PROJECT – PRELIMINARY DATA:

NUTRITIONAL APPROACHES TO REDUCE GROWTH RATES AND FEED INTAKE IN FINISHING PIGS

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THE RATIONALE

Typically, producers aim to optimize grow-finish pig growth rates and feed intakes to maximize pig performance and profitability. However, sometimes there is a need to slow growth rates and/or reduce feed intake to conserve feed. These situations could occur in response to feed supply interruptions for an extended period of time, when the movement of animals to market is delayed or impaired due to an animal movement standstill, such as could occur during a suspected outbreak of a foreign animal disease, or in situations when access to harvest facilities is temporarily suspended or delayed. Numerous dietary strategies could be implemented to slow growth rates and feed intake of finisher pigs. However, little controlled study data are available to producers to aid them in making decisions on what would be the best strategy to slow pig growth down in a manner that is in accordance with optimal animal welfare. In response to this, the following study is being conducted and is currently ongoing.

THE OBJECTIVES

The objective of this project is to evaluate dietary formulations to slow pig growth rates and reduce feed intake. To develop a strategy to reduce feed or nutrient intake, we must reverse our thinking. Normally we try to maximize feed and nutrient intake, as this is the way to maximize barn throughput; now, we must think of the practices we normally try to avoid when maximizing feed intake and actually employ them in our barns when we want to conserve feed and slow animal growth.

Disclaimer: The data presented in this document represent potential strategies that could be employed to influence feed intake and growth in unique situations. Producers need to ensure that any production practice utilized maintains their ability to follow production standards, guidelines, laws, etc. to which they are subject and/or governed by, and in particular, to maintain animal well-being.

METHODOLOGY

All procedures were reviewed and approved by the Iowa State University Institutional Animal Care and Use Committee (IACUC# 20-057). The project is being conducted at the Iowa State University Swine Nutrition Farm, Ames, IA.

Forty-six barrows and gilts (166±13.5 lbs BW; Camborough (1050) X 337) were blocked by body weight and sex, and assigned to 1 of 8 dietary treatments (n=5-6 pigs/trt). The dietary treatments included:

1. Control diet (**CON**)
2. 15% Neutral detergent fiber (**15% NDF**)
3. 20% Neutral detergent fiber (**20% NDF**)
4. 25% Neutral detergent fiber (**25% NDF**)
5. No Soybean meal (**97% Corn**)
6. Half soybean meal of #1 (**89% Corn**)
7. Calcium chloride 4% (**4% $CaCl_2$**)
8. Calcium chloride 2% (**2% $CaCl_2$**)

The eight dietary treatments are described in Table 1a and 1b. The CON diet was formulated as a straight corn-soybean meal diet that met or exceeded NRC (2012) nutrient requirements for this size pigs and is consistent with a commercial production diet. To examine the effect of NDF on growth and feed intake, NDF was increased by increasing the inclusion rate of soy hulls (12.5-33.2% of diet in diets 2-4, respectively). Amino acids were kept the same as the CON, but dietary ME was reduced by 5.4, 9.6 and 14.5%, in diets #2-4, respectively. In other words, dietary energy was allowed to float downwards at dietary fiber increased. Diets #5 and #6 utilized the formulation approach of reducing amino acids by the complete or 50% removal of soybean meal from the CON diet formulation and adding this quantity back as corn. Thus, diet #5 was a 97% corn diet and #6 consisted of a 89% corn diet. In both these diets, ME, vitamins, and minerals were formulated to be the same as the CON diet. Diet #7 and #8 explored the effects of calcium chloride on growth and appetite. These two diets were formulated to contain 4% and 2% calcium chloride, respectively. This resulted in a 6- and 3-fold increase in chloride, respectively from the CON diet. Calcium chloride is an acidogenic salt and is known to reduce feed intake.

All pigs were individually penned in 8 ft x 6 ft partially slatted concrete pens, *ad libitum* fed and had free access to water at all times. All pigs were on the 8 test diets for 28 days. Thereafter, all pigs were placed on the CON diet for 14 days (day 29-42) to assess compensatory gain responses. Pig body weights and feed disappearance were recorded weekly and feed efficiency (G:F and F:G) calculated. On day 28 of the study, all pigs were ultrasound scanned for backfat depth and loin eye area. The study was ended after 42 days.

