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Abstract

A total of 1080 pigs (PIC), initially 89.0 Â± 5.1 lb were used to determine the effects of increasing pantothenic acid on growth performance and carcass characteristics of growfinish pigs. Pigs were blocked by weight and gender, and were randomly allotted to treatment. Pigs were fed, in meal form, the experimental corn-soybean meal, added-fat diets in four phases. Dietary treatments consisted of a control diet (no added pantothenic acid), or the control diet with 22.5, 45.0, or 90.0 ppm added pantothenic acid from d-calcium pantothenate. Dietary treatments were fed from d 0 to 98 (89.0 to 272.5 lb). The first three dietary phases contained 5% choice white grease, and all diets contained 0.15% L-lysine HCl, trace mineral premix, and a standard vitamin premix manufactured with no pantothenic acid. Vitamins in the vitamin premix were supplemented at 300% of NRC guidelines. Added pantothenic acid had no effect on ADG, ADFI, or F/G, regardless of rate, and no significant differences were observed in carcass traits, including hot-carcass weight, dressing percentage, fat-free-lean index (FFLI), average backfat, and loin depth. In our experiment, added pantothenic acid did not influence growth performance or carcass composition of pigs reared in a commercial environment.; Swine Day, 2004, Kansas State University, Manhattan, KS, 2004

Keywords

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EFFECTS OF INCREASING PANTOTHENIC ACID ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISH PIGS REARED IN A COMMERCIAL ENVIRONMENT

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Summary

A total of 1080 pigs (PIC), initially 89.0 ± 5.1 lb were used to determine the effects of increasing pantothenic acid on growth performance and carcass characteristics of grow-finish pigs. Pigs were blocked by weight and gender, and were randomly allotted to treatment. Pigs were fed, in meal form, the experimental corn-soybean meal, added-fat diets in four phases. Dietary treatments consisted of a control diet (no added pantothenic acid), or the control diet with 22.5, 45.0, or 90.0 ppm added pantothenic acid from d-calcium pantothenate. Dietary treatments were fed from d 0 to 98 (89.0 to 272.5 lb). The first three dietary phases contained 5% choice white grease, and all diets contained 0.15% L-lysine HCl, trace mineral premix, and a standard vitamin premix manufactured with no pantothenic acid. Vitamins in the vitamin premix were supplemented at 300% of NRC guidelines. Added pantothenic acid had no effect on ADG, ADFI, or F/G, regardless of rate, and no significant differences were observed in carcass traits, including hot-carcass weight, dressing percentage, fat-free-lean index (FFLI), average backfat, and loin depth. In our experiment, added pantothenic acid did not influence growth performance or carcass composition of pigs reared in a commercial environment.

(Key Words: Pantothenic Acid, Vitamin, Pigs.)

Introduction

Pantothenic acid is one of four major B vitamins (riboflavin, niacin, thiamine) that are responsible for several metabolic and regulatory functions. Pantothenic acid is active in oxidation and acetylation reactions, the citric-acid cycle, fatty-acid synthesis, and cholesterol synthesis in the form of coenzyme A (CoA) and the acyl carrier protein (ACP). These processes are essential to maximize weight gain and efficiency. The National Research Council estimates that growing-finishing pigs have a pantothenic acid requirement of 6.0 to 10.5 ppm, and a typical corn-soybean meal diet will supply between 8.0 and 10.0 ppm pantothenic acid to the pig. Pantothenic acid in corn and soybean meal is approximately 100% bioavailable to the pig. There is evidence that increasing pantothenic acid may improve carcass leanness in pigs. Research conducted at Iowa State University showed that increasing dietary pantothenic acid (0 to 120 ppm added pantothenic acid) reduced subcutaneous fat thickness and increased loin eye area. Carcass lean content was increased by >1% for pigs fed 45 ppm

[1]Appreciation is expressed to DSM (Parsippany, NJ) for providing the vitamin premix used in this experiment.

