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The effects of two true-ileal-digestible lysine concentrations, Optipak®, ractopamine hcl (paylean®), and their combinations, on the growth performance and carcass characteristics of finishing pigs reared in commercial facility

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THE EFFECTS OF TWO TRUE-ILEAL-DIGESTIBLE LYSINE CONCENTRATIONS, OPTIPAK[®], RACTOPAMINE HCL (PAYLEAN[®]), AND THEIR COMBINATIONS, ON THE GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHING PIGS REARED IN COMMERCIAL FACILITY¹

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Summary

A total of 1,207 pigs (PIC, 337 × 1050) were used in a 28-d experiment in a commercial research barn to evaluate the effects of two true ileal digestible (TID) lysine concentrations, Optipak[®], ractopamine HCl, and their combinations, on the growth performance and carcass characteristics of finishing pigs. There were 6 replicates per treatment (with the exception of one treatment that had 5), and 19 to 26 pigs per pen. Pigs were weighed at approximately 220 lb and allotted to six, corn-soybean meal-based dietary treatments. Four diets were formulated to 0.80% TID lysine: a control diet, the control diet with 5 lb/ton of Optipak[®], the control diet with 4.5 g/ton of ractopamine HCl, or the control diet with both Optipak[®] and ractopamine HCl. The two remaining diets were formulated to 0.94% TID lysine and contained 4.5 g/ton of ractopamine HCl, with or without 5 lb/ton of Optipak[®]. The treatment structure provided for two 2 × 2 factorial arrangements of treatments. The first factorial utilized the four 0.80% TID lysine diets to evaluate the effects of Optipak[®] and ractopamine HCl. The second factorial utilized the four diets containing ractopamine HCl to evaluate the effects of TID lysine and

Optipak[®]. Pigs fed diets containing ractopamine HCl had improved ($P<0.04$) ADG, F/G, and final weight. In the diets containing ractopamine HCl, ADFI tended ($P<0.07$) to be lower for pigs fed 0.94% TID lysine. There were no other differences in growth performance among the treatments. For carcass characteristics, plant live weight, hot carcass weight, and dressing percentage were improved ($P<0.04$) for pigs fed ractopamine HCl. Additionally, loin depth increased ($P<0.03$) when Optipak[®] was included in the diet. This experiment provides further evidence that ractopamine HCl improves late-finishing growth performance, hot carcass weight, and dressing percentage. Although Optipak[®] did not improve growth performance, it increased loin depth. The different responses to ractopamine HCl and Optipak[®] suggest that the incentives for justifying their use need to be evaluated independently.

(Key words: amino acids, feed ingredient, lysine, ractopamine HCl.)

Introduction

In modern swine production, the “quest” for technologies to maximize growth rate and

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efficiency of the terminal market hog is constant. Ractopamine HCl (marketed as Paylean[®], Elanco Animal Health, Indianapolis, IN) is commonly fed to late-finishing pigs to improve growth rate and feed efficiency. A vast amount of research and field data support that appropriate use of this compound in feeding programs is economically justified. The value of the improvements in growth rates and feed conversion associated with its use usually outweigh the costs.

Recently, Hubbard Feeds has been marketing a nutritional supplement (Optipak[®]) to improve the growth rate and carcass characteristics of finishing pigs. Reports on the responses of finishing pigs in the field have stimulated interest in feeding Optipak[®] among producers. The suggested benefits are achieved at a considerably lower cost than ractopamine HCl partly because Optipak[®] is usually included in a diet containing a lower lysine concentration than that considered necessary in a diet containing Paylean[®]. Because a diet containing Optipak[®] is less expensive than a Paylean[®] diet, some producers have elected to use Optipak[®] in their feeding program instead of Paylean[®]. However, there is little scientific data to qualify the magnitude or value of the responses to the proprietary blend of nutrients in Optipak[®]. Therefore, the objective of this experiment was to evaluate Optipak[®], Paylean[®] and their combination at two concentrations of TID lysine.