The SAS program was used for the statistical analysis of all data (SAS Institute Inc., Cary, NC). Pen was considered the experimental unit and block used as a random effect. Least square means of treatment (diet) were determined using the LS means statement and differences in Least Squares Means (LS Means) were produced using the pdiff option. LS Means are means that are computed based on a linear ANOVA model. All data are reported as LS means with a pooled SEM. Differences were considered significant when $P \leq 0.05$ and a tendency when $P \leq 0.10$.

Table 1a. Diet ingredient, as fed

Ingredients (%)	CON	15% NDF	20% NDF	25% NDF	97% corn	89% corn	4% $CaCl_2$	2% $CaCl_2$
Corn	80.98	69.75	60.42	51.69	97.13	89.06	75.59	78.29
Soybean hulls	0.00	12.50	22.42	32.33	0.00	0.00	0.00	0.00
Soybean meal (47% CP)	16.03	14.92	14.43	13.30	0.00	8.02	16.41	16.22
L-lysine HCl	0.25	0.25	0.24	0.25	0.00	0.13	0.25	0.25
DL-methionine	0.01	0.03	0.04	0.06	0.00	0.01	0.02	0.02
L-threonine	0.06	0.06	0.07	0.08	0.00	0.03	0.06	0.06
L-tryptophan	0.01	0.01	0.01	0.02	0.00	0.01	0.01	0.01
Soybean oil	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Vitamin premix[1]	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Trace mineral premix[2]	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Limestone	1.16	1.01	0.87	0.73	1.23	1.20	0.31	0.74
Monocalcium phosphate, 21%	0.13	0.11	0.14	0.18	0.27	0.20	0.00	0.07
Monosodium phosphate[3]	0.00	0.00	0.00	0.00	0.00	0.00	2.30	1.15
Salt	0.50	0.50	0.50	0.50	0.50	0.50	0.20	0.35
Anhydrous Calcium Chloride[3]	0.00	0.00	0.00	0.00	0.00	0.00	4.00	2.00
Optiphos 5000 (500 FTU/kg)[4]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

[1]Provided per kilogram of diet: 6,125 IU vitamin A, 700 IU vitamin D_3, 50 IU vitamin E, 30 mg vitamin K, 0.05 mg vitamin B_{12}, 11 mg riboflavin, 56 mg niacin, and 27 mg pantothenic acid.

[2]Provided per kilogram of diet: 22 mg Cu (as $CuSO_4$), 220 mg Fe (as $FeSO_4$), 0.4 mg I (as $Ca(IO_3)_2$), 52 mg Mn (as $MnSO_4$), 220 mg Zn (as $ZnSO_4$), and 0.4 mg Se (as Na_2SeO_3).

[3]Nutra Blend, Neosho, MO

[4]Huvepharma, Peachtree City, GA

Table 1b. Diet energy and nutrient composition, calculated

Ingredients (%)	CON	15% NDF	20% NDF	25% NDF	97% corn	89% corn	4% $CaCl_2$	2% $CaCl_2$
DE, Mcal/kg	3.42	3.24	3.10	2.96	3.40	3.41	3.25	3.34
ME, Mcal/kg	3.32	3.14	3.00	2.86	3.34	3.33	3.15	3.24
NE, Mcal/kg	2.54	2.34	2.18	2.02	2.63	2.59	2.40	2.47
Crude protein, %	14.33	14.16	14.18	13.94	8.00	11.17	14.07	14.20
Ether extract, %	3.56	3.32	3.11	2.92	3.88	3.72	3.38	3.47
NDF, %	8.69	15.00	20.00	25.00	8.85	8.77	8.23	8.46
ADF, %	3.18	7.99	11.82	15.62	2.80	2.99	3.04	3.11
SID LYS, %	0.77	0.77	0.77	0.77	0.18	0.48	0.77	0.77
SID MET, %	0.23	0.23	0.24	0.24	0.15	0.19	0.23	0.23
SID CYS+MET, %	0.44	0.44	0.44	0.44	0.29	0.37	0.44	0.44
SID TSAA:Lys	0.58	0.57	0.57	0.57	1.63	1.11	0.57	0.58
SID THR, %	0.48	0.48	0.48	0.48	0.21	0.35	0.48	0.48
SID Thr:Lys	0.63	0.62	0.62	0.62	1.17	0.90	0.62	0.63
SID TRP, %	0.14	0.14	0.14	0.14	0.05	0.10	0.14	0.14
SID Trp:Lys	0.18	0.18	0.18	0.18	0.26	0.22	0.18	0.18
Ca, %	0.54	0.54	0.54	0.54	0.54	0.54	1.55	1.05
P Total, %	0.49	0.48	0.47	0.46	0.47	0.48	1.02	0.76
STTD P, %	0.27	0.27	0.27	0.27	0.27	0.27	0.78	0.52
Ca:STTD P	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Na, %	0.23	0.22	0.22	0.22	0.22	0.23	0.55	0.39
K, %	0.39	0.36	0.34	0.32	0.30	0.21	0.39	0.39
Mg, %	0.16	0.14	0.13	0.11	0.14	0.15	0.14	0.15
Cl, %	0.41	0.40	0.40	0.39	0.34	0.38	2.64	1.53
S, %	0.16	0.16	0.17	0.17	0.11	0.14	0.16	0.16
Dietary undetermined anion, mEq/kg	172.8	150.9	136.0	120.9	100.9	137.6	-137.6	15.8

