EFFECTS OF INCREASING DIETARY LYSINE ON GROWTH PERFORMANCE OF PIGS FED RACTOPAMINE HCl (PAYLEAN®)[1]

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Summary

A total of 919 gilts (PIC L337 × C22) were used in a 21-d trial conducted in a commercial research facility to determine growth and carcass effects of ractopamine HCl (Paylean®; 6.5 g/ton) and different levels of lysine. The diets were formulated to contain 0.75, 0.85, 0.95, 1.05, 1.15, and 1.25% true ileal digestible (TID) lysine to determine the lysine requirement for pigs fed ractopamine. These TID lysine levels correspond to 0.86, 0.97, 1.08, 1.19, 1.29, and 1.40% total lysine. From d 0 to 14, pigs fed 1.05% TID lysine had the greatest improvement in ADG and F/G. In the overall (d 0 to 21) data, however, pigs fed 1.15% TID lysine had the greatest improvement in ADG and F/G. Average daily gain increased (linear, $P<0.005$), whereas there were no differences in ADFI ($P>0.05$). Feed efficiency also improved (linear, $P<0.005$; quadratic $P<0.07$). Although the ADG and F/G responses were linear, there was very little improvement observed beyond 1.15% TID lysine. Percentage lean increased (linear, $P<0.03$) and FFLI tended to increase (linear, $P<0.07$) with increasing levels of TID lysine. The lean premium increased (linear, $P<0.05$) and backfat tended (linear, $P<0.08$) to improve, but other carcass criteria were not affected. Therefore, pigs fed ractopamine required between 1.05 and 1.15% TID lysine (1.19 to 1.29% total lysine) to maximize growth performance.

(Key Words: Carcass Parameters, Lysine, Paylean.)

Introduction

In December 1999, ractopamine HCl (Paylean®; Elanco, Indianapolis, IN) was approved for use in finishing diets for swine. Ractopamine has been shown to increase ADG, improve F/G, and increase pig weights. Feed intake tends to decrease when ractopamine is added to the diet, which makes it necessary to increase amino acids in the diet to ensure that the pig's requirements are met. With pigs growing faster, increasing lean accretion, and decreasing fat deposition, our objective was to determine the lysine requirement for pigs fed ractopamine the last 21 d before market.

Procedures

This experiment was conducted in a commercial finishing facility in southwestern Minnesota. There were 42 pens, with seven pens per treatment and 21 or 22 pigs per pen. A total of 919 gilts were allotted by weight,

[1]Paylean is a registered trademark of Elanco Animal Health, Indianapolis, IN.
[2]Food Animal Health & Management Center, College of Veterinary Medicine.
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with an initial weight of 219 lb. Pens were totally slatted, with a self feeder and waterer. The facility was double curtain sided, with natural ventilation and a deep pit for manure storage. The six dietary treatments were based on the amount of true ileal digestible (TID) lysine in the diet (0.75, 0.85, 0.95, 1.05, 1.15, and 1.25%), and each treatment also contained 6.5 g/ton of Paylean (Table 1). These TID lysine levels correspond to 0.86, 0.97, 1.08, 1.19, 1.29, and 1.40% total lysine. All diets were based on corn-soybean meal, with 2% added fat and 1.5 lb/ton of crystalline lysine.

Pen weights and feed intake were determined on d 0, 7, 14, and 21 to calculate ADG, ADFI, and F/G. At the conclusion of the trial, pigs in each pen were identified with a unique tattoo to obtain carcass information. At the slaughtering facility (Swift Inc, Worthington, MN), carcass parameters were measured. Data were analyzed by using the PROC mixed procedure in SAS v. 8.1 as a randomized design.

Results and Discussion

From d 0 to 14, pigs fed 1.05% TID lysine had the greatest ADG and second-lowest F/G (2.59 and 2.25, respectively). Increasing TID lysine improved ADG (linear, $P<0.05$) and F/G (linear, $P<0.01$; quadratic $P<0.05$) from d 0 to 14. As the trial progressed (overall d 0 to 21), however, ADG and F/G had the greatest improvement when pigs were fed the 1.15% TID lysine treatment. Average daily gain increased (linear, $P<0.005$) and F/G improved (linear, $P<0.0004$; quadratic $P<0.07$) for the overall data, whereas there were no differences in ADFI ($P>0.75$). Although the ADG and F/G responses were linear, there was no improvement in growth observed for treatments above 1.15% TID lysine.

Percentage lean increased (linear, $P<0.03$) and FFLI tended to increase (linear, $P<0.07$ and quadratic, $P<0.09$). There was a linear trend ($P < 0.08$) for decreased backfat thickness with increasing TID lysine. The lean premium also improved (linear, $P<0.05$), but other carcass criteria were not affected by TID lysine level. In conclusion, pigs fed ractopamine in this commercial research barn required 1.05% to 1.15% TID lysine (1.19% to 1.29% total lysine) to optimize growth performance. These lysine concentrations are higher than previously observed in pigs fed ractopamine.

