OPTIMUM LEVEL OF SPRAY-DRIED PORCINE PLASMA FOR EARLY-WEANED (10.5 D OF AGE) STARTER PIGS[1]

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Summary

A total of 290 early-weaned pigs (initially 7.6 lb and 10.5 d of age) was used to evaluate various levels of spray-dried porcine plasma. Pigs were assigned to one of five experimental diets with either 5, 7.5, 10, 12.5, or 15% spray-dried porcine plasma replacing dried skim milk. Pigs were fed this diet for the first 14 days postweaning. Common diets were fed from d 14 to 42 postweaning in order to monitor subsequent performance. During the first phase (d 0 to 14 postweaning), linear improvements in average daily gain (ADG) and average daily feed intake (ADFI) occurred as the level of spray-dried porcine plasma increased from 5% to 15%. This resulted in a linear improvement in weight at d 14 postweaning. For the first phase and subsequent phases, no differences occurred in feed efficiency (F/G). From d 14 to 21 postweaning, a linear decrease occurred in ADG and ADFI as well as a linear deterioration of F/G as the level of spray-dried porcine plasma increased from 5% to 15%. This reversal of performance resulted in no difference of pig weights at d 21 and 25 postweaning. From d 25 to 42 postweaning, no difference was seen in ADG. In summary, spray-dried porcine plasma can be used as an effective replacement for dried skim milk as a protein source in diets for pigs weaned at 10 d of age.

(Key Words: Starter, Spray-dried Porcine Plasma, Skim Milk.)

Introduction

Early weaning is becoming a common practice in the commercial swine industry as a part of disease elimination programs. Spray-dried porcine plasma has been largely responsible for the success of early weaning because of its stimulatory effects on feed intake. To date information is lacking in regard to the optimum level of spray-dried porcine plasma in diets for the very early-weaned pig. Recent research at Kansas State University has found a linear increase in ADG and ADFI when adding up to 10% spray-dried porcine plasma in the phase I diet of conventionally weaned (21 d of age) pigs. This response was obtained when the methionine:lysine ratio was maintained above the ratio suggested by NRC (1988). Additionally, further research at Kansas State University suggests that the methionine:lysine ratio for diets containing spray-dried blood products is higher than that suggested by NRC (1988). The objective of this experiment was to determine the optimum level of spray-dried porcine plasma for diets of early-weaned (10 d of age) pigs, while maintaining a methionine to lysine ratio of $\geq .275:1$.

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Procedures

A total of 290 weanling pigs (initially 7.6 lb and 10.5 d of age) was used on a commercial operation in Kansas to evaluate various levels of spray-dried porcine plasma in the phase I (d 0 to 14 postweaning) diet. Pigs were blocked by weight to the five experimental treatments. Pigs were housed nine or 10 pigs per pen (six pens per treatment) in an environmentally controlled nursery with metal flooring and allowed ad libitum access to feed and water. Pigs and feeders were weighed on d 7, 14, 21, and 25 after weaning to determine ADG, ADFI, and F/G. On d 28 postweaning, pigs were moved to an environmentally controlled, slatted floor, grower facility. Pigs were weighed on d 42 postweaning to determine ADG.

Experimental diets were formulated to contain either 5, 7.5, 10, 12.5, or 15% spray-dried porcine plasma (Table 1). Spray-dried porcine plasma replaced dried skim milk on a lysine basis with soybean meal maintained at a constant level (11%) in all diets. Lactose was added to the diet as dried skim milk was removed to maintain a constant lactose level (30%) in all diets. All diets were formulated to contain 1.8% lysine, .52% methionine, .9% calcium, and .8% phosphorus (Table 1). Pigs were fed the experimental diets for the first 14 days postweaning. On d 14 postweaning, all pigs were switched to a common transition diet (d 14 to 25 postweaning) containing 20% dried whey, 2.5% spray-dried porcine plasma, and 2.5% spray-dried blood meal (Table 1). This diet was formulated to contain 1.4% lysine, .42% methionine, .9% calcium and .8% phosphorus. Both phases were fed in the pellet form. A 3/32-in diameter pellet was fed in the first phase. In the transition phase, a 5/32-in diameter pellet was fed. From d 25 to 32 postweaning, all pigs were fed a common phase II diet containing 2.5% spray-dried blood meal and 10% dried whey. All pigs were fed a common phase III corn-soybean meal diet from d 32 to 42 postweaning. This diet was formulated to contain 1.1% lysine.

Results and Discussion

Average daily gain improved linearly (P<.06) during the first phase, with pigs fed the 15% spray-dried porcine plasma having the greatest performance (Table 2). Average daily feed intake was also improved linearly (P < .01). The pigs receiving the 15% plasma diet consumed the most feed during the d 0 to 14 postweaning period (Table 2). Pig weight increased linearly (P < .06) on d 14 postweaning as the percentage of spray-dried porcine plasma increased in the diet. Pigs receiving the 15% spray-dried porcine plasma diet were .7 lb heavier than the pigs consuming the 5% spray-dried porcine plasma diet (Table 3). In the first 7 days of the transition phase (d 14 to 21 postweaning), a linear decrease occurred in ADG and ADFI (P < .01, .04 respectively) as the inclusion level of spray-dried porcine plasma increased from 5% to 15%. Feed efficiency (F/G) also deteriorated linearly (P < .04) as the percentage of spray-dried porcine plasma increased from 5% to 15% (Table 2). For the entire transition phase, no differences occurred in ADG, ADFI, and F/G. However, numeric decreases were seen in ADG and ADFI as the amount of spray-dried porcine plasma increased from 5% to 15%. This reversal in performance resulted in no differences in weight between treatments on d 25 postweaning. From d 25 to 42 postweaning, no difference occurred in ADG, resulting in no differences in weight on d 42 postweaning (Table 3). These results have been observed in previous experiments. They could be caused by an increased metabolic demand for nutrients not being met in the second phase by pigs performing very well in the first phase. In summary, spray-dried porcine plasma can be used as an effective replacement for dried skim milk as a protein source in diets for pigs weaned at 10 d of age.