Procedures

Procedures used in the experiment were approved by the Kansas State University Animal Care and Use Committee. The experiment was conducted in a commercial research finishing facility in southwestern Minnesota. The facility was double curtain sided with pit fans to enable minimum ventilation, and completely slatted flooring over a deep pit for manure storage. Individual pens were 18 × 10 feet. Each pen contained one self-feeder and one cup waterer.

A total of 1,207 pigs were weighed and allotted to one of six dietary treatments. There were 6 replicate pens (with the exception of one treatment that had 5) per treatment. Each pen contained 19 to 26 pigs, depending on the block. Four diets were formulated to 0.80% TID lysine: a control diet, the control diet with 5 lb/ton of Optipak[®], the control diet with 4.5 g/ton of ractopamine HCl, or the control diet with both Optipak[®] and ractopamine HCl. The two remaining diets were formulated to 0.94% TID lysine and contained 4.5 g/ton of ractopamine HCl, with or without 5 lb/ton of Optipak[®]. Pigs were weighed and feeder measurements taken on d 0, 14, and 28 to determine ADG, ADFI, and F/G. On d 28, pigs were individually tattooed by pen number, and transported to Swift and Co. (Worthington, MN) for carcass data on the following day.

Data were analyzed as a randomized complete block design using the PROC MIXED procedure of SAS with pen as the experimental unit. Least squares means were used to determine differences among treatments. The treatment structure provided for two, 2 × 2 factorial arrangements of treatments. The first factorial utilized the four 0.80% TID lysine diets to evaluate the effects of Optipak[®] and ractopamine HCl. The second factorial utilized the four diets containing ractopamine HCl to evaluate the effects of TID lysine and Optipak[®]. Additionally, the effect of Optipak was evaluated using a contrast between those treatments that contained Optipak in the feed and those that did not.

Results

Overall (d 0 to 28), pigs fed diets containing ractopamine HCl had improved ($P < 0.04$) ADG, F/G, and final weight. In the diets containing ractopamine HCl, ADFI tended ($P < 0.07$) to be lower for pigs fed 0.94% TID lysine than pigs fed the diets containing 0.8% TID lysine. There were no other differences in growth performance among the treatments.

For carcass characteristics, plant live weight, hot carcass weight, and dressing percentage were improved ($P<0.04$) for pigs fed ractopamine HCl. Additionally, loin depth increased ($P<0.03$) when Optipak[®] was included in the diet.

In conclusion, other than the trend for lower feed usage, there were no advantages to increasing the TID lysine concentration from 0.80% to 0.94% in diets containing ractopamine HCl. Previous research in this facility has demonstrated a response to higher lysine levels when ractopamine HCl was fed for 21 d prior to market. The lack of response to lysine level in this experiment may have been due to

the longer feeding duration or higher feed intake than achieved in the previous experiments. In agreement with earlier research, this experiment provides further evidence that ractopamine HCl improves late-finishing growth performance and carcass characteristics. Growth performance was not improved by adding Optipak[®] to the diet; however, Optipak[®] increased loin depth.

Therefore, Optipak[®] should not be utilized as a substitute for Paylean[®] in late-finishing diets. The use of Optipak[®] must be justified independently, and may vary depending upon the incentives offered by the packer.

Table 1. Composition of Experimental Diets^a

Ingredient, %	TID lysine, %:		0.80				0.94	
	Optipak [®] :							
	Paylean [®] :		-	+	-	+	-	+
			-	-	+	+	+	+
Corn			75.50	75.25	75.47	75.22	69.80	69.55
Soybean meal (46.5% CP)			19.50	19.50	19.50	19.50	25.20	25.20
Choice white grease			3.00	3.00	3.00	3.00	3.00	3.00
Monocalcium P (21% P)			0.54	0.54	0.54	0.54	0.53	0.53
Limestone			0.89	0.89	0.89	0.89	0.85	0.85
Salt			0.35	0.35	0.35	0.35	0.35	0.35
L-lysine HCl			0.15	0.15	0.15	0.15	0.15	0.15
L-threonine			---	---	---	---	0.02	0.02
Vitamin premix			0.03	0.03	0.03	0.03	0.03	0.03
Trace mineral premix			0.04	0.04	0.04	0.04	0.04	0.04
Paylean [®] , 9 g/lb ^b			---	---	0.025	0.025	0.025	0.025
Optipak ^{®c}			---	0.25	---	0.25	---	0.25
Total			100.00	100.00	100.00	100.00	100.00	100.00