RESULTS

Normally we try to maximize feed and nutrient intake to support maximal lean accretion in growing pigs by composing diets based on requirement needs and palatability. However, unique situations may arise when grow-finish pig growth and feed intake needs to be attenuated. Due to the lack of public data available to producers to help make decisions towards attenuating pig performance in a controlled and animal welfare considerate manner, this project aims to evaluate different dietary formulation considerations in control pig growth and feed intake. Three key approaches are being examined. First, increasing the NDF content of the diets from ~10-25% (treatments #2-4). Second, reducing dietary essential amino acid concentrations (treatments #5 and #6). Third, increasing the ionic concentration of diets (treatments #7 and #8).

After 28 days of feeding pigs their respective diets, pig body weights and delta body weight changes are reported in Table 2 and Figure 1, respectively. These data indicate that the 97% corn and the 4% $CaCl_2$ treatments attenuated body weight gains over time compared to the control within all four weeks. The CON pigs gained ~75 lbs BW over this period, while the 97% corn and 4% calcium chloride diets gained 30 and 15 lbs, respectively (Figure 1, $P < 0.05$). All other dietary treatments gained 45-60 lbs body weight over this period, similar to the CON pigs. It should be noted that pigs became SIV positive around day 25 of the study and were all put on sodium salicylate in the water.

Over the 28 days of the study, diets within each strategy were able to attenuate growth performance from the CON treatment in a time dependent manner (Table 2, 3 and 4). Although highly variable week to week, increasing the NDF content of the diets from 15 to 25% numerically reduced ADG and ADFI in pigs compared to the CON pigs over the 28 day test period (Table 2-5). In another diet strategy, soybean meal was replaced with corn. This resulted in dietary amino acids being lower than the requirement for optimal lean growth. Consequently, the 97% corn diet significantly reduced ADG at 7, 14, 21 and 28 days, and ADG was reduced 57% compared to CON pigs over the 28 day test period (Tables 4 and 5). The 88% corn diet was intermediate and growth rates were only reduced 19% compared to CON pigs over 28 days. These two corn diets had differing ADFI compared to the CON pigs, and numerically pigs on the 88% corn diet consistently consumed more feed than CON pigs. The final strategy assessed the use of anhydrous calcium chloride. This type of calcium chloride salt can be added to the diet to reduce feed intake by altering the dietary undetermined anion concentration of the feed. However, prolonged use of anhydrous calcium chloride may have negative health and meat quality effects. Therefore, concentration and duration needs to be carefully considered when using. In the present study, anhydrous calcium chloride added at 4% and 2%, decreased dietary undetermined anion (dUA) concentrations compared to the CON diet (-138, 15.8, and 173 mEq/kg, respectively; Table 1b). As a result, both these diets reduced ADFI and ADG compared to the CON pigs (Table 5). However, the 4% calcium chloride diet significantly reduced ADG by 20-75% each week compared to the CON pigs. This reduction in ADG and ADFI by 4% calcium chloride diets resulted in pigs only gaining ~16 lbs body weight over the 28 day test period (Figure 1).

