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EFFECTS OF INCREASING L-LYSINE HCl ON FINISHING PIG GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS

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Summary

We conducted two studies to determine the effects of increasing L-lysine HCl in finishing pig diets. Experiment 1 used sorghum-soybean meal-based diets, and Exp. 2 used corn-soybean meal-based diets. Treatments included a control diet (no L-lysine HCl) or .15, .225, and .30% L-lysine HCl replacing the lysine provided by soybean meal. In Exp. 1, increasing L-lysine HCl from 0 to .15% had no effect on ADG, F/G, and percentage lean; however, pigs fed .225 and .30% L-lysine HCl had poorer ADG, F/G, and percentage lean. In Exp. 2, ADG and F/G were poorer for pigs fed .225 or .30% L-lysine HCl compared with those fed the control diet or .15% L-lysine. Carcass charactistics were not affected by dietary treatment but tended to become poorer in pigs fed .225 or .30% L-lysine HCl. Unless diets are fortified with other amino acids, no more than .15% (3 lb/ton) L-lysine HCl should be added to sorghum- and corn-soybean meal finishing diets.

(Key Words: Lysine, Sorghum, Corn, Finishing Pigs.)

Introduction

Over the past few years, an effort has been made to reduce excess crude protein concentrations in swine diets by replacing soybean meal with synthetic lysine (L-lysine HCl). This has the advantage of lowering N excretion in swine waste, and in most cases, diet cost also can be reduced. Although adding increasing amounts of L-lysine generally will decrease diet costs, a potential exists that deficiencies of other amino acids will decrease pig performance. However, if diets are formulated in excess of the pig's lysine requirement, the amount of L-lysine HCL that can be added at the expense of soybean meal can be grossly overestimated. Therefore, the objective of this experiment was to determine how much L-lysine HCl can be added to sorghum- or corn-soybean meal finishing diets without adversely affecting pig growth performance and carcass traits.

Procedures

Both experiments used similar procedures and methods with the exception that Exp. 1 used sorghum-soybean meal-based diets (Table 1) and Exp. 2 used corn-soybean meal-based diets (Table 2).

One hundred and sixty PIC (L326 × C22) finishing pigs were used in each experiment with initial average weights of 124 and 138 lb (Exps. 1 and 2, respectively). Pigs were allotted randomly on the basis of initial weight to one of the four dietary treatments in a randomized complete block design. There were four pens per treatment (two of gilts and two of barrows). Gilts and barrows were penned separately, with 10 pigs per pen. Diets were fed in growing (120 to 180 lb) and finishing (180 to 240 lb) phases. Growing diets were formulated to contain .70% lysine, and finishing diets to contain .55% lysine. The lysine levels used were

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estimated to be at or slightly below the requirement estimates for these weight ranges. Overestimating the lysine requirement for these pigs could have confounded our data by providing high levels of other amino acids, thus overestimating the amount of L-lysine HCl that can be added to a diet. Treatments included a control diet (no added L-lysine HCL) or increasing L-lysine HCl (.15, .225 and .30% of the diet) replacing the lysine provided by soybean meal.

Pigs were housed at the Kansas State University Swine Teaching and Research Center in pens with 50% slatted and 50% solid flooring. Pigs were allowed to ad libitum access to food and water through a dry feeder and one nipple waterer per pen.

All pigs and feeders were weighed every 14 d to calculate ADG, ADFI, and F/G. When the mean weight of pigs reached 180 lb, all pigs were switched from growing to finishing diets. At the termination of the study, pigs were sent to a USDA-inspected packing plant for carcass data collection.

Results and Discussion

Experiment 1. During the growing phase (120 to 180 lb), increasing L-lysine HCl from .15% to .225 and .30% decreased (P<.05) ADG, and F/G tended to become poorer with increasing L-lysine HCl (Table 3). During the finishing phase (180 to 250 lb) and for the overall experimental period, ADG decreased and F/G became poorer (P<.05) for pigs fed .225 and .30% L-lysine HCl compared with those fed control or .15% L-lysine. Backfat depth was increased in pigs fed .15 or .225% L-lysine HCl compared with those fed the control diet, and pigs fed .30% L-lysine HCl had the greatest backfat depth (P>.05). Loin eye depth was not affected by increasing L-lysine HCl. Percentage lean was not different between pigs fed the control diet and .15% L-lysine HCl but was decreased (P<.05) in pigs fed either .225 or .30% compared with controls. Fat-free lean index decreased (P<.05) with increasing L-lysine HCl additions.