Calculated analysis

Total lysine, %	0.90	0.90	0.90	0.90	1.06	1.06
True digestible amino acids						
Lysine, %	0.80	0.80	0.80	0.80	0.94	0.94
Isoleucine:lysine ratio, %	70	70	70	70	69	69
Leucine:lysine ratio, %	165	165	165	165	154	154
Methionine:lysine ratio, %	29	29	29	29	28	28
Met & Cys:lysine ratio, %	60	60	60	60	57	57
Threonine:lysine ratio, %	62	62	62	62	62	62
Tryptophan:lysine ratio, %	19	19	19	19	19	19
Valine:lysine ratio, %	81	81	81	81	78	78
Protein, %	15.60	15.60	15.60	15.60	17.70	17.70
ME, kcal/lb	1,581	1,577	1,581	1,577	1,581	1,577
TID lysine:ME ratio, g/Mcal	2.30	2.30	2.30	2.30	2.71	2.72
Ca, %	0.53	0.53	0.53	0.53	0.53	0.53
P, %	0.46	0.46	0.46	0.46	0.48	0.48
Available P, %	0.18	0.18	0.18	0.18	0.18	0.18

^aExperimental diets fed for 28 d before slaughter.^bPaylean[®] fed at a rate of 4.5 g/ton of complete feed.^cOptipak[®] fed at recommended rate of 5 lb/ton of complete feed.

Table 2. An Evaluation of the Growth Performance and Carcass Characteristics of Finishing Pigs fed Two TID Lysine Levels, Optipak[®], 4.5 g/Ton of Paylean[®], or the Combination for 28 Days Prior to Slaughter – Interactive Means^{a,b}

Item	TID Lysine, %:	0.80	0.80	0.80	0.80	0.94	0.94	SE Mean	P <						
									0.80% TID lys diets				Paylean diets		
									Overall Optipak	Optipak	Paylean	Optipak × Paylean	Lysine	Optipak	Lysine × Optipak
D 0 to 28	Optipak:	-	+	-	+	-	+								
	Paylean:	-	-	+	+	+	+								
D 0 wt, lb		220	222	222	219	221	218	2.31	-	-	-	-	-	-	-
ADG, lb		1.93	2.00	2.13	2.17	2.12	2.10	0.09	-	-	0.03	-	-	-	-
ADFI, lb		5.72	5.99	6.02	6.00	5.76	5.78	0.14	-	-	-	-	0.07	-	-
F/G		3.00	3.02	2.84	2.78	2.72	2.78	0.10	-	-	0.04	-	-	-	-
Final wt, lb		275	276	280	282	280	280	2.60	-	-	0.03	-	-	-	-
Carcass characteristics															
Plant live wt, lb		273	274	277	278	278	276	2.35	-	-	0.04	-	-	-	-
Hot carcass wt, lb		205	206	211	211	211	210	2.05	-	-	0.01	-	-	-	-
Dressing percentage, %		75.3	75.1	76.1	76.0	76.1	75.8	0.003	-	-	0.01	-	-	-	-
Backfat – 10 th rib, in		0.67	0.70	0.71	0.69	0.68	0.70	0.01	-	-	-	0.09	-	-	-
Loin depth, in		2.45	2.46	2.42	2.53	2.48	2.54	0.04	0.03	0.07	-	-	-	0.02	-
Percent lean		55.93	55.54	54.87	55.85	55.56	55.72	0.37	-	-	-	0.05	-	-	-
FFLI		50.48	50.14	50.22	50.46	50.60	50.29	0.16	-	-	-	0.05	-	-	0.07

^aA total of 1,207 pigs were used in a 28 d experiment to compare the growth performance and carcass characteristics of pigs fed two levels of TID Lys, Optipak[®], 4.5 g/ton Paylean, or the combination prior to slaughter. Six pens of 19 to 26 pigs (5 pens for the 0.94% TID Lys + Optipak[®] + Paylean treatment) were assigned to the treatments in a completely randomized design. This provided 148, 140, 144, 146, 149 and 118 pigs per treatment for the 0.80% TID Lys, 0.80% TID Lys + Optipak[®], 0.80% TID Lys + Paylean, 0.80% TID Lys + Paylean + Optipak[®], 0.94% TID Lys + Paylean, and 0.94% TID Lys + Paylean + Optipak[®]; respectively.

