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Effects of different specialty protein sources on growth performance of starter pigs

Abstract

Two hundred and ten weanling pigs were fed diets containing either soybean meal, spray-dried blood meal, spray-dried red blood cells, select menhaden fish meal, or synthetic amino acids. From d 0 to 7 postweaning, pigs fed either spray-dried whole blood meal or red blood cells had greater ADG and ADFI than pigs fed select menhaden fish meal or added synthetic amino acids. However, from d Â°to 14 and 0 to 21, no differences in growth performance occurred among pigs fed the various protein sources. However, pigs fed added synthetic amino acids had poorer ADG compared with the mean for pigs fed the other protein sources.; Swine Day, Manhattan, KS, November 21, 1996

Keywords

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EFFECTS OF DIFFERENT SPECIALTY PROTEIN SOURCES ON GROWTH PERFORMANCE OF STARTER PIGS

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Summary

Two hundred and ten weanling pigs were fed diets containing either soybean meal, spray-dried blood meal, spray-dried red blood cells, select menhaden fish meal, or synthetic amino acids. From d 0 to 7 postweaning, pigs fed either spray-dried whole blood meal or red blood cells had greater ADG and ADFI than pigs fed select menhaden fish meal or added synthetic amino acids. However, from d 0 to 14 and 0 to 21, no differences in growth performance occurred among pigs fed the various protein sources. However, pigs fed added synthetic amino acids had poorer ADG compared with the mean for pigs fed the other protein sources.

(Key Words: Starter Pig Performance, Protein Source.)

Introduction

Spray-dried blood meal has been an essential ingredient in starter pig diets because of its stimulatory effects on feed intake and subsequent increases in growth rate. However, because of the demand for spray-dried animal plasma, the remaining red blood cell fraction is now available for use in swine diets in addition to spray-dried whole blood meal. Little information is available to compare growth performance of pigs fed spray-dried whole blood meal and spray-dried red blood cells. Therefore, the objective of this experiment was to compare performance of pigs fed diets containing various specialty protein sources, including spray-dried whole blood meal, spray-dried red blood cells, select menhaden fish meal, synthetic amino acids, and soybean meal.

Procedures

A total of 210, weanling pigs (initially 13.58 lb and 21-d of age) was blocked by weight, equalized for gender and ancestry, and randomly allotted to each of five dietary treatments. Pigs were fed a soybean meal-based control diet containing 10% dried whey or diets containing 2.5% spray-dried whole blood meal, 2.5% spray-dried red blood cells, or 3.96% select menhaden fish meal (Table 1). The specialty protein sources were substituted for soybean meal in the control diet on a lysine basis. Because of past discrepancies between amino acid concentrations provided by the supplier and analyzed values, the spray-dried whole blood meal and spray-dried red blood cells were both assumed to contain 7.44% lysine (NRC, 1988). All diets were formulated to 1.35% lysine (slightly below the pig's estimated requirement) to emphasize amino acid availability of the various protein sources. The diet containing synthetic amino acids replacing those from the intact protein sources had added lysine, methionine, and threonine to equal the essential amino acid requirements based on a total and digestible amino acid basis using the Illinois ideal amino acid ratio. All diets contained 10% dried whey and were pelleted. Each treatment had seven pigs/pen and six pens (replications). Experimental diets were fed from d 0 to 21 postweaning. Pigs were weighed and feed disappearance determined on d 0, 7, 14, and 21 postweaning to calculate ADG, ADFI, and F/G.

Results and Discussion

Because of discrepancies we have observed with analyzed amino acids profiles and those reported by the manufacturer, we analyzed each protein source for amino acids. These results are reported in Table 2.

Amino acid analysis of the protein sources revealed slight differences between calculated and analyzed values. Soybean meal contained slightly less lysine than the 3.01% used in diet formulation. Spray-dried red blood cells contained 8.64% lysine, greater than the 7.44% used in diet formulation but lower than the 9.0% suggested by the manufacturer. Concentrations of most amino acids in the spray-dried whole blood and select menhaden fish meal were similar to reference values (NRC, 1988).

From d 0 to 7 postweaning, no differences were observed in ADG, ADFI, and F/G between pigs fed either blood meal source (Table 3). However, pigs fed select menhaden fish meal had decreased ADG and ADFI compared with the mean for pigs fed either blood meal source. Pigs fed the diets containing added synthetic amino acids had decreased ADG compared with the mean for those fed the other protein sources. Feed efficiency was not affected by dietary treatment.

From d 0 to 14 postweaning, no differences were observed in ADG, ADFI, and F/G between pigs fed either blood meal source or select menhaden fish meal. However, pigs fed added amino acids had decreased ADG compared with the mean for those fed the other protein sources. Average daily feed intake was not affected by dietary treatment, but was highest for pigs fed the blood meal sources and lowest for those fed select menhaden fish meal or added synthetic amino acids. Pigs fed soybean meal tended to have poorer F/G than the mean for those fed the other protein sources.

For the cumulative study (d 0 to 21), no differences were observed among pigs fed any of the intact protein sources; however, pigs fed added synthetic amino acids had decreased ADG compared with the mean for those fed the other protein sources.

