The Effect of Feeding a Low Nutrient Excretion Diet on Growth Performance and Carcass Characteristics of Nursery, Grower, and Finisher Pigs

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Introduction

Today's swine industry has undergone many production changes over the past two decades. Production facilities have become more concentrated, not only in the number of pigs reared at one production operation, but also the number of production facilities located in the same geographical area. A negative aspect of this increased animal concentration is the increase in the amount of manure that is produced and the land that is required to apply manure at rates that environmentally sustainable. Many practices are currently being evaluated to reduce the amount of nutrients excreted in the urine and feces by the pig and directly impacting manure application rates and environmental air quality. Three such practices include: feeding diets with a reduced crude protein level and the supplementing with crystalline amino-acids, the inclusion of phytase in the diet, and the replacing of normal corn with high available phosphorus (HAP) corn.

The purpose of this experiment was to combine these three feeding practices into the same low nutrient excretion (LNE) diet and measure its effect on growth performance and carcass characteristics during the nursery, grower, and finisher phases of production.

Materials and Methods

Seventy-four barrows and seventy-four gilts (Ausgene genetics) were used in this trial. Pigs were received after early weaning (avg. 15.5 days of age) and sorted by sex into Double L™ SEW nursery buildings located at the Purdue Swine Research Center. After being fed a common SEW starter diet for one week, pigs (initial BW 14.7 lbs.) were sorted again by sex and weight, and assigned to one of two dietary treatments, control and low nutrient excretion (LNE). Pigs were split into two SEW buildings that contained two separate rooms each, with one treatment in each room per building. Within each room, barrows were on one side of a center aisle and gilts were on the other, with each side of the isle on their own manure pits. Pigs were housed four or five pigs/pen during the nursery period and there were 9 pens per treatment-sex combination during the nursery period. Pigs were fed three phases of nursery diets (Table 1). Feed and water were provided ad lib throughout the trial. Individual pig weights and pen feed consumption was measured on day 7, 20, and 34 during the nursery period in order to determine average body weight, ADG, ADFI, and G:F (Table 4).

On d 34 of the study, 20 pigs per sex per treatment were randomly selected and re-allotted within treatment and sex into one of two identical, environmentally controlled rooms with one dietary treatment in each room. Pigs were housed at four pigs/pen during the grower period and two pigs/pen during the finisher period. There were five pens per sex-treatment combination during the grow-finish period. Two phases of diets were fed during the grower phase for 4 weeks each (Table 2), and two phases of finisher diets were fed for 4 weeks each (Table 3), for a 112 d (16 weeks) total grow-finish period. Individual pig weights and pen feed consumption was measured every 14 days to calculate average body weight, ADG, ADFI, and G:F (Table 4.).

At four periods throughout the trial, equal numbers of pigs from each treatment and sex were slaughtered in order to determine body composition and carcass characteristics. Body composition data will not be presented at this time. There was an initial slaughter prior to the start of the experiment, which included six barrows and six gilts (Table 5), six pigs per sex per treatment at the end of the nursery phase (Table 6), ten pigs per sex per treatment at the end of the grower phase(Table 7), and ten pigs per sex per treatment at the end of the finisher phase(Table 8). At all slaughters blood and cleaned visceral organs were collected, weighed, and frozen for later grinding and chemical analysis. Initial and nursery slaughter pigs were frozen overnight before backfat and LEA measurements were recorded. Grower and finisher slaughter pigs were allowed to chill for 24 h prior to being ribbed at the 10^{th} rib to collect 10^{th} rib, last rib, and last lumbar backfats, and LEA measurements. Subjective firmness, marbling, and color scores were also obtained at the 10^{th} rib interface of the loin at the time of final slaughter.

Data were analyzed as a randomized complete block design with 2 X 2 factorial arrangement of dietary treatments and sex using the GLM procedure of SAS (2000). Pen was the experimental unit for the growth performance data and individual pig was the experimental unit for the carcass data.