^bData were analyzed using the initial average weight as a covariate.

Table 3. An Evaluation of the Growth Performance and Carcass Characteristics of Finishing Pigs fed Two TID Lysine Levels, Optipak®, 4.5 g/Ton of Paylean®, or the Combination for 28 Days Prior to Slaughter – Main Effects^{a,b}

Item	0.80% TID Lysine Treatments				Paylean Treatments				Optipak Treatments		P <							
											0.80% TID Lysine Diets				Paylean Diets			
	Optipak		Paylean, g/ton		TID Lysine, %		Optipak				SE Mean	All Optipak	Optipak	Pay-lean	Optipak × Pay-lean	Lys	Opti-pak	Lys × Optipak
	-	+	0	4.5	0.80	0.94	-	+	-	+								
D 0 to 28																		
D 0 wt, lb	221	221	221	221	221	220	222	219	221	220	2.31	-	-	-	-	-	-	-
ADG, lb	2.03	2.09	1.97	2.15	2.15	2.11	2.13	2.14	2.06	2.09	0.09	-	-	0.03	-	-	-	-
ADFI, lb	5.87	6.00	5.86	6.01	6.01	5.77	5.89	5.89	5.83	5.92	0.14	-	-	-	-	0.07	-	-
F/G	2.92	2.90	3.01	2.81	2.81	2.75	2.78	2.78	2.85	2.86	0.10	-	-	0.04	-	-	-	-
Final wt lb	278	279	276	281	281	280	280	281	278	279	2.60	-	-	0.03	-	-	-	-
Carcass characteristics																		
Plant live wt, lb	275	276	274	278	278	277	278	277	276	276	2.35	-	-	0.04	-	-	-	-
Hot carcass wt, lb	208	209	206	211	211	211	211	211	209	209	2.05	-	-	0.01	-	-	-	-
Dressing percent, %	75.7	75.6	75.2	76.1	76.1	76.0	76.1	75.9	75.8	75.6	0.003	-	-	0.01	-	-	-	-
Backfat – 10 th rib, in	0.69	0.70	0.69	0.70	0.70	0.69	0.70	0.70	0.69	0.70	0.01	-	-	-	0.09	-	-	-
Loin depth, in	2.44	2.50	2.46	2.48	2.48	2.51	2.45	2.54	2.45	2.51	0.04	0.03	0.07	-	-	-	0.02	-
Percent lean	55.4	55.7	55.7	55.4	55.4	55.6	55.2	55.8	55.5	55.7	0.37	-	-	-	0.05	-	-	-
FFLI	50.4	50.3	50.3	50.3	50.3	50.4	50.4	50.4	50.4	50.3	0.16	-	-	-	0.05	-	-	0.07

^aA total of 1,207 pigs were used in a 28 d experiment to compare the growth performance and carcass characteristics of pigs fed two levels of TID Lys, Optipak®, 4.5 g/ton Paylean, or the combination prior to slaughter. Six pens of 19 to 26 pigs (5 pens for the 0.94% TID Lys + Optipak® + Paylean treatment) were assigned to the treatments in a completely randomized design. This provided 148, 140, 144, 146, 149 and 118 pigs per treatment for the 0.80% TID Lys, 0.80% TID Lys + Optipak®, 0.80% TID Lys + Paylean, 0.80% TID Lys + Paylean + Optipak®, 0.94% TID Lys + Paylean, and 0.94% TID Lys + Paylean + Optipak®; respectively.

^bData were analyzed using the initial average weight as a covariate.