Experiment 2. During the growing phase, ADG was decreased and F/G was poorer for pigs fed .30% L-lysine HCl compared to those fed other dietary treatments. However, a numerical trend occurred for the same decrease in growth performance observed for pigs fed .225% L-lysine as in Exp. 1. During the finishing phase and for the overall experimental period, ADG and F/G were not affected by addition of .15% L-lysine compared to pigs fed the control diet; however, increasing L-lysine HCl (.225 or .30%) decreased ADG and resulted in poorer F/G (P<.05). Unlike Exp. 1, we did not observe any difference in carcass characteristics with increasing L-lysine HCl. However, note that carcass leanness tended to decrease numerically, especially in those pigs fed .30% L-lysine HCl.

These results suggest that if soybean meal is replaced with greater than .15% L-lysine HCl in sorghum- or corn-soybean meal-based diets, other amino acids will limit growth performance. Thus, no more than .15% (3 lb/ton) of L-lysine HCl should be added to sorghum-corn-soybean meal finishing diets.

Table 1. Diet Compositions (Exp. 1)

	Growing				Finishing			
	L-lysine HCl, lb/ton				L-lysine HCl, lb/ton			
Ingredient, %	0	3	4.5	6	0	3	4.5	6
Sorghum	80.57	84.52	86.65	88.74	85.79	89.90	91.80	93.90
Soybean meal, 46.5%	17.10	12.90	10.70	8.50	11.80	7.50	5.50	3.30
Monocalcium phosphate	.78	.85	.90	.93	.88	.95	.98	1.00
Limestone	.90	.88	.88	.88	.88	.85	.85	.85
Salt	.35	.35	.35	.35	.35	.35	.35	.35
Vitamin premix	.15	.15	.15	.15	.15	.15	.15	.15
Trace mineral premix	.10	.10	.10	.10	.10	.10	.10	.10
Tylosin (40 grms/ton)	.05	.05	.05	.05	.05	.05	.05	.05
Lysine HCl	--	.15	.22	.30	--	.15	.22	.30
Calculated analysis								
Lysine, %	.70	.70	.70	.70	.55	.55	.55	.55
ME, kcal/lb	1,461	1,456	1,453	1,451	1,458	1,453	1,450	1,447
Protein, %	15.10	13.50	12.70	11.90	13.10	11.50	10.70	9.90
Calcium, %	.55	.55	.55	.55	.55	.55	.55	.55
Phosphorus, %	.50	.50	.50	.50	.50	.50	.50	.50

Table 2. Diet Compositions (Exp. 2)

	Growing				Finishing			
	L-lysine HCl, lb/ton				L-lysine HCl, lb/ton			
Ingredient, %	0	3	4.5	6	0	3	4.5	6
Corn	81.17	85.17	87.25	89.3	86.50	90.50	92.58	94.60
Soybean meal, 46.5%	16.50	12.30	10.10	8.00	11.10	6.90	4.70	2.60
Monocalcium phosphate	.79	.85	.90	.93	.88	.95	1.00	1.00
Limestone	.89	.88	.88	.88	.88	.88	.85	.85
Salt	.35	.35	.35	.35	.35	.35	.35	.35
Vitamin premix	.15	.15	.15	.15	.15	.15	.15	.15
Trace mineral premix	.10	.10	.10	.10	.10	.10	.10	.10
Tylosin (40 grms/ton)	.05	.05	.05	.05	.05	.05	.05	.05
Lysine HCl	--	.15	.22	.30	--	.15	.22	.30
Calculated analysis								
Lysine, %	0.70	0.70	0.70	0.70	0.55	0.55	0.55	0.55
ME, kcal/lb	1,513	1,510	1,509	1,507	1,512	1,509	1,508	1,507
Protein, %	14.60	12.90	12.10	11.30	12.50	10.90	10.10	9.20
Calcium, %	.55	.55	.55	.55	.55	.55	.55	.55
Phosphorus, %	.50	.50	.50	.50	.50	.50	.50	.50