On day 28, all pigs were ultrasound scanned for determination of backfat and loin eye area. No differences in backfat were reported between dietary treatments ($P = 0.292$, Table 4). However, the 97% corn and 4% calcium chloride diets significantly reduced loin eye area by ~24% compared to the CON pigs ($P = 0.001$, Table 4). Not surprisingly, these data highlight that smaller BW pigs have reduced loin eye area.

Compensatory Gain Period

After 28 days on the 8 test diets, all pigs were placed on the CON diet for 14 days to assess post-growth restriction pig performance. Body weights were significantly different at day 35, in which the 97% corn and 4% calcium chloride diets where ~40 lbs lower than the CON pigs ($P < 0.005$; Table 2 and Figure 1). By day 42, these 2 treatments only tended to be lower than the CON (Table 2). Over the last 14 days of the study, the CON pigs gained 42 lbs, while the 97% corn pigs gained 47 lbs and the 4% calcium chloride pigs gained ~60 lbs BW (Figure 1). These gains over the 14 days on the CON diet were a result of increased ADGs in the 97% corn and 4% calcium chloride treatment groups compared to the CON (3.6, 4.3 and 3.0 lbs/d, respectively, Table 4). The significant gains associated with the 4% calcium chloride treatment may not be just augmented lean growth, but also be attributed to increased gut fill and water retention. The 2% calcium chloride treatment had the same ADG as the CON, while all three NDF treatments had an 8-16% reduction in ADG compared to the CON pigs (Table 4, Figure 1). This is most likely a result of changing pigs from a high soyhulls fiber diet to a low fiber diet.

Energy and nutrient daily intakes

Due to the wide variation in feed intake, and in some cases, nutrient and energy content of the diets, daily intake of ME, SID lysine, calcium and STTD P were determined (Table 6). The quantity consumed per kg of body weight gain was also calculated. Energy and nutrient requirements can be expressed on a daily intake basis, to define the intake required to meet an expected level of gain. There is some logic to this calculation, because a significant portion of a pig's daily needs is provided to satisfy its requirement for maintenance purposes. For example, about a third of daily energy intake and a similar portion of lysine intake is devoted to maintenance purposes, and maintenance is best expressed on a daily basis. However, this calculation fails in another respect because the other two-thirds of the pig's requirement is for gain, which is based on the rate and composition of body weight gain. It is well known that body weight gain varies widely among farms.

Therefore, requirements can be expressed per unit of gain, which has the advantage of accounting for the two-thirds of the pig's requirement that is based on rate of gain. But it has the weakness of being less directly related to the portion of requirement devoted to maintenance. For this reason, both calculations - grams per day and grams per kg of gain - were used to compare treatments.

The daily ME intake of the control pigs was very high - 10.9 Mcal/d. Plenty of barns report daily ME intakes of less than 9.0 Mcal/d, so these were high intake pigs! Most of the treatments supported daily ME intake above 9.0 Mcal; the exceptions were highest fiber diet and the 4% $CaCl_2$ diet. When expressed per unit of daily gain, all but one treatment supported ME intakes above that of the control diet.

Because these pigs were eating so well, daily SID lysine intake was above requirement on 5 of the 8 treatments. Only the reduced protein corn diets, because they were so low in lysine content, and the 4% $CaCl_2$ diet, because intake was so low, failed to meet the lysine requirement for normal growth.

Concerns about skeletal development being hindered due to low intake of minerals proved to be unfounded, at least in this group of animals. Pigs on all treatments consumed above their requirement for calcium and STTD phosphorus. This illustrates the importance of feed intake in achieving adequate macro mineral intake by the pig. The pig's requirement for calcium and STTD phosphorus was met on the CaCl2 treatments, since these diets contain extra levels of these minerals to maintain a 2:1 Ca:STTD P ratio. This was probably unnecessary but was part of the diet formulation process to ensure that the Ca: STTD ratio did not confound the experiment. The experiment currently underway at New Fashion Pork took a different approach, so the results of that experiment are being watched carefully.

