung were not influenced by trt ($P > 0.05$). However, kidney weights decreased ($P < 0.05$) with increasing RAC and an interaction of

RAC and temperature was observed for liver weight ($P < 0.05$). There were no effects ($P > 0.05$) on carcass variables. We can conclude that RAC improves performance variables, besides interfering concentrations of T3, but does not alter the respiration rate and rectal temperature of pigs, the latter being altered by environmental conditions. The use of ractopamine reduces the weight of the kidney and does not alter carcass characteristics.

Key Words: performance, heat stress, carcass modifier

W443 Lysine levels in diets with different corn starch digestion kinetics for growing pig. N. O. Amaral², L. G. M. Amaral¹, F. M. Carvalho Jr.¹, H. Silveira¹, and V. S. Cantarelli*¹, ¹Federal University of Lavras, Lavras, Minas Gerais, Brazil, ²Federal Institute of Education, Science and Technology, Machado, Minas Gerais, Brazil.

This study was conducted to verify the influence of the kinetics of starch digestion on digestible lysine requirement of growing pigs. A total of 120 gilts and barrows, Landrace/Large White genetic line (initial weight of 34.2 kg), were used for performance evaluation and 60 barrows (initial weight of 40.3 kg) were used to determine total tract digestibility and nitrogen balance. The experiment was designed as a 3×4 with 3 different maize geometric mean diameters (GMDs: 550, 700 and 850 mm) and 4 concentrations of lysine (0.85, 0.95, 1.05 and 1.15%) totaling 12 treatments and 5 replications. Data were subjected to statistical analysis by SNK test (5%). There was a significant interaction between GMD and lysine concentration for ADFI and feed conversion (FC). Pigs fed 0.85 and 0.95% lysine had lower ADFI of pigs fed the source of slow digested starch (SDS, GMD 850 mm). At 1.05% level, however, this situation was reversed, the ADFI was higher. Moreover, there was a quadratic effect on ADFI of animals receiving SDS in the diet, as the concentration of Lys increased. For FC, pigs fed diets with SDS and 0.85% lysine had a FC 14% lower than those fed diets containing rapidly digested starch (RDS – GMD 550 mm) and intermediate digested starch (IDS, GMD 750 mm). Moreover, there was a quadratic effect RDS and a linear effect to the source SDS as Lys concentration increased. Thus, we conclude that the variation of the kinetics of starch digestion provided by different degrees of grinding of maize influences the lysine requirement of growing pigs (30–60 kg). The particle size of slow starch digestion (850 μ m) enhances the efficiency of lysine utilization by pigs.

Key Words: nutrition, particle size, starch digestion

W444 The effect of immunocastration on growth performance and meat quality of heavy gilts . M. A. Latorre*¹, A. Daza², A. Olivares³, and C. J. López-Bote³, ¹Universidad de Zaragoza, Zaragoza, Spain, ²Universidad Politécnica de Madrid, Madrid, Spain, ³Universidad Complutense de Madrid, Madrid, Spain.

A total of 48 Duroc \times (Large White \times Landrace) gilts of 33.2 ± 0.63 kg BW were used to study the effect of immunization against G_nRH on growth performance and on the content and fatty acid (FA) profile of intramuscular fat (IMF) of meat. Each experimental treatment (control vs. immunocastration) was replicated 8 times and the replicate was a pen with 3 gilts. Immunization was carried out with 2 injections of Improvac (Pfizer) with at least 4 weeks between both injections (1st: 35.0 kg BW, 2nd: 57.6 kg BW). A commercial diet, based on barley, wheat, and vegetable meal and containing 13.74 MJ DE/kg, 13.9% CP, and 0.89% Lys, was provided ad libitum through the trial. Pigs were slaughtered at 125 kg BW because were intended for dry-cured ham industry. Data were analyzed by ANOVA and the statistical model included the gilt

sex as main effect. The castrates ate more feed (2.83 vs. 2.67 kg/d; $P = 0.04$) and grew faster (989 vs. 937 g/d; $P = 0.03$) than entire gilts but the feed conversion ratio was similar (2.86 vs. 2.84 kg/kg; $P > 0.05$). The highest IMF content was found in meat from castrates (5.0 vs. 4.3%; $P = 0.09$). The proportion of total saturated FAs was higher in IMF from immunocastrated than in that from entire gilts (40.8 vs. 38.4%; $P < 0.0001$) due to the higher content in C16:0 ($P < 0.0001$), C18:0 ($P < 0.0001$) and C20:0 ($P = 0.02$). However, the percentage of total monounsaturated FAs was lower in immunocastrates (50.8 vs. 52.3%; $P = 0.004$) because of the lower content in C18:1n-9 ($P = 0.002$). The castrates had lower proportion of C18:2n-6 ($P < 0.10$) and C20:4n-6 ($P = 0.01$) than entire gilts which carried out a lower total polyunsaturated FA percentage (8.34 vs. 9.25%; $P = 0.06$) and polyunsaturated FA/saturated FA ratio (0.20 vs. 0.23; $P = 0.01$) in immunocastrated animals. It is concluded that the immunization against GnRF in gilts improved growth performance and increased the IMF content of meat but impaired its quality related to fatty acid profile.