Table 1. Diet Composition[a]

Item, %	Spray-dried Porcine Plasma, % - Phase I 5	7.5	10	12.5	15	Trans-ition	Phase II	Phase III
Corn	22.77	22.91	23.05	23.19	23.25	44.86	60.73	67.06
Soybean meal (48.5 % CP)	11.00	11.00	11.00	11.00	11.00	20.92	22.37	28.07
Dried whey, edible grade	25.00	25.00	25.00	25.00	25.00	20.00	10.00	--
Spray-dried porcine plasma	5.00	7.50	10.00	12.50	15.00	2.50	--	--
Dried skim milk	24.06	18.04	12.03	6.01	--	--	--	--
Soy oil	6.00	6.00	6.00	6.00	6.00	5.00	--	--
Lactose	--	3.00	6.00	9.00	12.00	--	--	--
Select menhaden fish meal	4.00	4.00	4.00	4.00	4.00	--	--	--
Spray-dried blood meal	--	--	--	--	--	2.50	2.50	--
Limestone	.015	.075	.134	.194	.253	.698	.843	.95
Antibiotic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Monocalcium phosphate (21 %P)	.51	.79	1.06	1.34	1.61	1.79	1.91	2.05
Salt	--	--	--	--	--	--	--	.30
Vitamin premix	.25	.25	.25	.25	.25	.25	.25	.25
Trace mineral pre-mix	.15	.15	.15	.15	.15	.15	.15	.15
Vitamin E premix	.05	.05	.05	.05	.05	--	--	--
Copper sulfate	.075	.075	.075	.075	.075	.075	.075	.075
L-lysine HCl	.075	.075	.075	.075	.075	.10	.10	.10
DL-methionine	--	.083	.124	.166	.207	.150	.075	--
Isoleucine	--	--	--	--	.081	--	--	--
Total	100	100	100	100	100	100	100	100

[a]Diets were formulated to contain 1.8% lysine, .53% methionine, .9% Ca, and .8% P in phase I and 1.4% lysine, .42% methionine, .9% Ca, and .8% P in the transition phase.
[b]Provided 150 g/ton apramycin in phase I and 50 g/ton carbadox in the transition phase.

Table 2. Effect of Spray-dried Porcine Plasma Level on Growth Performance of Pigs Weaned at 10.5 d of Age[a]

	Spray-dried Porcine Plasma, %					
Item	5	7.5	10	12.5	15	CV
d 0 to 14						
ADG, lb[b]	.45	.46	.47	.48	.50	10.0
ADFI, lb[c]	.48	.49	.51	.51	.55	7.8
F/G	1.09	1.05	1.08	1.08	1.11	6.3
d 14 to 21						
ADG, lb[c]	.77	.71	.68	.63	.63	6.9
ADFI, lb[d]	.93	.88	.85	.80	.83	10.7
F/G[d]	1.22	1.24	1.27	1.28	1.33	13.0
d 14 to 25						
ADG, lb	.78	.75	.73	.69	.74	9.9
ADFI, lb	.96	.93	.91	.86	.91	9.6
F/G	1.23	1.25	1.26	1.26	1.23	6.2
d 0 to 25						
ADG, lb	.59	.59	.59	.57	.61	8.3
ADFI, lb	.69	.68	.68	.66	.71	7.6
F/G	1.17	1.16	1.17	1.17	1.17	4.4
d 25 to 42						
ADG, lb	.95	.94	.90	.90	.95	5.4
d 0 to 42						
ADG, lb	.74	.72	.71	.70	.74	5.0

[a]Two hundred ninety weanling pigs were used (initially 7.6 lb and 10.5 d of age), 9 or 10 pigs/pen, 6 pens per treatment. Experimental diets were fed from d 0 to 14 postweaning. All pig were fed common diets from d 14 to 42 postweaning.
[b,c,d]Linear effects ($P<.06$, .01, .04, respectively).

Table 3. Weights of Pigs Fed Various Levels of Spray-dried Porcine Plasma[a]

	Spray-dried Porcine Plasma, %					
Item, lb	5	7.5	10	12.5	15	CV
d 0	7.6	7.6	7.6	7.6	7.6	.42
d 7	9.4	9.7	9.9	9.5	9.8	3.8
d 14[b]	13.9	14.2	14.4	14.3	14.6	4.3
d 21	19.3	19.2	19.1	18.8	19.1	4.9
d 25	22.6	22.5	22.4	22.1	22.8	5.1
d 42	38.8	38.7	37.8	37.6	38.9	3.8

[a]Two hundred ninety weanling pigs were used (initially 7.6 lb and 10.5 d of age), 9 or 10 pigs/pen, 6 pens per treatment. Experimental diets were fed from d 0 to 14 postweaning. All pig were fed common diets from d 14 to 42 postweaning.
[b]Linear effect ($P<.06$).