In conclusion, whenever diets are formulated to slow growth by reducing feed intake, nutrient intake, and especially calcium and phosphorus intake, need to be monitored to ensure that deficiencies leading to problems with bone development are avoided. Even then, the intake deficiency would have to be fairly substantial, or the diets would have to be fed for an extended period of time in order to lead to such problems. Nonetheless, due to this concern, holding diets should not be fed to developing future breeding stock – unless care and attention is made to ensure that daily intake of macro- and micro-minerals and vitamins is maintained above requirement.

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Table 2. Pig body weight changes

	Diet									
	CON	15% NDF	20% NDF	25% NDF	97% corn	89% corn	4% $CaCl_2$	2% $CaCl_2$	SEM	*P*-value
BW Day 0, lbs	164.4	159.1	162.0	166.3	162.4	174.5	171.5	167.4	5.42	0.156
BW Day 7, lbs	184.4	170.1*	178.9	178.4	167.5*	187.9	169.0*	178.8	7.35	0.102
BW Day 14, lbs	203.9	190.7	193.2	195.5	177.7*	206.1	173.9*	196.3	13.65	0.002
BW Day 21, lbs	224.8	204.8	213.7	213.2	186.8*	222.0	179.6*	213.5	14.73	<0.001
BW Day 28, lbs	236.9	231.6	225.9	216.5	193.2*	232.2	189.3*	224.6	15.59	<0.001
BW Day 35[#], lbs	259.7	247.4	242.8	235.5	218.7*	252.0	223.4*	249.2	15.95	<0.005
BW Day 42[#], lbs	279.0	267.1	261.2	254.8	243.3	273.5	248.7	262.6	17.08	0.066

*denotes treatments that differ significantly from CON (*P*<0.05)

Pigs blocked by Day 0 BW, used as a random effect in statistical model

[#]All pigs placed on the CON diet after 28 days.

n=5-6 pigs/trt, mix of barrows and gilts

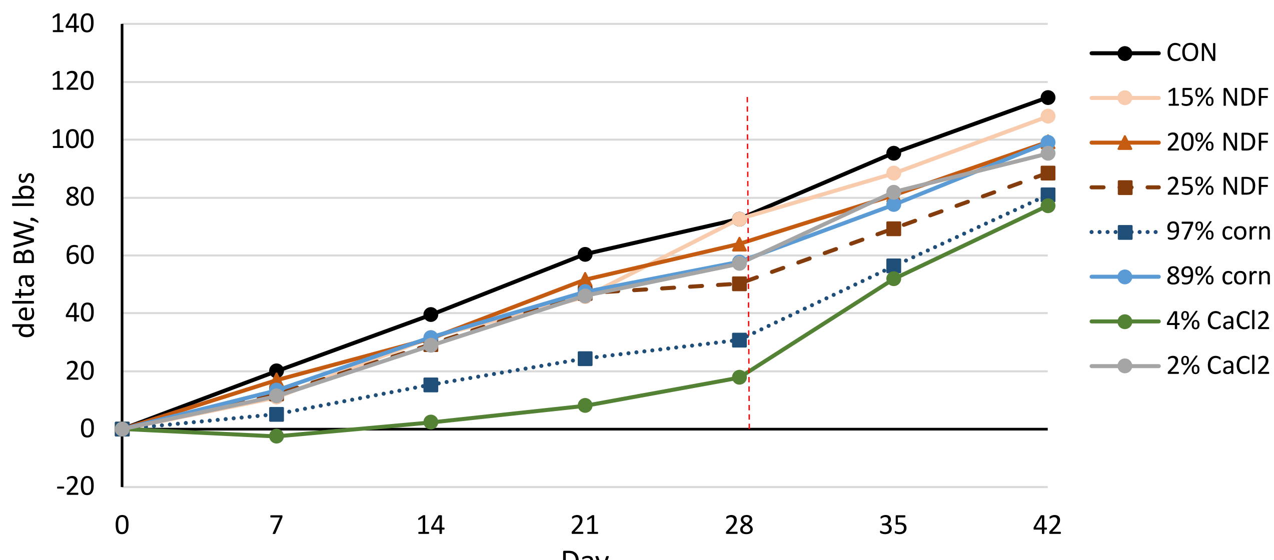

Figure 1. Delta body weight changes over time. All pigs fed CON diet after 28 days.