Results

Growth performance. Nursery, grower, and finisher phases, and overall grow-finish performance is presented in Table 4. There was no difference (P>0.10) in initial nursery weight, ADG and ADFI between treatments or sexes. Numerically, control pigs grew at a faster rate while consuming less feed than the LNE pigs. Consequently, this led to an improved feed efficiency (P<0.0001) for control pigs compared to the LNE-fed pigs (0.67 vs. 0.62). No differences (P>0.10) were observed in feed efficiency between barrows and gilts during the nursery period. Final nursery body weights did not differ (P>0.10) between treatments or sexes.

During the grower phase, control pigs exhibited a 5.1% higher ADG compared to the LNE-fed pigs (P<0.05). Numerically, control-fed pigs consumed less feed than the LNE-fed pigs, when combined with the improved ADG, led to the control pigs having greater feed efficiency (P<0.05) than the LNE-fed pigs during the grower period. Gilts grew at a slower rate (P<0.05), consumed less feed (P<0.05), and tended to have better feed efficiency (P<0.07) than the barrows during the grower phase. There was no difference between diets on final grower body weight (P>0.10), while there was a reduction in final grower body weight with the gilts compared to the barrows (P<0.05).

There was no difference between dietary treatments for ADG, ADFI, or G:F (P>0.10) during the finisher period. However, LNE-fed pigs grew numerically faster and consumed less feed, leading to an increase in feed efficiency (P<0.06) compared to the control pigs. During the finisher phase, gilts grew at a slower rate (P<0.09), while having a lower ADFI (P<0.01) and a higher G:F (P<0.01) ratio than barrows. There was no difference between dietary treatments for final body weight (P>0.10), while gilts were lighter than barrows (P<0.05).

For the overall grow-finish period, there were no significant (P>0.10) differences in ADG, ADFI, or G:F between dietary treatments. Gilts grew at a slower rate (P<0.05), consumed less feed (P<0.01), while having a greater feed efficiency (P<0.01). There were no treatment by sex interactions during the nursery, grower, finisher, or overall grow-finish periods.

Carcass characteristics. There were no differences (P>0.10) in carcass measurements, blood or visceral weights between barrows and gilts for the initial slaughter time point (Table 5). There also were no differences (P>0.10) observed in the slaughter data between treatments or sexes at the end of the nursery phase (Table 6), with the exception of a tendency for pigs fed the LNE diets to have less blood mass (P<0.07) than pigs fed the control diets.

No differences were observed in the slaughter data between treatments (P>0.10) at the end of the grower phase (Table 7), except for an increased visceral weight (P<0.05) for pigs fed the control diet compared to pigs fed the LNE diet. At the end of the grower period, control-fed pigs did tend to have larger LEA (4.59 vs. 4.24 in^2; P<0.06) than pigs fed the LNE diets. Gilts were 5.6% lighter (P<0.05), exhibited less (P<0.0001) 10^{th} rib backfat and greater predicted fat free lean % compared to the barrows at the end of the grower period. Gilt visceral weights were also 9.7% less than that of the barrows (P<0.05).

No statistical differences (P>0.10) were observed between treatments for any of the final slaughter measurements (Table 8). However, there was a trend for pigs fed the LNE diets to have greater carcass yield than pigs fed the control diets (P<0.09). Control-fed pigs had a consistant trend of having less backfat depths compared to LNE-fed pigs (0.92 vs. 0.96 in. for 10^{th} rib backfat; 1.04 vs. 1.11 in. for last rib backfat; and 0.81 vs. 0.84 in. for last lumbar backfat). Also, control-fed pigs had numerically larger LEA (6.70 vs. 6.61 in^2) compared to the LNE-fed pigs. Gilts were lighter (P<0.01) and continued to have less backfat depths (P<0.01) at all three measurement locations than the barrows. Predicted fat free lean mass % was also greater (P<0.0001) for the gilts compared to the barrows. Gilts also tended to have a greater total blood weight (P<0.05) compared to the barrows. Subjective marbling scores were higher (P<0.05) for the barrows than the gilts. No treatment X sex interactions were noted for any of the final slaughter period criteria.

