were placed in mixed-gender pens and blocked by BW in a randomized complete block design. Diets were corn–soy– distiller's dried grains with solubles (DDGS) based and were fed in 4 phases. Treatments were 1) Control, no Cr in the grower or finisher phases; 2) 200 ppb of Cr fed in both grower and finisher phases; and 3) 200 ppb of Cr fed in the grower phase and 100 ppb fed in the finisher phase. The grower phase was from 49 to 92 kg and the finisher phase was from 92 to 124 kg. Data were analyzed using PROC GLIMMIX of SAS (SAS Inst. Inc., Cary, NC) and are presented as least squares means ± SEM. There was no evidence ($P \geq 0.197$) of a Cr supplementation effect in the grower period. In the finishing period, addition of Cr resulted in a quadratic increase ($P = 0.023$) in ADG, with the greatest performance observed at 200 ppb Cr (0.92, 0.92, and 0.94 ± 0.010 kg/d for the Control and 100 and 200 ppb added Cr, respectively), with no evidence of differences on ADFI or G:F. Overall, the addition of 200 ppb Cr in both grower and finisher phases tended to increase ($P = 0.086$) ADG compared with the control (0.89, 0.90, and 0.91 ± 0.006 kg/d for the control and 200/100 and 200/200 ppb added Cr, respectively). There was no evidence ($P \geq 0.523$) of a Cr supplementation effect on overall ADFI and G:F. Backfat was lowest ($P = 0.028$) for pigs fed 200 and then 100 ppb Cr and greatest for pigs fed 200 ppb Cr in the grower and finisher phases, with control pigs intermediate (18.4, 18.0, and 18.7 ± 0.23 mm for the Control and 200/100 and 200/200 ppb added Cr, respectively). Percentage lean was greatest ($P = 0.028$) for pigs supplemented with 200 and then 100 ppb Cr (55.1, 55.4, and 55.0 ± 0.16% for the control and 200/100 and 200/200 ppb added Cr, respectively). Dressing percentage was lowest ($P = 0.018$) for pigs fed 200 ppb Cr in both grower and finisher phases, with no difference between the other treatments (77.1, 77.1, and 76.8 ± 0.001%, respectively). There was no evidence of differences ($P > 0.10$) in HCW or loin depth. In summary, adding 200 ppb of Cr in both grower and finisher phases increased finishing ADG. Carcass characteristics were optimized with supplementation of 200 ppb Cr in the grower phase followed by 100 ppb Cr fed in the finisher phase.

Key Words: chromium propionate, duration, finishing pigs
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276 Evaluation of standardized ileal digestible tryptophan:lysine ratio with and without ractopamine hydrochloride on growth performance and carcass characteristics of finishing pigs.

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Previous research has reported that increasing the SID Trp:Lys ratio to 24.5% in finishing pigs fed ractopamine HCl (RAC) during summer months improved ADG by 70 and 37 g/d in comparison with ratios of 18 and 21%, respectively. The objective of this experiment was to determine the effects of feeding higher SID Trp:Lys ratios with and without RAC on growth performance and carcass characteristics of finishing pigs during summer months. In August 2016 (mean outside temperature 23.03°C), a total of 1,101 pigs (PIC 1050 × 327; 99.3 kg initial BW) were used in a 30-d trial. Pens of 26 or 27 pigs were randomly assigned to 6 dietary treatments arranged in a 2 × 3 factorial with main effects of RAC (0 or 10 ppm) and SID Trp:Lys ratio (20, 24, and 28%) with 7 replications per treatment. Diets with and without RAC were formulated to 0.90 and 0.66% SID Lys, respectively. Overall (d 0 to 30), a RAC × SID Trp:Lys ratio interaction was observed (linear, $P < 0.05$), where increasing SID Trp:Lys ratios improved BW, ADG, and G:F when diets contained RAC but decreased these criteria when diets did not contain RAC. Similarly, RAC × SID Trp:Lys ratio interactions were observed (linear, $P < 0.05$) for carcass criteria with improvements in carcass ADG, carcass G:F, and HCW when pigs were fed increasing SID Trp:Lys ratios in diets containing RAC. A linear decrease ($P < 0.05$) was observed in carcass ADG and carcass G:F in pigs fed higher SID Trp:Lys ratios when diets did not contain RAC. In summary, increasing SID Trp:Lys ratio above 20% improved growth and carcass performance when diets contained RAC, whereas pigs fed higher SID Trp: Lys ratio above 20% had reduced performance when diets did not contain RAC.

Key Words: finishing pigs, ractopamine hydrochloride, tryptophan
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277 Effects of dietary electrolyte balance and crude protein on growth performance and carcass characteristics of finishing pigs from 110 to 130 kilograms.

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Economic and environmental factors have compelled nutritionists to develop low-protein, AA-fortified diets that deliver performance equivalent to traditional formulations. In some instances, low-protein, AA-fortified diets have led to poorer performance in finishing pigs than conventional diets. Along with low CP concentrations, with crystalline AA, there is proportional decrease in dietary electrolyte balance (dEB). To evaluate the effects of dEB and determine the optimum dietary CP level in finishing pigs, 2 experiments were conducted. In Exp. 1, 288 pigs (PIC 327 × 1050; initially 110.4 kg) were used in a 20-d trial. Pens of 8 pigs were randomly assigned to 4 dietary treatments with 8 replications per trea tment. Treatments were arranged in a 2 × 2 factorial with main effects of CP (10 or 13%) and dEB (48 or 107 mEq/kg). Pigs fed 13% CP diets had greater ($P = 0.001$) ADG (0.79 vs. 0.71 kg; $P = 0.037$), final BW, and ($P < 0.001$) G:F (0.279 vs. 0.253) compared with pigs fed the 10% CP diets. Marginal significance for a CP × dEB interaction ($P = 0.083$) was observed for ADFI because intake numerically decreased when dEB was increased for pigs fed 10% CP whereas

Table 276.