Key Words: gilt immunocastration, growth performance, fat composition

W445 Performance of growing-finishing pigs fed brewers rice and dried distillers brewers yeast. T. Dokes and O. Gekara*, *University of Arkansas Pine Bluff, Pine Bluff.*

The objective of this study was to determine whether brewers rice and dried distillers brewers yeast can replace all corn and soybean meal, and, significantly increase performance of growing-finishing pigs. Sixty-four Yorkshire \times Duroc \times Hampshire crosses (BW = 72 \pm 13 kg) were randomly assigned to 4 diets: (1) corn/soybean meal (CSM; control); (2) brewers rice/soybean meal (RSM); (3) corn/dried distillers brewers yeast (CBY); (4) brewers rice/dried distillers brewers yeast (RBY). The 4 diets were formulated to be isonitrogenous. The experiment lasted 28 d; BW of finished pigs = 95 \pm 14 kg. Variables determined included ADG, apparent total tract digestibility (ATTD) of nutrients (mainly N and P), fecal DM output, G:F, and back fat thickness. All data were analyzed using ANOVA of SAS. Compared with pigs fed on CSM and CBY diets, pigs on RSM and RBY diets gained faster (0.868 vs. 0.730 kg/d; $P < 0.01$), had reduced fecal DM output (0.299 vs. 0.607 kg/d; $P < 0.001$), and fecal loss of N (0.012 vs. 0.020 kg/d; $P < 0.01$) and P (0.012 vs. 0.017 kg/d; $P < 0.01$), had greater ATTD (89.7 vs. 78.9%; $P < 0.001$) and G:F (0.30 vs. 0.25 kg/kg; $P < 0.01$). Pigs fed on RSM and RBY tended ($P < 0.10$) to deposit more back fat compared with CSM and CBY pigs. Brewers rice and dried distillers brewers yeast can complement each other and greatly reduce fecal loss of N and P; thus,

can effectively replace corn and soybean meal in diets for growing-finishing pigs.

Key Words: brewers rice, dried distillers brewers yeast, pig

W446 Effects of vegetable oils and residue of winemaking on performance, carcass traits, and pork quality. T. M. Bertol*¹, R. M. L. de Campos², E. A. P. de Figueiredo¹, and V. L. Kowski¹, ¹*Embrapa Suínos e Aves, Concórdia, SC, Brazil,* ²*Fundação Universidade Federal do Vale do São Francisco, Petrolina, PE, Brazil.*

A 38 d study was carried out to evaluate the effect of dietary oil and grape bagasse on performance, carcass traits and pork quality. Forty barrows with a genetic composition of 50% Landrace, 25% Moura, and 25% Large White, averaging 80.12 \pm 4.95 kg, were utilized. Treatments (TREAT) compared were (1) Control: corn-soybean meal based diet; (2) Diet with 1.5% of canola oil (CAN) + 1.5% of flax oil (FLAX); (3) Diet with 1.5% of CAN + 1.5% of FLAX, and 3 and 5% of grape bagasse (GB), for 21 and 17 d, respectively; (4) Diet with 1.5% of CAN + 1.5% of FLAX, and 6 and 10% of GB, for 21 and 17 d, respectively. The diets of TREATs 2, 3 and 4 were maintained isocaloric by replacing wheat bran by GB. The ANOVA model included block (initial weight), and TREAT. Means were compared by protected *t*-test and by orthogonal contrasts: TREAT 1 vs. TREATs 2, 3 and 4; TREAT 2 vs. TREATs 3 and 4; and TREAT 3 vs. TREAT 4 ($P < 0.10$). Average daily gain (ADG) and final weight (FW) increased with dietary oil supplementation (FW = 112.8 \pm 1.69^b, 120.1 \pm 2.00^a, 118.6 \pm 2.47^a, 115.9 \pm 2.68^{ab} kg; ADG = 0.862 \pm 0.041^b, 1.044 \pm 0.035^a, 1.016 \pm 0.037^a, 0.944 \pm 0.051^{ab} kg, for TREATs 1, 2, 3, and 4, respectively; $P < 0.01$). FW reduced with the inclusion of GB in the diet (contrast TREAT 2 vs. TREATs 3 and 4; $P < 0.05$). Backfat thickness, loin eye area and meat/fat ratio were not affected ($P > 0.05$) by TREATs. The values of pH 24 h after slaughter were higher on TREAT 2 than in the other TREATs (pH 24 h = 5.59 \pm 0.03^b, 5.71 \pm 0.04^a, 5.61 \pm 0.01^b, 5.62 \pm 0.04^b; $P < 0.06$). Ether extract (EE) of loin was lower and shear force (SF) was higher in the TREATs 2, 3 and 4 (EE = 2.36 \pm 0.23, 1.84 \pm 0.06, 1.92 \pm 0.22, 2.00 \pm 0.22%; SF = 1.86 \pm 0.15, 2.25 \pm 0.25, 2.18 \pm 0.17, 2.39 \pm 0.21 kg; contrast TREAT 1 vs. TREATs 2, 3 and 4; $P < 0.05$). In conclusion, dietary supplementation with CAN and FLAX, associated to wheat bran and GB, improved growth performance and decreased the intramuscular fat and tenderness, but it did not affect carcass traits. The inclusion of GB in the diet did not affect carcass traits, but the highest level of inclusion decreased growth performance.

Key Words: canola oil, flax oil, grape bagasse