Application

The data from this study show that the feeding of low nutrient diets does not have significant detrimental impacts on pig growth performance or carcass characteristics. Data from this study indicates a slight reduction in performance of pigs fed the LNE diet during the nursery and grower periods, but there is no difference in performance during the finisher and overall grow-finish periods. As in a previous trial at our research station, the feeding of LNE diets tends to lead to a numerical increase in backfat depth and a tendency for LEA to be smaller in the pigs fed the LNE diet. Ways to overcome these small differences between treatments could include: an evaluation of the net energy levels of the rations, adjust diets to more closely meeting the exact amino acid requirements of these pigs, or reexamine the suggested amino acid requirements and ratios for nursery and growing pigs that are given by the NRC (1998) for these time periods.

Acknowledgement

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References

NRC. 1998. Nutrient Requirements of Swine. 10^{th} rev. ed. Natl. Acad. Press, Washington, DC.

Table 1. Composition of nursery phase dietary treatments [a]

	Standard	Transition Diet		Nursery 2		Nursery 3	
	SEW Diet	Control	LNE	Control	LNE	Control	LNE
Ingredient, %							
Corn, normal	34.725	37.07	--	47.00	--	57.75	--
Corn, HAP	--	--	41.85	--	53.19	--	65.61
SBM, 48%	12.5	19.90	15.00	25.45	19.20	35.50	27.33
Spray dried blood meal	1.65	--	--	--	--	--	--
Lactose	5.00	--	--	--	--	--	--
Soy oil	6.00	5.00	5.00	3.00	3.00	3.00	3.00
Limestone	0.40	0.55	1.00	0.51	1.11	0.84	1.40
Dical	--	0.95	0.20	1.04	0.05	1.58	0.70
Monocal. phos.	0.50	--	--	--	--	--	--
Vitamin premix [b c]	0.25	0.25	0.25	0.25	0.25	0.25	0.25
TM premix [d e]	0.15	0.125	0.125	0.125	0.125	0.125	0.125
Phytase [f]	--	--	0.10	--	0.10	--	0.10
Salt	0.25	0.30	0.30	0.30	0.30	0.35	0.35
Soy concentrate	--	2.00	2.00	2.50	2.50	--	--
Fish meal	6.00	4.00	4.00	4.00	4.00	--	--
Dried whey	25.00	25.00	25.00	15.00	15.00	--	--
Plasma protein	6.70	4.00	4.00	--	--	--	--
Lysine-HCL	0.15	0.10	0.275	0.10	0.322	1.00	0.39
DL-Methionine	0.15	0.085	0.13	0.05	0.121	0.03	0.11
L-Threonine	--	--	0.08	--	0.05	--	0.14
L-Tryptophan	--	--	0.015	--	0.01	--	0.02
Carbadox	--	0.25	0.25	0.25	0.25	0.25	0.25
Banmith	--	--	--	--	--	0.10	0.10
CuSO	--	--	--	--	--	0.075	0.075
Zinc oxide	0.375	0.375	0.375	0.375	0.375	--	--
Se 600 [g]	--	0.05	0.05	0.05	0.05	0.05	0.05
Acidifier	0.20	--	--	--	--	--	--
Total	100	100	100	100	100	100	100
Calculated composition							
Crude protein, %	22.3	22.5	20.8	22.0	19.7	21.7	18.7
Metabolizable energy, Kcal/lb	1596	1585	1584	1545	1545	1548	1545
Calcium, %	0.90	0.90	0.90	0.85	0.85	0.80	0.80
Phosphorus, %	0.80	0.80	0.65	0.75	0.55	0.70	0.51
Available phosphorus, %	0.66	0.57	0.49	0.47	0.36	0.37	0.30
Lysine, %	1.67	1.55	1.55	1.40	1.40	1.30	1.30
Threonine, %	1.06	1.00	1.00	0.89	0.84	0.82	0.83
Methionine + Cysteine, %	0.97	0.86	0.86	0.78	0.78	0.73	0.73
Tryptophan, %	0.30	0.29	0.28	0.26	0.24	0.26	0.23

[a] Control = standard nursery diet; LNE = High available phosphorus corn + reduced crude protein, amino acid supplementation + phytase.

