THE EFFECT OF SPRAY-DRIED PLASMA SOURCE ON STARTER PIG PERFORMANCE[1]

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Summary

A total of 416 pigs (initially 9.36 lb and 15 d of age) was used in a 28-d growth assay to evaluate the effects of spray-dried plasma source on starter pig performance. Pigs were blocked by weight and allotted to one of four dietary treatments in a randomized complete block design. Three spray-dried plasma sources were tested: bovine, porcine, and plasma collected from only sows. Plasma sources and lactose replaced skim milk in the control diet to form the experimental diets. Experimental diets were fed during Phase I (d 0 to 14 postweaning), and all pigs were fed a common Phase II (d 14 to 28 postweaning) diet. Phase I diets were formulated to 1.5% lysine and .42 % methionine. Phase II diets were formulated to 1.25% lysine and .36% methionine. Phase I diets were fed in a pellet form and Phase II in a meal form, and all diets were formulated to .9% Ca and .8% P. During Phase I, pigs fed diets containing porcine and sow plasma grew faster than the pigs fed the control and bovine plasma diets. Pigs fed either swine plasma source were more efficient than pigs fed the control diet. During Phase II, when pigs were fed a common diet, pigs that were fed diets containing sow and bovine plasma diets in Phase I had higher feed intakes than pigs that were fed the control diet. Overall (d 0 to 28), pigs fed the porcine plasma diet grew faster and pigs fed the sow plasma diet grew more efficiently than pigs fed the control diet. In conclusion, plasma source affects starter pig performance. Based on our results, plasma of porcine origin promoted greater ADG d 0 to 14 postweaning than bovine plasma.

(Key Words: Starter Performance, Plasma Protein, Sources.)

Introduction

Previous research at Kansas State University demonstrated that porcine plasma was superior to bovine plasma in diets for early-weaned pigs. However, subsequent trials conducted at Kansas State University, University of Illinois, and University of Minnesota indicate no differences in performance for pigs fed diets containing porcine or bovine plasma. With these results in mind, the objective of this trial was to determine whether species of origin is important when using spray-dried plasma in diets for early-weaned pigs.

Procedures

A total of 416 pigs (initially 9.36 lb and 15 d of age) was used in a 28-d growth assay to evaluate the effects of plasma source on starter pig performance. Pigs were blocked by weight and allotted to one of four dietary treatments in a randomized complete block design. Three spray-dried plasma sources were tested: bovine, porcine, and plasma collected from sows. Experimental diets

[1]Appreciation is expressed to American Proteins Corporation for partial funding and donation of spray-dried plasmas. The authors wish to thank Ellen Johncock and Eichman Brothers, St. George, KS, for use of facilities and animals in this experiment.

were fed during Phase I (d 0 to 14 postweaning) and were formulated by replacing 13.3% dried skim milk in the control diet with 5% plasma and 6.65% purified lactose (Table 1). The corn-soybean meal-based Phase I diets were formulated to 1.5% lysine, .42% methionine, .9% Ca, and .8% P and contained 25% dried whey, 5% select menhaden fishmeal, and 5% soybean oil. The pigs were fed a common corn-soybean-meal-based Phase II (d 14 to 28 postweaning) diet that was formulated to 1.25% lysine, .36% methionine .9% Ca, and .8% P. Phase I diets were pelleted, and Phase II diets were fed in meal form.

The pigs were housed in an environmentally controlled nursery in 5 ft × 5 ft pens with a self-feeder and two nipple waterers to allow ad libitum access to feed and water. The pigs were weighed and feed disappearance was measured weekly to calculate average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (F/G).

Results and Discussion

During d 0 to 7 of this trial, pigs fed any of the plasma sources had increased ADG and were heavier on d 7 than pigs fed the control diet ($P<.05$). Also during the first week, pigs fed the two diets containing porcine and sow plasma ate more feed ($P<.05$) than pigs fed the control diet. Pigs fed the diet containing sow plasma were also more efficient than pigs fed the control diet ($P<.05$). During the second week of the trial, pigs fed the diets containing either porcine plasma source grew faster ($P<.05$) than the pigs fed either the control or bovine plasma diets. However, during this period no differences were observed for ADFI or F/G.

For d 0 to 14, pigs fed the diets containing porcine and sow plasma grew faster ($P<.05$) than pigs fed the control and bovine plasma diets and were more efficient ($P<.05$) than pigs fed the control diet. However, feed intake was not affected by dietary treatment. The pigs fed the porcine and sow plasma diets were heavier ($P<.05$) at the end of Phase I than the pigs fed the bovine plasma and control diets.

During Phase II, pigs that were fed the control diet during Phase I ate more feed ($P<.05$) than the pigs fed the bovine and sow plasma diets. No differences were detected during this period for ADG or F/G.

