INFLUENCE OF SPRAY-DRIED PLASMA SOURCE ON GROWTH PERFORMANCE OF WEANLING PIGS[1]

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Summary

Six hundred twenty six pigs (initially 9 lb and 13.2 d of age) were used in a 28-d growth trial to determine the effect of spray-dried porcine (SDPP), spray-dried bovine (SDBP), and low-ash porcine plasma (LAPP) on growth performance in the early-weaned pig. Pigs were allotted by weight to one of 10 dietary treatments with 8 to 10 pigs per pen and 7 replicate pens per treatment. The control diet was corn-soybean meal-based and contained 14.44% dried skim milk with no plasma added. Each plasma source (2, 4, and 6%) replaced dried skim milk in the control diet. The LAPP is a similar product to SDPP with the ash component removed. Therefore, the protein content is higher, and slightly lower inclusion rates were required at 1.79, 3.59, and 5.38%. Phase I diets were formulated to contain 1.5% lysine, .42% methionine, .9% Ca, and .8% P. SBM was held constant throughout all the diets at 16.31% with 25% dried whey and 4% fish meal added. On d 14 postweaning, all pigs were switched to a common Phase II milo-SBM based diet. Phase II diets were formulated to 1.25% lysine, .35% methionine, .9% Ca, and .8% P; contained 2.5% spray-dried blood meal and 10% dried whey; and were fed in meal form. Adding any of the plasma sources to the diet from d 0 to 7 after weaning resulted in a linear improvement in average daily gain (ADG) and average daily feed intake (ADFI). Pigs fed diets containing plasma also consumed more feed and were more efficient in feed conversion (F/G) compared to pigs fed the control diet. Adding plasma to the diet also improved ADG and ADFI from d 0 to 14 postweaning. No interactions occurred between level and source; however, pigs fed diets containing SDPP or LAPP had slightly higher ADFI than pigs fed diets containing SDBP d 0 to 14. Feeding a common Phase II diet from d 14 to 28 postweaning had no effect on growth performance. Overall, the pigs fed the plasma sources had greater ADG and ADFI than pigs fed the control diet. These data confirm that feeding spray-dried plasma protein improves growth performance from d 0 to 14 postweaning.

(Key Words: Pigs, Plasma, Growth.)

Introduction

Recent research conducted at Kansas State University determined that porcine plasma is a superior protein source to skim milk in diets of nursery pigs. Also, data in 1992 KSU Swine Day (pages 18 and 24) indicated that the optimum level of porcine plasma in diets of nursery pigs is 7.5%. Several sources of plasma are available to the producer. Therefore, the objective of this trial was to determine whether a difference occurs in growth performance of pigs fed diets

[1]Appreciation is expressed to American Protein Corporation for donating feed ingredients and for partial financial support. The authors also wish to thank Steve Eichman; Ellen Johncock; and Eichman Brothers, St. George, KS, for the use of facilities and animals in this experiment.

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containing the three available sources of spray-dried plasma including: SDPP, SDBP, and LAPP. The LAPP is derived from SDPP with the ash portion removed.

Procedures

A total of 626 weanling pigs (initially 9 lb and 13.2 d of age) was allotted by weight to one of 10 experimental treatments with 8 to 10 pigs per pen and seven replicate pens per treatment. Phase I diets were formulated to contain 1.5% lysine, .42% methionine, .9% Ca, and .8% P. SBM was held constant throughout all the diets at 16.31%, with 25% dried whey and 4% fish meal added. Spray-dried plasma sources (0, 2, 4, and 6%) and lactose (0, 2, 4, and 6%) replaced dried-skim milk in order to maintain equal lactose and lysine levels in all diets. The LAPP is a similar product to SDPP with the ash component removed. Therefore, the protein content is higher, and slightly lower inclusion rates were required at 1.79, 3.59, and 5.38%. On d 14 postweaning, all pigs were switched to a common Phase II milo-SBM-based diet. Phase II diets were formulated to 1.25% lysine, .35% methionine, .9% Ca, and .8% P; contained 2.5% spray-dried blood meal and 10% dried whey; and were fed in meal form. Pigs were housed in an environmentally controlled nursery with slatted metal flooring and had ad libitum access to feed and water. Pen sizes were 4 ft × 6 ft. Pigs and feeders were weighed weekly (d 0, 7, 14, and 28) to determine ADG, ADFI, and F/G.

Results and Discussion

During wk 1, ADG ($P<.01$), ADFI ($P<.01$), and F/G ($P<.05$) were improved for pigs fed the plasma diets compared with the control diet. Average daily gain and ADFI increased (linear, $P<.05$) for pigs fed any of the plasma sources.

Average daily gain and ADFI improved ($P<.01$) for pigs fed plasma diets compared to the pigs fed the control diet during Phase I (d 0 to 14 postweaning). No interactions occurred between plasma level and source. However, pigs fed SDPP or LAPP had greater ADFI ($P<.05$) than pigs fed SDBP. Increasing plasma level (regardless of source) increased (linear $P<.05$) ADG and ADFI d 0 to 14 postweaning. Cumulative (d 0 to 28) ADG and ADFI improved for pigs fed diets containing plasma during Phase I compared to pigs fed the control diet ($P<.10$).