[b] Vitamins per pound of SEW diet: 5,000 IU A, 750 IU D3, 30 IU E, 2 mg Menadione, 17.5 µg B12, 3.75 mg Riboflavin, 12.5 mg Pantothenic Acid, 22.5 mg Niacin.

[c] Vitamins per pound of transition and nursery diets: 2,750 IU A, 275 IU D3, 20 IU E, 0.91 mg Menadione, 15.9 µg B12, 3.22 mg Riboflavin, 10.0 mg Pantothenic Acid, 15.0 mg Niacin .

[d] Provides per pound of SEW diet: 75 mg Fe, 75 mg Zn, 18 mg Mn, 7.5 mg Cu, 0.135mg I, 0.135 mg Se.

[e] Provides per pound of transition and nursery diets: 55 mg Fe, 55 mg Zn, 6.8 mg Mn, 5.1 mg Cu, 0.21 mg I.

[f] Provides 272 phytase units/lb of feed.

[g] Provides .135 mg selenium/lb of feed.

Table 2. Ingredient composition of grower phase dietary treatments [a]

	Grower 1				Grower 2			
	Control		LNE		Control		LNE	
	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts
Ingredient, %								
Corn, normal	66.36	64.01	--	--	72.73	69.52	--	--
HAP corn	--	--	74.68	72.78	--	--	80.54	77.80
SBM, 48 %	29.78	32.20	21.20	23.11	23.44	26.72	15.55	18.28
Swine grease	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Limestone	0.87	0.88	1.52	1.50	0.72	0.73	1.49	1.47
Dical	1.14	1.08	0.10	0.10	1.26	1.20	--	--
Vitamin premix [b]	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
TM premix [c]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Phytase [d]	--	--	0.10	0.10	--	--	0.075	0.075
Salt	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Lysine-HCL	0.10	0.08	0.405	0.40	0.10	0.08	0.38	0.38
DL-Methionine	--	--	0.09	0.10	--	--	0.06	0.08
L-Threonine	--	--	0.13	0.135	--	--	0.13	0.14
L-Tryptophan	--	--	0.025	0.025	--	--	0.03	0.025
Chlortetracycline	0.10	0.10	0.10	0.10	--	--	--	--
Antioxidant	--	--	--	--	0.10	0.10	0.10	0.10
SE 600 [e]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total	100	100	100	100	100	100	100	100
Calculated composition								
Crude protein, %	19.7	20.7	16.6	17.3	17.2	18.3	14.4	15.4
Metabolizable energy, Kcal/lb	1522	1523	1520	1519	1524	1521	1524	1523
Calcium, %	0.70	0.70	0.70	0.70	0.65	0.70	0.65	0.65
Phosphorus, %	0.60	0.60	0.38	0.39	0.60	0.60	0.35	0.36
Available phosphorus, %	0.28	0.27	0.19	0.19	0.30	0.29	0.18	0.18
Lysine, %	1.14	1.20	1.15	1.20	0.97	1.05	0.97	1.05
Threonine,%	0.74	0.78	0.73	0.77	0.64	0.68	0.64	0.70
Methionine + Cysteine, %	0.65	0.68	0.65	0.68	0.59	0.62	0.56	0.61
Tryptophan, %	0.23	0.24	0.20	0.21	0.19	0.21	0.17	0.19

[a]Control = Standard grower diet; LNE = High available phosphorus corn + reduced crude protein, amino acid supplementation + phytase.

[b] Provides per pound of diet: 1,650 IU A; 165 IU D3; 12.0 IU E; 0.54 mg Menadione; 9.52 µg B12; 1.93 mg Riboflavin; 6.0 mg Pantothenic acid; 9.0 mg Niacin.

[c]Provides per pound of diet: 44 mg Fe, 44 mg Zn, 5.45 mg Mn, 4.09 mg Cu, 0.167 mg I.