	Ractopamine HCl, ppm							Probability, $P <$	
	0			10					
	SID Trp:Lys ratio, %							R × T[1]	
Item	20	24	28	20	24	28	SEM	Linear	RAC
ADG, kg	0.88	0.84	0.82	0.98	1.03	1.03	0.049	0.012	0.001
ADFI, kg	2.51	2.44	2.48	2.39	2.36	2.42	0.075	0.351	0.003
G:F	0.35	0.34	0.33	0.41	0.44	0.42	0.007	0.010	0.001
Final BW, kg	125.1	124.1	123.3	128.0	130.2	129.3	2.75	0.030	0.001
Carcass ADG, kg	0.64	0.61	0.60	0.72	0.75	0.75	0.036	0.009	0.001
HCW, kg	90.6	90.2	89.5	93.3	95.0	94.9	2.14	0.057	0.001
Carcass yield, %	72.4	72.7	72.6	72.9	73.0	73.4	0.20	0.490	0.001

[1]R × T = RAC × SID Trp:Lys ratio.

intake increased as dEB was increased for pigs fed 13% CP diets. For carcass performance, pigs fed the diets with 13% CP had increased ($P = 0.001$) HCW and HCW ADG and improved ($P = 0.001$) HCW G:F compared with pigs fed 10% CP diets. In Exp. 2, 224 pigs (PIC 327 × 1050; initially 109.4 kg) were used in a 20-d trial. Pens of 7 pigs were assigned to 4 levels of dietary CP (10, 11, 12, and 13%) with 8 replications per treatment. For overall growth performance (d 0 to 20), increasing CP increased (linear, $P < 0.05$, and quadratic, $P < 0.10$) ADG (0.77, 0.86, 0.91, and 0.90 kg), ADFI (2.58, 2.72, 2.84, and 2.76 kg), and HCW ADG, with the greatest response for pigs fed the diet with 12% CP. Increasing diet CP also improved (linear, $P < 0.05$) G:F (0.299, 0.314, 0.322, and 0.327), NE caloric efficiency, final BW, HCW and HCW G:F. In summary, dEB in the tested range had no effects on growth performance or carcass performance. Optimum dietary CP was reached by pigs fed diets with 12% CP. Rationale for poor feed efficiency and low feed intake when pigs are fed diets with less than 12% CP remains unclear.

Key Words: crude protein, electrolyte balance, finishing pig
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278 Does chemical composition of dietary fat sources alter messenger RNA abundance of genes related to lipid digestion and metabolism in pigs?

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Our objective was to determine the effect of dietary fat source on the mRNA abundance in porcine tissues of genes related to lipid digestion, lipogenesis, and lipolysis. A total of 48 Genetiporc 6.0 × Genetiporc F25 (PIC, Inc., Hendersonville, TN) barrows (initial BW of 9.9 ± 0.6 kg) were randomly allotted to 1 of 6 dietary treatments in a 56-d experiment. Each experimental diet included 95% of a corn–soybean meal basal diet and then 5% of either cornstarch (CNTR), animal–vegetable blend (AV; iodine value [IV] = 70.9), coconut oil (COCO: IV = 1.1), corn oil (CORO; IV = 131.9), fish oil (FO; IV = 140.0), or tallow (TAL; IV = 46.0). Pigs were fed these experimental diets from d 0 to 10 and d 46 to 56 and fed a common diet from d 10 to 46. Expression normalization across samples collected postmortem (d 56) within tissue was performed by calculating a delta cycle threshold (Ct) value for each sample using *RPL32*, as transcript abundance was similar among treatments ($P > 0.10$). Delta delta Ct (ΔΔCt) values were calculated from delta Ct values using a reference sample pooled from all experimental samples within tissue. Data were analyzed using PROC MIXED with dietary treatment as a fixed effect, replicate (2 cohorts of 24 barrows each) as a random effect, and pig as the experimental unit. Including dietary fat decreased the mRNA abundance of *fatty acid synthase* in adipose tissue (AT; CNTR = −1.48, AV = 0.89, COCO = 0.26, CORO = −0.15, FO = 0.96, TAL = 1.10 ΔΔCt; $P = 0.031$). Including fat sources with greater concentrations of oleic or linoleic acid increased mRNA abundance in AT of *sterol regulatory element-binding protein-1* (CNTR = 0.59, AV = −1.64, COCO = 0.30, CORO = −2.06, FO = 1.13, TAL = 0.08 ΔΔCt; $P = 0.050$). Including CORO or no added dietary fat versus including TAL tended to increase mRNA abundance of *stearoyl CoA desaturase* in AT (CNTR = −0.71, AV = 0.09, COCO = −0.32, CORO = −1.75, FO = 0.51, TAL = 2.14 ΔΔCt; $P = 0.100$). Dietary treatment had no impact on the mRNA abundance of *acetyl CoA carboxylase* ($P = 0.377$), *ATP citrate lyase* ($P = 0.422$), or *peroxisome proliferator-activated receptor-α* ($P = 0.688$) in AT. In conclusion, the chemical composition among dietary fat sources alters the mRNA abundance of genes related in the synthesis and desaturation of fatty acids in AT.

Key Words: dietary fat, lipogenesis, swine
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279 Pigs receiving daily tailored diets have different amino acid requirements than pigs raised in conventional phase feeding systems.

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There is a large variation in nutrient requirements among pigs, and therefore, individually feeding pigs with daily tailored diets