In summary, regardless of the origin of spray-dried plasma, feeding plasma as a protein source for weanling pigs results in improved growth performance from d 0 to 14 postweaning. Spray-dried porcine plasma and LAPP performed similarly, but pigs fed either of these plasma sources had greater ADFI d 0 to 14 postweaning than those fed SDBP. Therefore, pig performance can be improved by adding any one of the plasma sources evaluated to a Phase I diet. Secondly, the cost of spray-dried plasma should be a considered to determine the most economical type to feed.

Table 1. Composition of Diets Containing Spray-Dried Porcine and Bovine Plasma

Item	Control	2% Plasma	4% Plasma	6% Plasma
Corn	32.66	32.79	32.93	33.05
SBM	16.31	16.31	16.31	16.31
Dried whey	25.00	25.00	25.00	25.00
Dried skim milk	14.44	9.63	4.81	---
Lactose[a]	---	2.41	4.81	7.22
Plasma[b]	---	2.00	4.00	6.00
Select menhaden fish meal	4.00	4.00	4.00	4.00
Monocalcium phosphate	.71	.92	1.15	1.36
Limestone	.18	.23	.28	.33
Vit/Min[c]	.48	.48	.48	.48
Antibiotic[d]	1.00	1.00	1.00	1.00
Soy oil	5.00	5.00	5.00	5.00
Lysine-HCl	.15	.15	.15	.15
DL-methionine	---	.03	.06	.10
L-cystine	.07	.05	.02	---
Total	100.00	100.00	100.00	100.00

[a]Lactose was added as dried-skim milk was replaced to ensure the diets were isolactose.
[b]Plasma replaced dried skim milk on a lysine basis.
[c]Vit/Min = KSU vitamin and mineral premixes and .08% copper sulfate.
[d]Antibiotic provided by apramycin at 150 g/ton.

Table 2. Composition of Diets Containing Low-Ash Porcine Plasma

Item	Control	2% Plasma	4% Plasma	6% Plasma
Corn	32.66	32.85	33.04	33.23
SBM	16.31	16.31	16.31	16.31
Dried whey	25.00	25.00	25.00	25.00
Dried skim milk	14.44	9.63	4.81	---
Lactose[a]	---	2.41	4.81	7.22
Plasma[b]	---	1.79	3.59	5.38
Fish meal	4.00	4.00	4.00	4.00
Cornstarch	---	.21	.41	.62
Monocalcium phosphate	.71	.81	.93	1.03
Limestone	.18	.28	.39	.48
Vit/Min[c]	.48	.48	.48	.48
Antibiotic[d]	1.00	1.00	1.00	1.00
Soy oil	5.00	5.00	5.00	5.00
Lysine-HCl	.15	.15	.15	.15
DL-methionine	----	.03	.06	.10
L-cystine	.07	.05	.02	---
Total	100.00	100.00	100.00	100.00

[a]Lactose was added as dried-skim milk was removed to ensure the diets were isolactose.
[b]Plasma replaced dried skim milk on a lysine basis.
[c]Vit/Min = KSU vitamin and mineral premixes with .08% copper sulfate.
[d]Antibiotic provided by apramycin at 150 g/ton.

Table 3. Effects of Spray-Dried Plasma Source on Growth Performance of Weanling Pigs[a]

		LAPP, %			SDPP, %			SDBP, %			
Item	Control	2	4	6	2	4	6	2	4	6	CV
d 0 to 7											
ADG, lb[ad]	.20	.27	.27	.32	.27	.30	.33	.24	.31	.32	17.0
ADFI, lb[ad]	.29	.35	.35	.41	.35	.37	.40	.33	.38	.37	12.5
F/G[b]	1.54	1.22	1.33	1.26	1.30	1.27	1.30	1.50	1.21	1.13	18.6
d 0 to 14											
ADG, lb[ad]	.36	.43	.45	.47	.43	.47	.46	.40	.45	.44	11.1
ADFI, lb[ade]	.40	.48	.51	.52	.48	.52	.53	.44	.48	.50	9.4
F/G	1.15	1.12	1.17	1.12	1.18	1.11	1.19	1.15	1.10	1.16	7.1
d 0 to 28[f]											
ADG, lb[c]	.59	.62	.62	.63	.64	.63	.63	.61	.64	.63	7.8
ADFI, lb[c]	.83	.88	.89	.88	.88	.89	.89	.85	.87	.89	7.3
F/G	1.42	1.42	1.47	1.38	1.41	1.43	1.42	1.40	1.37	1.43	4.4

[abc]Control vs all plasma sources ($P<.01$), ($P<.05$) and ($P<.10$), respectively.
[d]Linear effect of plasma level ($P<.05$).
[e]Plasma source effect, LAPP or SDPP > SDBP ($P<.05$).
[f]All pigs were fed a common diet from d 14 to 28 postweaning.