[d]Provided 272 phytase units/lb feed for Phase 1 and 204 phytase units/lb feed for Phase 2.

[e]Provides .135 mg selenium/lb.

Table 3. Ingredient composition of finisher phase dietary treatments [a]

	Finisher 1				Finisher 2			
	Control		LNE		Control		LNE	
	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts
Ingredient, %								
Corn, normal	79.44	75.09	--	--	85.117	81.496	--	--
HAP corn	--	--	86.955	83.305	--	--	91.237	88.931
SBM, 48 %	17.06	21.53	9.45	13.10	11.615	15.30	4.75	7.70
Swine grease	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Limestone	0.715	0.734	1.407	1.378	0.713	0.725	1.316	1.292
Dical	1.135	1.03	--	--	0.98	0.906	--	--
Vitamin premix [b]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
TM premix [c]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Phytase [d]	--	--	0.075	0.075	--	--	0.075	0.075
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine-HCL	0.10	0.07	0.37	0.369	0.10	0.0975	0.345	0.367
DL-Methionine	--	--	0.03	0.05	--	--	--	0.01
L-Threonine	--	--	0.12	0.135	--	--	0.092	0.115
L-Tryptophan	--	--	0.043	0.038	--	--	0.035	0.035
Chlortetracycline	0.10	0.10	0.10	0.10	--	--	--	--
Tylan 40	--	--	--	--	0.05	0.05	0.05	0.05
Se 600 [e]	0.05	0.05	0.05	0.05	0.025	0.025	0.025	0.025
Total	100	100	100	100	100	100	100	100
Calculated composition								
Crude protein, %	14.8	16.5	12.0	13.4	12.7	14.1	10.1	11.3
Metabolizable energy, Kcal/lb	1530	1531	1530	1529	1534	1534	1524	1534
Calcium, %	0.60	0.60	0.60	0.60	0.55	0.55	0.55	0.55
Phosphorus, %	0.55	0.55	0.32	0.34	0.50	0.50	0.30	0.32
Available phosphorus, %	0.27	0.25	0.18	0.18	0.23	0.22	0.18	0.18
Lysine, %	0.80	0.90	0.80	0.90	0.65	0.75	0.65	0.75
Threonine,%	0.54	0.61	0.54	0.61	0.46	0.51	0.44	0.51
Methionine + Cysteine, %	0.52	0.57	0.47	0.53	0.47	0.50	0.39	0.43
Tryptophan, %	0.15	0.18	0.15	0.17	0.12	0.14	0.12	0.13

[a]Control = Standard finisher diet; LNE = High available phosphorus corn + reduced crude protein, amino acid supplementation + phytase.

[b]Provides per pound of diet: 1100 IU A; 110 IU D3; 8.0 IU E; 0.36 mg Menadione; 6.35 µg B12; 1.29 mg Riboflavin; 4.0 mg Pantothenic acid; 6.0 mg Niacin.

[c]Provides per pound of diet: 22 mg Fe; 22 mg Zn; 2.7 mg Mn; 2.0 mg Cu, 0.08 mg I.

[d]Provided 204 phytase units/lb feed.

[e]Provides .135 mg/lb for finisher 1 and .068 mg/lb for finisher 2.

Table 4. Effect of dietary treatment and sex on nursery, grower, finisher, and overall grow-finish phase growth performance [a]

