NUTRITION NOTES
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EVALUATION OF AMINO ACID IMBALANCES IN REDUCING GROWTH RATE AND FEED INTAKES IN LATE FINISHING PIGS

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Due to the Coronavirus (COVID-19) Pandemic, numerous packing plants have been shut down for extended periods of time due to employee safety concerns. These shut downs and closures have placed a critical strain on the pork industry as market hogs are being held in facilities longer than expected. The importance of wanting to reduce growth rate with these market hogs is to keep their weights below the thresholds to keep sort losses to a minimum and attempt to keep as many pigs marketable as possible when plants reopen.

EXPERIMENTAL DESIGN:

The following experiment was designed to create an amino acid imbalance, which results in pigs consuming less feed, and thus reduced growth rates. Four experimental diets were evaluated at the Kent Nutrition Group Research Farm with pigs weighing 273 pounds, The control diet was a common late finishing diet with an appropriate amino acid balance. The second diet consisted of corn along with 60 lb/ton of added DL-Methionine; the third diet consisted of low protein (75 lb/ton of added soybean meal added to the corn) along with 33 lb/ton of added DL-Methionine; and the fourth diet consisted of low protein but with 63 lb/ton of added DL-Methionine. All rations had similar vitamin, trace mineral, calcium, and phosphorus fortification. Fifteen pounds of salt was added to the high DL-Methionine diets.

Previous research in nursery pigs (Edmonds and Baker, 1987) showed a negative growth rate with a 50% reduction in feed intakes after only one day when pigs were fed adequate diets severely imbalanced with 80 lb/ton of DL-Methionine. After 16 days growth rates for the pigs fed the high DL-Methionine diet were about 50% of the pigs on the control showing pigs have some adaptation to the imbalanced diets.

After six days on the KNG test, the pigs on high DL-Methionine levels (Diets 2-4) were reduced to much lower levels of DL-Methionine, but still maintaining an amino acid imbalance to reduce feed intakes and growth. All the pigs had previously been fed the control diet for three weeks as part of the Kent NexGen Finishing program.

Pictured above: Tyler Treimer weighing hogs on the holding trial involving amino acid imbalances.

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TABLE 1. EXPERIMENTAL DIETS

Treatment	Control	Corn + 60 lb/ton DL-Met	Low Protein + 33 lb/ton DL-Met	Low Protein + 63 lb/ton DL-Met	Corn + 12 lb/ton DL-Met	Low Protein + 7 lb/ton DL-Met	Low Protein + 13 lb/ton DL-Met
Corn (7% Crude Protein (CP))	1743.2	1889.0	1839.0	1809.0	1937.0	1865.0	1859.0
Soybean Meal (46.85% CP)	212.0	-	75.0	75.0	-	75.0	75.0
Limestone	17.3	18.0	18.0	18.0	18.0	18.0	18.0
Monocalcium Phosphate (21%)	3.5	10.0	8.0	8.0	10.0	8.0	8.0
Salt	7.0	15.0	15.0	15.0	15.0	15.0	15.0
NexGen 6/5 VTM PT	5.0	5.0	5.0	5.0	5.0	5.0	5.0
L-Lysine HCl	7.0	3.0	6.0	6.0	3.0	6.0	6.0
L-Threonine	2.5	-	1.0	1.0	-	1.0	1.0
L-Tryptophan	0.6	-	-	-	-	-	-
DL-Methionine	1.9	60.0	33.0	63.0	12.0	7.0	13.0
Totals, lbs	2000.0	2000.0	2000.0	2000.0	2000.0	2000.0	2000.0
Diet Costs*, $/ton	148.04	183.19	164.21	196.12	132.13	136.55	142.93
Crude Protein, %	11.6	8.5	9.5	10.3	7.3	8.8	9.0
Lysine, %	0.78	0.33	.55	.55	.33	.55	.55
Methionine, %	.29	3.10	1.79	3.27	.73	.50	.80
Calcium**, %	.54	.58	.57	.57	.58	.57	.57
Phosphorus**, %	.45	.47	.46	.46	.47	.46	.46