These results suggest that little difference occurs in growth performance of pigs fed spray-dried whole blood meal and spray-dried red blood cells. In addition, pigs fed either blood meal source had greater initial (d 0 to 7 postweaning) ADG than those fed select menhaden fish meal; however, no differences in ADG were observed by d 14. Furthermore, pigs fed added synthetic amino acids in place of specialty protein sources had consistently poorer ADG. Therefore, the decision on which protein source to use in diet formulation should be based on relative ingredient price (including changes in diet formulation based on the different protein sources, i.e., added methionine) and availability, as well as diet factors such as flowability and handling characteristics.

Table 1. Diet Composition[a]

Ingredient, %	Soybean Meal	Red Blood Cells	Whole Blood Meal	Select Menhaden Fish Meal	Amino Acids
	Amino Acid Sources				
Corn	48.30	52.22	52.22	51.53	54.37
Soybean meal	33.79	27.28	27.28	27.28	27.28
Red blood cells	—	2.50	—	—	—
Whole blood meal	—	—	2.50	—	—
Select menhaden fish meal	—	—	—	3.96	—
Dried whey	10.00	10.00	10.00	10.00	10.00
Soy oil	3.00	3.00	3.00	3.00	3.00
Monocalcium phosphate	1.76	1.87	1.87	1.37	1.88
Limestone	1.02	.98	.98	.71	1.00
Medication[b]	1.00	1.00	1.00	1.00	1.00
Salt	.25	.25	.25	.25	.25
Vitamin premix	.25	.25	.25	.25	.25
Trace mineral premix	.15	.15	.15	.15	.15
Zinc oxide	.25	.25	.25	.25	.25
L-lysine HCl	.15	.15	.15	.15	.15
DL-methionine	.08	.10	.10	.10	.11
Threonine	—	—	—	—	.07

[a]All diets were formulated to 1.35% lysine and at least .38% methionine, .90% Ca, and .80% P.
[b]Provided 50 g/ton carbadox.

Table 2. Amino Acid Analysis of Protein Sources[a]

Item	Soybean Meal	Red Blood Cells	Whole Blood Meal	Select Menhaden Fish Meal
Arginine	3.26	3.66	3.92	3.74
Cystine	.73	.66	1.21	.55
Histidine	1.21	6.39	4.79	1.44
Isoleucine	1.97	.46	1.79	2.32
Leucine	3.55	12.67	10.24	4.41
Lysine	2.88	8.64	7.64	4.77
Methionine	.65	1.04	.99	1.68
Threonine	1.81	3.83	4.37	2.53
Tryptophan	.63	1.53	1.49	.63
Tyrosine	1.65	2.36	2.85	1.89
Phenylalanine	2.33	6.82	5.74	2.48
Valine	2.13	8.38	6.29	2.85

[a]Values are expressed on as-fed basis and represent the mean of one sample.

Table 3. Evaluation of Different Specialty Protein Sources on Starter Pig Growth Performance

	Amino Acid Sources						Probability ($P<$)			
Item	SBM	Red Blood Cells	Whole Blood Meal	Select Menhaden Fish Meal	Amino Acids	CV	1 vs. 2,3,4,5	2 vs. 3	4 vs. 2,3	5 vs. 1,2,3,4
d 0 to 7										
ADG, lb	.29	.31	.34	.27	.26	18.8	.93	.25	.07	.09
ADFI, lb	.39	.41	.43	.36	.39	10.1	.57	.42	.01	.43
F/G	1.33	1.35	1.26	1.35	1.49	15.3	.77	.43	.59	.98
d 7 to 14										
ADG, lb	.57	.67	.60	.69	.59	16.5	.18	.22	.29	.32
ADFI, lb	.77	.76	.77	.76	.73	11.8	.68	.85	.81	.36
F/G	1.35	1.09	1.29	1.09	1.23	18.1	.11	.12	.38	.67
d 0 to 14										
ADG, lb	.43	.49	.47	.48	.42	11.8	.19	.57	.95	.08
ADFI, lb	.58	.59	.60	.56	.56	9.1	.98	.64	.20	.29
F/G	1.35	1.19	1.28	1.16	1.31	11.0	.11	.23	.31	.27
d 7 to 21										
ADG, lb	.99	1.00	.98	.94	.93	12.1	.57	.65	.50	.37
ADFI, lb	1.20	1.30	1.20	1.20	1.20	10.3	.98	.72	.86	.26
F/G	1.23	1.27	1.27	1.30	1.27	10.7	.47	.90	.58	.98
d 0 to 21										
ADG, lb	.62	.66	.64	.64	.59	7.2	.49	.41	.60	.04
ADFI, lb	.79	.81	.81	.79	.76	8.5	.97	.99	.44	.22
F/G	1.28	1.23	1.28	1.23	1.30	5.5	.39	.25	.61	.30

[a]A total of 210 weanling pigs was used (initially 13.58 lb and 21 d of age), seven pigs per pen and six pens per treatment. Experimental diets were fed from d 0 to 21 postweaning.