	Control		LNE			Significance, (P<)		
	Barrows	Gilts	Barrows	Gilts	SE [b]	Treatment	Sex	Trt X Sex
Nursery								
No. of pigs/trt	37	37	37	37				
No. of replicates/trt	9	9	9	9				
d 0 BW, lbs	14.6	14.8	14.6	14.8	0.60	0.974	0.795	0.994
ADG, lbs	1.24	1.27	1.21	1.18	0.038	0.154	1.000	0.372
ADFI, lbs	1.86	1.88	1.94	1.92	0.052	0.266	0.974	0.601
G:F	0.66	0.68	0.62	0.61	0.011	0.0001	0.962	0.362
d 34 BW, lbs	55.5	56.0	54.4	53.1	1.58	0.220	0.775	0.568
Grower								
No. of pigs/trt	20	20	20	20				
No. of replicates/trt	5	5	5	5				
d 34 BW, lbs	54.4	55.0	55.6	53.6	1.19	0.980	0.715	0.507
ADG, lbs	1.94	1.79	1.83	1.71	0.039	0.022	0.004	0.764
ADFI, lbs	4.49	3.90	4.51	4.16	0.121	0.257	0.001	0.336
G:F	0.43	0.46	0.41	0.41	0.009	0.0004	0.067	0.222
d 90 BW, lbs	163.1	155.4	158.0	149.2	3.33	0.111	0.025	0.877
Finisher								
No. of Pigs/trt	10	10	10	10				
No. of Replicates/trt	5	5	5	5				
d 90 BW, lbs	163.3	157.3	158.7	152.1	3.64	0.197	0.103	0.935
ADG, lbs	2.08	1.92	2.09	2.03	0.061	0.349	0.088	0.453
ADFI, lbs	7.07	5.89	6.69	6.05	0.191	0.579	0.0002	0.179
G:F	0.29	0.33	0.31	0.33	0.006	0.058	0.0006	0.444
d 146 BW, lbs	279.6	264.8	275.7	265.5	5.35	0.769	0.033	0.6723
Overall grow-finish								
ADG, lbs	2.01	1.86	1.96	1.87	0.038	0.626	0.005	0.4560
ADFI, lbs	5.35	4.56	5.24	4.79	0.132	0.654	0.0002	0.214
G:F	0.38	0.41	0.37	0.39	0.007	0.242	0.004	0.359

[a]Control = Standard diet; LNE = High available phosphorus corn + reduced crude protein, amino acid supplementation + phytase.

[b]Pooled standard error of treatment X sex interaction.

Table 5. Effect of sex on initial carcass characteristics

	Sex			
	Barrows	**Gilts**	**SE**	**Significance, (P<)**
No. of pigs	6	6		
Live weight, lbs	14.8	14.3	1.38	0.791
Carcass weight, lbs [a]	11.4	10.9	0.95	0.717
Dressing %	77.3	76.6	0.75	0.561
Loin eye area, in.^{2} [b]	0.78	0.74	0.063	0.683
Blood weight, lbs	0.65	0.57	0.063	0.408
Visceral weight, lbs	1.89	1.87	0.209	0.965

[a]Carcass weight includes head weight.
[b]Average of left and right sides.

Table 6. Effect of dietary treatment and sex on nursery phase carcass characteristics [a]

	Control		LNE			Significance, (P<)		
	Barrows	**Gilts**	**Barrows**	**Gilts**	**SE [b]**	**Treatment**	**Sex**	**Trt X Sex**
No. of pigs	6	6	6	6				
Live weight, lbs.	56.4	57.7	55.2	53.01	2.66	0.292	0.865	0.528
Carcass weight, lbs [c]	42.6	43.5	41.3	39.9	1.96	0.222	0.893	0.586
Dressing %	75.7	75.4	74.8	75.1	0.70	0.439	0.985	0.627
10th rib backfat, in [d]	0.21	0.24	0.22	0.20	0.018	0.380	0.859	0.224
Loin eye area, in^2 [d]	2.22	2.46	2.33	2.40	0.104	0.834	0.150	0.441
Blood weight, lbs	2.67	2.56	2.23	2.49	0.131	0.070	0.556	0.185
Visceral weight, lbs	8.04	9.00	8.07	8.33	0.443	0.484	0.186	0.442

[a]Control = Standard diet; LNE = High available phosphorus corn + reduced crude protein, amino acid supplementation + phytase.
[b]Pooled standard error of treatment X sex means.
[c]Carcass weight include head weight.
[d]Average of left and right side.