*Ingredient prices assumed: corn, $3.15/bushel; soybean meal, $300/ton; L-Lysine HCl, $1,500/ton; L-Threonine, $2,100/ton; L-Tryptophan, $8,600/ton; DL-Methionine, $2,240/ton

**Calcium is total calcium as the added phytase releases 0.11 units of calcium while phosphorus is total. Phosphorus as the added phytase releases 0.13 units of phosphorus

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TABLE 2. PERFORMANCE OF LATE FINISHING PIGS

Treatments (Days 0-6)	Control (C)	Corn + 60 lb/ton DL-Met	Low Protein (LP) + 33 lb/ton DL-Met	LP + 63 lb/ton DL-Met
Treatments (Days 6-10)	**Control (C)**	**Corn + 12 lb/ton DL-Met**	**LP + 7 lb/ton DL-Met**	**LP + 13 lb/ton DL-Met**
# Pens	**6 or 3[a]**	**6**	**6**	**6**
Days 0-3				
Daily Gain[1], lb	1.89[a]	-3.58[c]	-2.04[b]	-3.60[c]
Daily Feed[1], lb	6.19[a]	1.84[c]	2.90[b]	1.75[c]
Cost per Day[2], $	.45[a]	.17[c]	.24[b]	.17[c]
Days 3-6				
Daily Gain[1], lb	1.75[a]	-1.27[c]	-.40[b]	-1.34[c]
Daily Feed[1], lb	7.10[a]	1.70[c]	3.46[b]	1.36[c]
Cost per Day[1], $	.53[a]	.16[c]	.28[b]	.13[c]
Days 0-6				
Daily Gain[1], lb	1.82[a]	-2.43[c]	-1.22[b]	-2.47[c]
Daily Feed[1], lb	6.64[a]	1.77[c]	3.18[b]	1.56[c]
Cost per Day[1], $	.49[a]	.16[c]	.26[b]	.15[c]
Days 6-10				
Daily Gain, lb	1.73	2.65	3.17	3.51
Daily Feed[3], lb	6.36[a]	5.21[b]	5.96[a]	5.80[a]
Cost per Day[3], $	.47[a]	.34[c]	.41[b]	.41[b]
Days 0-10				
Daily Gain[2], lb	1.82[a]	-.40[d]	.53[b]	-.07[c]
Daily Feed[1], lb	6.82[a]	3.15[c]	4.28[b]	3.25[c]
Cost per Day[2], lb	.51[a]	.24[c]	.32[b]	.26[c]
Days 10-21				
Daily Gain[3], lb	1.10[a]	.64[b]	1.07[a]	1.08[a]
Daily Feed[3], lb	5.44[c]	5.49[c]	6.29[a]	5.95[b]
Cost per Day[3], lb	.40[a]	.36[b]	.43[a]	.43[a]
Days 0-21				
Daily Gain[3], lb	1.43[a]	.15[d]	.81[b]	.53[c]
Daily Feed[2], lb	6.12[a]	4.37[c]	5.33[b]	4.67[c]
Cost per Day[2], lb	.45[a]	.30[d]	.38[b]	.35[c]

[a]Pens on the Control were reduced from 6 to 3 pens (after Day 6) when 3 of the 6 pens were placed on a diet with Corn + 12 lb/ton of DL-Methionine (see Table 3)

[1]means with different superscripts in a row are significantly different (P < .001)
[2]means with different superscripts in a row are significantly different (P < .01)
[3]means with different superscripts in a row are significantly different (P < .05)

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These data in Table 2 clearly show that during Days 0-3 finishing pigs lost weight with added DL-Methionine. Pigs fed 33 lb/ton DL-Methionine lost 2.04 lb/head/day compared to about 3.6 lb/head/day in pigs fed the other two treatments. During Days 3-6, the weight losses were much less at -1.22 lb/day for those on the diets with 33 lb/ton of DL-Methionine, whereas the losses were just under 2.5 lb/day for those on the diets with 60 or 63 lb/ton of DL-Methionine. Despite the negative growth rates, all the pigs were very calm through Day 6.