[2]Food Animal Health and Management Center.

pantothenic acid. Additional industry research showed no improvement in loin eye area and only a numerical improvement in tenth-rib fat depth in pigs supplemented with pantothenic acid. Therefore, the objective of our studies was to further evaluate the effects of increasing pantothenic acid on pig performance and carcass composition and to determine the interactive effects of ractopamine HCl (RAC) and pantothenic acid in grow-finish pigs.

Procedures

A total of 1080 pigs (PIC) with initial BW 89.0 ± 5.1 lb were used to evaluate the effects of pantothenic acid on growing-finishing pigs reared on a commercial research site. There were 16 pens of gilts and 24 pens of barrows, with 27 pigs per pen; pens were blocked by average initial pen weight and then randomly allotted to one of four dietary treatments, with 10 pens per treatment. Pigs had ad libitum access to feed and water. Pigs were housed on totally slatted concrete floors in 6 × 6 m pens. Pigs were fed, in meal form, the experimental corn-soybean meal, added-fat diets in four phases (Table 1). Dietary treatments consisted of a control diet (no added pantothenic acid), or the control diet with 22.5, 45.0, or 90.0 ppm added pantothenic acid from d-calcium pantothenate. Dietary treatments were fed from d 0 to 98 (40.4 to 123.6 kg). The first three dietary phases contained 5% choice white grease, and all diets contained 0.15% L-lysine HCl, trace mineral premix, and a standard vitamin premix manufactured with no pantothenic acid. Pantothenic acid was added at amounts indicated by dietary treatment. Before the diets were manufactured, a pantothenic premix was prepared with d-calcium pantothenate and corn to equal 6 lb. Corn added to the premix was subtracted from the bulk-ingredient addition. The pantothenic acid premix was added to the diet during the micro-ingredient addition. Pigs were weighed, and feed disappearance was measured every 14 d to calculate ADG, ADFI, and G/F. At the conclusion of the growth study, all pigs in each pen were tattooed to maintain pen identity and were transported to a commercial packing facility (Swift, Worthington, MN) where carcass measurements were obtained from the packing facility. Individual pig data was received for hot-carcass weight, average backfat, longissimus-muscle depth, and FFLI. The data were then sorted by pen, and a pen average was generated.

Data from this experiment were analyzed as a spit-plot design, with gender as the whole plot and dietary pantothenic acid as the subplot. Pigs were blocked by weight, and analysis was performed by using the MIXED procedure in SAS. The model included contrasts for linear and quadratic effects of increasing pantothenic acid.

Results and Discussion

There were no pantothenic acid × gender interactions ($P<0.05$) observed, and there were no differences in ADG, ADFI, or G/F with added pantothenic acid, regardless of rate (Table 2). Barrows had greater ADG ($P<0.01$) and ADFI ($P<0.001$) than did gilts.

Dressing percentage, hot-carcass weight, average backfat, FFLI, and longissimus-muscle depth were measured at a commercial packing facility. There were no ($P<0.05$) effects on carcass traits with increasing rates of added pantothenic acid (Table 2); there was, however, a tendency ($P<0.08$) toward a quadratic effect of dressing percentage and hot-carcass weight. Dressing percentage decreased numerically through 22.5 ppm added pantothenic acid, and hot-carcass weight decreased numerically through 45.0 ppm added pantothenic acid. Gilts had less ($P<0.001$) backfat and a higher ($P<0.001$) FFLI than barrows had. Gilts had less ($P<0.001$) average backfat than barrows had. There were no

(P>0.10) gender differences observed in dressing percentage or loin depth.

Adding dietary pantothenic acid to diets during the growing-finishing phase did not improve growth performance or carcass composition of commercially reared finishing pigs.