Table 7. Effect of dietary treatment and sex on grower phase carcass characteristics [a]

	Control		LNE			Significance, (P<)		
	Barrows	Gilts	Barrows	Gilts	SE [b]	Treatment	Sex	Trt X Sex
No. of pigs	10	10	10	10				
Live weight, lbs.	165.2	156.3	160.2	150.8	3.84	0.180	0.023	0.959
Carcass weight, lbs [c]	127.1	121.9	124.7	118.0	2.97	0.270	0.052	0.799
Dressing %	77.0	78.0	77.9	78.2	0.55	0.329	0.238	0.510
10^{th} rib back fat, in. [d]	0.65	0.45	0.68	0.52	0.038	0.230	0.0001	0.671
Last rib back fat, in. [d]	0.69	0.69	0.79	0.67	0.034	0.212	0.111	0.111
Last lumbar back fat, in. [d]	0.47	0.44	0.51	0.42	0.037	0.789	0.100	0.462
Loin eye area, $in.^2$ [d]	4.43	4.75	4.28	4.21	0.180	0.062	0.487	0.288
Predicted fat free lean, % [e]	55.30	60.41	54.93	58.87	0.947	0.319	0.0001	0.539
Blood weight, lbs	6.15	5.82	5.96	5.77	0.271	0.660	0.344	0.785
Visceral weight, lbs	18.3	16.2	17.0	15.7	0.40	0.042	0.0002	0.303

[a]Control = Standard diet; LNE = High available phosphorus corn + reduced crude protein, amino acid supplementation + phytase.
[b]Pooled standard error of treatment X sex means.
[c]Carcass weights includes head weight.
[d]Average of left and right side.
[e]Predicted fat free lean = 25.2 + 0.367*CW, lbs + 2.759*LEA, in^2 + -21.17*10^{th} rib backfat, in; $R^2 = 0.84$.

Table 8. Effect of dietary treatment and sex on finisher phase carcass characteristics [a]

	Control		LNE			Significance, (P<)		
	Barrows	Gilts	Barrows	Gilts	SE [b]	Treatment	Sex	Trt X Sex
No. of pigs	10	10	10	10				
Live weight, lbs	285.8	267.7	279.4	269.1	4.99	0.619	0.007	0.439
Hot carcass weight, lbs [c]	231.0	217.0	230.8	218.6	3.56	0.859	0.0008	0.804
% yield	80.9	81.1	82.5	81.3	0.51	0.086	0.363	0.163
10^{th} rib back fat, in. [d]	1.03	0.81	1.11	0.82	0.048	0.384	0.0001	0.504
Last rib back fat, in. [d]	1.09	0.98	1.21	1.02	0.046	0.114	0.003	0.394
Last lumbar back fat, in. [d]	0.88	0.74	0.97	0.71	0.045	0.512	0.0001	0.194
Loin eye area, $in.^2$ [d]	6.54	6.86	6.60	6.61	0.178	0.612	0.357	0.387
Predicted fat free mass, % [e]	45.97	49.21	45.71	48.77	0.651	0.601	0.0001	0.894
Coloring [d f]	2.55	2.45	2.43	2.63	0.104	0.811	0.632	0.156
Marbling [d g]	2.48	1.83	2.25	2.03	0.145	0.932	0.005	0.153
Firmness [d h]	2.78	2.80	2.78	2.93	0.064	0.334	0.179	0.334
Blood weight, lbs	8.77	9.04	8.16	9.02	0.272	0.255	0.045	0.286
Visceral weight, lbs	24.8	24.3	24.1	24.2	0.82	0.619	0.772	0.705

[a]Control = Standard diet; LNE = High available phosphorus + reduced crude protein, amino acid supplementation + phytase.
[b]Pooled standard error of treatment X sex means.
[c]Carcass weights includes head weight.
[d]Average of left and right side.
[e]Predicted fat free lean = 25.2 + 0.367*CW, lbs + 2.759*LEA, in^2 + -21.17*10^{th} rib backfat, in; R^2 = 0.84.
[f]On a scale of 1 – 5, 1 being pale / pinkish gray and 5 being dark purplish red.
[g] On a scale of 1 – 5, 1 being devoid to practically devoid and 5 being moderately abundant or greater.
[h]On a scale of 1 – 5, 1 being very soft and watery and 5 being very firm and dry.