Table 3. Day 0-42 performance data

	Diet									
	CON	**15% NDF**	**20% NDF**	**25% NDF**	**97% corn**	**89% corn**	**4% $CaCl_2$**	**2% $CaCl_2$**	**SEM**	***P*-value**
Day 0-7										
ADG, lbs	2.85	1.57*	2.40	1.72*	0.73*	1.91	-0.37*	1.66*	0.558	<0.001
ADFI, lbs	6.72	6.18	6.33	5.55*	6.17	7.14	3.90*	6.00	0.532	<0.001
G:F	0.42	0.23	0.38	0.31	0.15*	0.26	-0.13*	0.28	0.071	<0.001
Day 8-14										
ADG, lbs	2.77	2.97	2.07	2.43	1.43*	2.61	0.70*	2.51	0.372	<0.001
ADFI, lbs	7.27	6.25	7.45	6.88	6.15	7.43	3.63*	6.75	0.575	<0.001
G:F	0.39	0.49	0.28	0.37	0.24	0.35	0.16*	0.36	0.056	0.003
Day 15-21										
ADG, lbs	2.99	2.02	2.92	2.54	1.30*	2.33	0.82*	2.50	0.347	<0.001
ADFI, lbs	7.93	6.47	7.55	7.26	6.12	8.25	3.50*	7.10	0.590	<0.001
G:F	0.38	0.32	0.38	0.36	0.20	0.29	0.19*	0.35	0.059	0.019
Day 22-28										
ADG, lbs	1.73	2.31	1.76	0.46	0.92	1.47	1.38	1.61	0.579	0.413
ADFI, lbs	7.04	6.64	6.78	5.55	5.44	5.89	3.30*	6.87	0.839	0.014
G:F	0.23	0.36	0.25	0.07	0.15	0.21	0.41	0.23	0.125	0.172
Day 29-35[#]										
ADG, lbs	3.26	2.29	2.41	2.72	3.64	2.73	4.89*	3.43	0.409	<0.001
ADFI, lbs	10.31	10.21	10.67	11.19	11.12	10.22	10.15	10.55	0.779	0.931
G:F	0.31	0.23	0.23	0.25	0.33	0.27	0.48*	0.32	0.041	<0.001
Day 36-42[#]										
ADG, lbs	2.76	2.79	2.64	2.76	3.52	3.13	3.61	1.96	0.433	0.086
ADFI, lbs	8.36	8.46	8.80	8.24	8.87	8.15	9.71	8.03	0.808	0.729
G:F	0.33	0.33	0.30	0.34	0.40*	0.38*	0.37	0.22	0.038	0.016

*denotes treatments that differ significantly from CON ($P<0.05$)

Pigs blocked by Day 0 BW, used as a random effect in statistical model. LS means are reported.

[#]All pigs placed on the CON diet after 28 days.

n=5-6 pigs/trt, mix of barrows and gilts

Table 4. Overall pig performance (day 0-42) and body ultrasound data

	Diet									
	CON	**15% NDF**	**20% NDF**	**25% NDF**	**97% corn**	**89% corn**	**4% $CaCl_2$**	**2% $CaCl_2$**	**SEM**	**P-value**
Day 0-28										
ADG, lbs	2.58	2.35	2.29	1.79	1.10*	2.08	0.64*	2.05	0.263	<0.001
ADFI, lbs	7.24	6.60	7.03	6.31	5.97	7.18	3.58*	6.67	0.509	<0.001
G:F	0.36	0.34	0.33	0.28	0.18*	0.29	0.15*	0.30	0.038	<0.001
FCR	2.84	3.15	3.20	3.77	6.07*	3.56	4.32	3.26	0.513	<0.001
Day 28 Ultrasound										
10th rib fat, mm	15.1	15.3	12.2	12.6	14.3	13.7	9.9	15.9	1.97	0.292
Loin Eye Area, cm^2	46.1	42.0	42.8	40.7	34.9*	41.1	37.3*	43.5	2.74	0.001
Day 29-42[#]										
ADG, lbs	3.01	2.53	2.52	2.74	3.58	2.98	4.25*	2.74	0.314	0.002
ADFI, lbs	9.34	9.32	9.73	9.71	10.00	9.20	9.93	9.30	0.624	0.945
G:F	0.32	0.27	0.26	0.28	0.36	0.32	0.43*	0.29	0.025	<0.001
FCR	3.19	3.78	3.95	3.63	2.82	3.12	2.40	3.74	0.277	0.001

*denotes treatments that differ significantly from CON (P<0.05)

Pigs blocked by Day 0 BW, used as a random effect in statistical model. LS means are reported.