Table 3. Influence of Increasing Synthetic Lysine Additions on Growth Performance and Carcass Characteristics of Growing Pigs (Exp. 1)[a]

	HCl-Lysine, lb				
Item	0	3	4.5	6	CV, %
Growing (d 0 to 27)					
ADG, lb	2.04[bc]	2.10[b]	1.89[c]	1.88[c]	6.2
ADFI, lb	6.14[b]	6.63[c]	6.32[bd]	6.48[cd]	2.4
F/G	3.03[b]	3.16[bd]	3.35[bd]	3.48[cd]	4.8
Finishing (d 27 to 68)					
ADG, lb	1.99[b]	1.95[b]	1.69[c]	1.63[c]	6.2
ADFI, lb	7.55[b]	7.83[b]	7.78[b]	7.75[b]	3.8
F/G	3.80[b]	4.01[b]	4.64[c]	4.86[c]	9.4
Overall (d 0 to 68)					
ADG, lb	2.01[b]	2.01[b]	1.77[c]	1.73[c]	4.4
ADFI, lb	7.01[b]	7.34[cd]	7.18[bd]	7.24[bd]	2.8
F/G	3.49[b]	3.65[b]	4.07[c]	4.21[c]	5.1
Packing plant data					
Live weight, lb[e]	261.3[b]	261.2[b]	246.5[c]	242.1[c]	2.4
Backfat, in	0.566[b]	0.633[c]	0.681[c]	0.737[d]	4.6
Carcass yield, %	64.04[b]	65.02[cd]	64.06[bd]	63.99[bd]	0.8
L.E. depth, in	2.08[b]	2.11[b]	2.04[b]	2.05[b]	5.5
Lean percentate	56.60[b]	55.70[bd]	54.59[cd]	53.51[c]	1.2
Fat-free lean index	51.10[b]	50.34[c]	49.66[c]	48.83[d]	0.8

[a]One hundred and sixty PIC (L326 × C15) finishing pigs. Initial weight 125 lb.
[b,c,d]Means in a row with similar letter are not different (P<.05).
[e]Live weight was used as a covariate to analyze the packing plant data.

Table 4. Influence of Increasing Synthetic Lysine Additions on Growth Performance and Characteristics of Growing Pigs (Exp. 2)[a]

	HCl-Lysine, lb				
Item	0	3	4.5	6	CV, %
Growing (d 0 to 24)					
ADG, lb	2.13[b]	2.15[b]	2.04[b]	1.81[c]	5.69
ADFI, lb	6.41[b]	6.54[b]	6.40[bc]	6.21[c]	2.98
F/G	3.02[b]	3.04[b]	3.15[b]	3.43[c]	3.55
Finishing (d 24 to 54)					
ADG, lb	2.05[b]	1.92[bc]	1.76[c]	1.42[d]	8.09
ADFI, lb	7.35[b]	7.00[b]	7.08[b]	6.13[c]	3.29
F/G	3.60[b]	3.72[b]	4.03[c]	4.33[c]	5.13
Overall (d 0 to 54)					
ADG, lb	2.08[b]	2.01[bc]	1.88[c]	1.59[d]	4.38
ADFI, lb	6.92[b]	6.81[b]	6.77[b]	6.16[c]	2.83
F/G	3.32[b]	3.39[b]	3.61[c]	3.87[d]	5.11
Packing plant data					
Live weight, lb[e]	251.9[b]	246.8[bc]	239.6[c]	224.1[d]	2.23
Backfat, in	0.612	0.589	0.591	0.677	12.38
Carcass yield, %	64.17	64.26	65.23	64.33	1.23
L.E. depth, in	2.38	2.32	2.30	2.29	4.89
Lean percentage	56.63	56.81	56.69	55.37	1.98
Fat-free lean index	50.06	50.25	50.52	49.79	1.81

[a]One hundred and sixty PIC (L326 × C15) finishing pigs. Initial weight 138.1 lb.
[b,c,d]Means with different superscripts differ (P<.05).
[e]Live weight was used as a covariate to analyze the packing plant data.