Remarkably, during Days 6-10, the pigs previously on high DL-Methionine levels during Days 0-6 had greater weight gains than the pigs on the Control diets. This occurrence is partially due to gut fill as feed intake increased substantially in pigs fed the high DL-Methionine rations. Reducing the severity of the amino acid imbalance likely allowed the pigs to adapt and compensate in both growth and feed intake.

Over the 10-day period, pigs lost 0.4 lb/day on the Corn plus DL-Methionine treatment, gained 0.53 lb/day on the Low Protein plus moderate level of added DL-Methionine (33 reduced to 7 lb/ton) and lost only 0.07 lb/day on the Low Protein with the high DL-Methionine levels.

These high levels of DL-Methionine clearly affected amino acid imbalance with substantially lower feed intakes compared to the control pigs. In addition, the cost per pig per day ranged from $0.24 to $0.32 compared to pigs fed the Control diet with a cost per pig per day of $0.51.

During Days 10-21, the pigs on the Low Protein + 7 lb/ton of DL-Methionine and Low Protein + 13 lb/ton of DL-Methionine did grow at a rate similar to the control pigs. In addition, during Days 10-21, the pigs on the Corn + 12 lb/ton of DL-Methionine continued to grow less (0.64 lb/day) than the control pigs at 1.10 lb/day. Overall (Days 0-21), pigs on the control diets gained substantially more than those on the other three treatments involving the high levels of DL-Methionine with the Corn diet having pigs gain only 0.15 lb/day compared to the pigs on the control diets which gained 1.43 lb/day.

Because of the weight losses observed through Day 6 with the high levels of DL-Methionine, we elected to take three of the six control pens and place them on the Corn diet with 12 lb/ton of DL-Methionine to determine what effect we would have on feed intake and growth. These data are shown in Table 3 below.

TABLE 3. PERFORMANCE OF LATE FINISHING PIGS

Treatments	Control (C)	Corn + 12 lb/ton DL-Met
# Pens	**3**	**3**
Days 0-15		
Daily Gain[1], lb	1.27[a]	.61[b]
Daily Feed, lb	5.69	5.43
Cost per Day, $	.46	.37

[1]means with different superscripts in a row are significantly different (P < .05)

Clearly, in Table 3 we observed a marked decrease in growth with slightly less feed intake on the pigs with the diets with 12 lb/ton of DL-Methionine. However, growth was positive at 0.61 lb/day from using the diet with the lower levels of DL-Methionine as compared to the main trial (Days 0-6) in Tables 1 and 2. We also observed a cost per pig per day of $0.37 with the 0.61 lb/day gain.

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BOTTOM LINE:

1. Feeding a Low Protein diet with 33 lb/ton of DL-Methionine for Days 0-6 followed by 7 lb/ton Days 6-21 would be recommended for pigs at or near ideal market weight. Pigs fed this regimen only gained 5 pounds in this trial after 10 days and 17 pounds after 21 days.
2. If hogs are so heavy and they need to lose weight over a 10 day holding period, then using the Corn or the Low Protein diets with 60 lb/ton of DL-Methionine for about a week followed by 13 lb/ton of DL-Methionine (Days 6-10) would be recommended. After 21 days on test, the pigs on the Corn diets gained only 3 pounds and those on the Low Protein gained 11 pounds.
3. Starting pigs with the Corn + 12 lb/ton of DL-Methionine resulted in a gain of 0.61 lb/day during a 15 day test period. This diet may be an option for reducing growth in finishing pigs that are well under market weigh with unknown delayed marketing date.

CONCLUSION:

Several various diet schemes showed using high levels of DL-Methionine, which clearly created different patterns of growth (gain and/or loss) should help swine producers manage their finishing hogs ending weights during this unprecedented time facing the Covid-19 Pandemic.

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