[#]All pigs placed on the CON diet after 28 days.

n=5-6 pigs/trt, mix of barrows and gilts

Table 5. Pig performance data expressed as a percentage decrease from the control (CON) dietary treatment (day 0-28)

	Diet							
	CON	**15% NDF**	**20% NDF**	**25% NDF**	**97% corn**	**89% corn**	**4% $CaCl_2$**	**2% $CaCl_2$**
BW Day 7, lbs	100%	-8%	-3%	-3%	-9%	+2%	-8%	-3%
BW Day 14, lbs	100%	-6%	-5%	-4%	-13%	+1%	-15%	-4%
BW Day 21, lbs	100%	-9%	-5%	-5%	-17%	-1%	-20%	-5%
BW Day 28, lbs	100%	-2%	-5%	-9%	-18%	-2%	-20%	-5%
Day 0-7								
ADG, lbs	100%	-45%	-16%	-40%	-74%	-33%	-113%	-42%
ADFI, lbs	100%	-8%	-6%	-17%	-8%	+6%	-42%	-11%
Day 8-14								
ADG, lbs	100%	+7%	-25%	-12%	-48%	-6%	-75%	-9%
ADFI, lbs	100%	-14%	+2%	-5%	-15%	+2%	-50%	-7%
Day 15-21								
ADG, lbs	100%	-2%	-2%	-15%	-57%	-22%	-73%	-16%
ADFI, lbs	100%	-18%	-5%	-8%	-23%	+4%	-56%	-10%
Day 21-28								
ADG, lbs	100%	+32%	+2%	-73%	-47%	-15%	-20%	-7%
ADFI, lbs	100%	-6%	-4%	-21%	-23%	-16%	-53%	-2%
Day 0-28								
ADG, lbs	100%	-9%	-11%	-31%	-57%	-19%	-75%	-21%
ADFI, lbs	100%	-9%	-3%	-13%	-18%	-1%	-51%	-8%

Table 6. Energy and nutrient intake calculations based of diet calculated composition, pig ADG and ADFI data (day 0-28)

	NRC (2012)	Diet							
		CON	15% NDF	20% NDF	25% NDF	97% corn	89% corn	4% $CaCl_2$	2% $CaCl_2$
Start BW, kg	75.0	74.6	78.8	73.5	75.4	73.6	79.2	77.8	76.0
End BW, kg	100.0	107.4	109.2	102.5	98.2	87.6	105.7	85.8	102.3
ADG, kg/d	0.92	1.17	1.09	1.04	0.81	0.50	0.85	0.29	0.94
ADFI, kg/d	2.50	3.28	2.99	3.19	2.86	2.71	3.26	1.62	3.02
ME, Mcal/d[1]	8.3	10.9	9.4	9.6	8.2	9.1	10.9	5.1	9.8
ME, Mcal/kg ADG[1]	9.0	9.3	8.6	9.2	10.1	18.2	12.8	17.6	10.4
SID Lys, g/d	18.3	25.3	23.0	24.6	22.0	4.9	15.6	12.4	23.3
SID Lys, g/kg ADG	19.9	21.6	21.1	23.0	27.2	9.8	18.4	10.4[2]	24.8
Total Calcium, g/d	13.1	17.7	16.1	17.2	15.4	14.6	17.6	25.1	31.7
Total Calcium, g/kg ADG	14.2	15.1	14.8	16.5	19.0	29.2	20.7	21.0[2]	33.7
STTD P, g/d	6.1	8.9	8.1	8.6	7.7	7.3	8.8	12.6	15.7
STTD, g/kg ADG	6.6	7.6	7.4	8.3	9.5	14.6	10.4	16.0[2]	16.7

[1] The NRC does not specify a dietary requirement for energy. Instead, they state the energy content of a typical diet formulated to meet the requirements for other nutrients listed in their tables.

[2] Removal of an outlier resulted in this mean differing from the simple calculation of daily calcium intake divided by average daily gain.