Overall, pigs fed diets containing porcine plasma during Phase I grew faster and were heavier on d 28 than pigs that were fed the control diet ($P<.05$). Pigs fed diets containing sow or bovine plasma were intermediate for ADG. The pigs that were fed the diet containing sow plasma in Phase I were more efficient during the entire trial than the pigs fed the control diet during Phase I. Pigs fed diets containing porcine and bovine plasma had feed efficiencies similar to those of the pigs fed the sow plasma diets.

In conclusion, species source of plasma affects starter pig performance. Pigs fed diets containing porcine and sow plasma grew faster during d 0 to 14 postweaning than pigs fed either the control or bovine plasma diets. The pigs fed the porcine plasma diet were heavier on d 28 and grew faster for the entire trial than pigs fed the control diet. Pigs fed the sow plasma diet were more efficient during the entire trial than pigs fed the control diet. However, an alternative explanation might be that minor differences in processing conditions for plasma at different plants might be affecting pig performance. Plasma sources used in this experiment were processed at different plants. More research must be conducted to evaluate how differences in processing methods and compositional differences of different plasma sources affect starter pig performance.

Table 1. Diet Composition[a]

Ingredient, %	Phase I Control	Phase I Spray-dried plasma	Phase II
Corn	32.66	33.68	60.27
Soybean meal, (46.5% CP)	15.01	15.01	22.81
Dried whey	25.00	25.00	10.00
Skim milk	13.30	--	--
Lactose[b]	--	6.65	--
Spray dried plasma source[b]	--	5.00	--
Select menhaden fishmeal	5.00	5.00	--
Spray-dried blood meal	1.75	1.75	2.50
Soybean oil	5.00	5.00	--
Monocalcium phosphate, (21% P)	.65	.94	1.90
Limestone	.11	.41	.84
Antibiotic[c]	1.00	1.00	1.00
Copper sulfate	.08	.08	.08
L-Lysine HCl	--	--	.15
DL-Methionine	.04	.70	.05
Vitamin premix	.25	.25	.25
Trace mineral premix	.15	.15	.15
Total	100.00	100.00	100.00

[a]Phase I (d 0 to 14) diets were formulated to 1.50% lysine and .42% methionine. Phase II (d 14 to 28) diets were for formulated to 1.25% lysine and .36% methionine. All diets were formulated to .9% Ca and .8% P.
[b]Plasma sources were added at 5% to form experimental diets. Purified lactose was added to ensure that experimental diets contained 24.65% lactose.
[c]Provided 150g/ton apramycin in Phase I and 50g/ton carbadox in Phase II.

Table 2. The Influence of Plasma Source on Starter Pig Performance[a]

Item	Control	Spray-dried plasma source: Bovine	Porcine	Sow	CV
d 0 to 7					
ADG, lb	.25[b]	.34[c]	.37[c]	.37[c]	20.3
ADFI, lb	.37[b]	.42[bc]	.45[c]	.43[c]	19.8
F/G	1.45[b]	1.25[bc]	1.21[bc]	1.16[c]	15.5
d 7 to 14					
ADG, lb	.58[b]	.58[b]	.65[c]	.66[c]	17.2
ADFI, lb	.75	.74	.75	.74	15.1
F/G	1.30	1.30	1.17	1.15	16.5
d 0 to 14					
ADG, lb	.42[b]	.46[b]	.51[c]	.51[c]	14.5
ADFI, lb	.56[b]	.58[bc]	.60[c]	.59[bc]	12.0
F/G	1.35[b]	1.28[bc]	1.18[c]	1.16[c]	12.0
d 14 to 28					
ADG, lb	.79	.79	.79	.74	14.5
ADFI, lb	1.39[b]	1.30[c]	1.33[bc]	1.28[c]	9.1
F/G	1.77	1.65	1.71	1.76	9.7
d 0 to 28					
ADG, lb	.60[b]	.62[bc]	.65[c]	.63[bc]	12.3
ADFI, lb	.98	.93	.97	.93	8.5
F/G	1.61[b]	1.51[bc]	1.50[bc]	1.50[c]	8.9
Pig weight, lb					
d 0	9.36	9.36	9.36	9.37	13.3
d 7	11.13[b]	11.72[c]	11.94[c]	11.97[c]	12.9
d 14	15.21[b]	15.79[b]	16.52[c]	16.55[c]	12.5
d 28	26.29[b]	26.84[bc]	26.96[bc]	27.52[c]	11.9

[a]A total of 416 pigs (15 ± 3 d) with 9, 10, or 11 pigs/pen with 10 replicate pens/treatment
[bc]Means within a row with different superscripts differ ($P<.05$).