Table 1. Ingredient and Chemical Composition of Diets (As-Fed Basis)[a]

Item	Phase 1	Phase 2	Phase 3	Phase 4
Ingredient, %				
Corn[b]	61.62	67.22	72.74	81.53
Soybean meal (46.5% CP)	30.53	25.08	19.63	15.57
Choice white grease	5.00	5.00	5.00	-
Monocalcium phosphate (21% P)	1.05	0.90	0.83	1.10
Limestone	1.00	1.00	1.00	1.00
Salt	0.35	0.35	0.35	0.35
Vitamin premix[c]	0.15	0.15	0.15	0.15
Trace mineral premix[d]	0.15	0.15	0.15	0.15
L-Lysine HCl	0.15	0.15	0.15	0.15
	100.00	100.00	100.00	100.00
Calculated Analysis				
Total lysine, %	1.20	1.05	0.90	0.80
ME, kcal/lb	1608	1611	1613	1507
CP, %	19.4	17.4	15.3	14.2
Ca, %	0.70	0.65	0.62	0.66
P, %	0.60	0.55	0.51	0.57
Available P, %	0.29	0.26	0.23	0.29
Lysine:calorie ratio, g/Mcal	3.39	2.96	2.53	2.41

[a]Dietary treatments were fed in four phase feeding periods, d 0 to 28, 29 to 56, 57 to 70, and 71 to 98, respectively. Analyzed pantothenic acid amounts of 12.7, 10.2, 10.6, and 11.1 ppm in the basal diet.

[b]Corn was replaced with d-calcium pantothenate, resulting in four dietary treatments (0, 22.5, 45, and 90 ppm added pantothenic acid).

[c]Provided (per lb of diet): 3,000 IU of vitamin A; 450 IU of vitamin D_3; 12 IU of vitamin E; 1.20 mg of vitamin K (as menadione sodium bisulfate); 15 mg niacin; 2.7 mg of riboflavin; and 0.011 mg of B_{12}.

[d]Provided (per lb of the diet): 18 mg of Mn (oxide); 78 mg of Fe (sulfate); 75 mg of Zn (oxide); 8 mg of Cu (sulfate); 0.14 mg of I (as Ca iodate); and 0.14 mg of Se (as Na selenite).

Table 2. Effects of Increasing Dietary Pantothenic Acid (PA) on Growth Performance and Carcass Characteristics of Growing-Finishing Pigs[ab]

	Added Pantothenic Acid, ppm					Probability, P <			
Item	0.0	22.5	45.0	90.0	SE	PA	Linear	Quadratic	Gender
D 0 to 98									
Initial wt, lb	88.54	88.85	88.86	88.07	1.69	0.61	0.51	0.25	0.29
ADG, lb	1.88	1.86	1.88	1.91	0.02	0.45	0.24	0.27	0.01
ADFI, lb	5.15	5.14	5.16	5.23	0.05	0.62	0.26	0.48	0.001
F/G	2.75	2.76	2.75	2.73	0.03	0.89	0.92	0.47	0.01
Final wt, lb	271.33	270.16	269.68	272.77	2.27	0.77	0.78	0.46	0.01
Carcass measurements									
Dressing percentage	75.46	74.54	75.08	74.97	0.30	0.07	0.34	0.08	0.45
Hot-carcass wt, lb	205.81	203.74	201.66	205.69	1.51	0.19	0.72	0.07	0.001
Tenth-rib backfat, in	0.68	0.69	0.70	0.69	0.02	0.71	0.39	0.94	0.001
FFLI	50.42	50.36	50.05	50.29	0.19	0.38	0.32	0.37	0.001
Longissimus muscle depth, in	2.30	2.33	2.27	2.27	0.05	0.26	0.20	0.26	0.64

[a]A total of 1080 pigs (PIC, initial BW 89.0 ± 5.1 lb), were used in the experiment. The values represent the mean of 27 pigs per pen and 10 pens per treatment.
[b]There were no PA × Gender interactions, P<0.05, observed.