Table 1. Diet Composition (As-fed Basis)[a]

Item	TID[b] Lysine Content %					
Ingredient, %	0.75	0.85	0.95	1.05	1.15	1.25
Corn	78.84	71.84	67.85	63.85	59.85	55.86
Soybean meal (46.5% CP)	19.85	23.83	31.20	31.79	35.77	39.75
Choice white grease	2.00	2.00	2.00	2.00	2.00	2.00
Monocalcium P (21% P)	0.60	0.58	0.56	0.54	0.52	0.50
Limestone	1.10	1.10	1.10	1.10	1.10	1.10
Salt	0.40	0.40	0.40	0.40	0.40	0.40
L-Lysine HCl	0.075	0.075	0.075	0.075	0.075	0.075
DL-methionine	0.00	0.015	0.030	0.045	0.060	0.075
L-threonine	0.00	0.022	0.043	0.065	0.086	0.108
Vitamin premix	0.050	0.050	0.050	0.050	0.050	0.050
Trace mineral premix	0.050	0.050	0.050	0.050	0.050	0.050
Ractopamine HCl	0.036	0.036	0.036	0.036	0.036	0.036
Total	100	100	100	100	100	100
ME (Mcal/lb)	1.55	1.55	1.55	1.55	1.55	1.55
Total lysine, %	0.86	0.97	1.08	1.19	1.29	1.40
TID methionine, %	0.24	0.27	0.30	0.34	0.37	0.40
TID methionine+cystine, %	0.49	0.54	0.59	0.65	0.70	0.75
TID threonine, %	0.50	0.58	0.65	0.73	0.80	0.88
TID tryptophan, %	0.15	0.18	0.20	0.22	0.24	0.26
TID isoleucine, %	0.57	0.63	0.70	0.77	0.83	0.90
TID valine, %	0.65	0.72	0.79	0.85	0.92	0.98

[a]All diets were based on corn and soybean meal.

[b]True ileal digestible.

Table 2. Effects of Dietary Lysine Level on Performance of Pigs Fed Ractopamine[a]

	TID[b] Lysine, %							Probability, $P <$		
Item	0.75	0.85	0.95	1.05	1.15	1.25	SE	Trt	Linear	Quadratic
Initial weight, lb	219.0	219.0	219.1	219.1	219.0	219.0	3.09	1.00	0.99	0.98
d 0 to 14										
ADG, lb	2.36	2.36	2.49	2.59	2.55	2.50	0.08	0.25	0.05	0.22
ADFI, lb	5.85	5.71	5.78	5.83	5.69	5.78	0.11	0.89	0.69	0.72
F/G	2.49	2.44	2.32	2.25	2.23	2.34	0.07	0.06	0.01	0.05
d 0 to 21										
ADG, lb	2.12	2.16	2.20	2.28	2.34	2.27	0.06	0.07	0.005	0.34
ADFI, lb	5.83	5.71	5.75	5.80	5.82	5.77	0.09	0.93	0.88	0.75
F/G	2.76	2.64	2.62	2.54	2.49	2.56	0.05	0.005	0.0004	0.07
Final weight, lb	263.4	264.5	265.4	267.4	268.2	265.8	3.22	0.91	0.37	0.55
Carcass weight, lb	198.2	198.3	199.2	199.9	200.5	197.6	2.50	0.96	0.83	0.47
Yield %	76.13	75.75	76.25	75.66	75.66	75.77	0.004	0.78	0.39	0.88
Backfat, in	0.62	0.61	0.59	0.57	0.58	0.59	0.02	0.33	0.08	0.20
Loin depth, in	2.25	2.31	2.28	2.27	2.32	2.37	0.06	0.77	0.21	0.63
Lean %	56.16	56.39	56.88	56.87	57.00	56.91	0.30	0.28	0.03	0.27
FFLI	50.98	51.06	51.32	51.51	51.53	51.22	0.18	0.18	0.07	0.09
Carcass criteria, $[c]										
Sort loss/cwt	-1.86	-2.04	-1.94	-2.02	-2.05	-1.74	0.31	0.98	0.85	0.50
Value/cwt carcass[d]	72.96	73.11	73.38	73.26	73.24	73.57	0.38	0.91	0.31	0.94
Income/pig	144.05	144.49	145.41	146.43	146.51	146.17	1.77	0.88	0.24	0.66
Lean premium	4.25	4.57	4.74	4.70	4.71	4.73	0.17	0.29	0.05	0.17
Value live	54.71	54.42	55.15	55.26	54.80	55.72	0.52	0.58	0.16	0.79

[a]A total of 919 gilts (PIC L337 × C22; initially 219 lb) were used in a 21-d feeding trial. Pigs were fed ractopamine (6.5 g/ton), with 6 dietary treatments formulated to titrate the lysine requirement. A total of 42 pens were used, with 7 pens per treatment and 21 or 22 pigs per pen.

[b]True ileal digestible.

[c]Carcass base price was $70.58/cwt.

[d]Value/cwt for carcass was calculated as: carcass base price – sort + lean premium.