INFLUENCE OF PROTEIN SOURCE FED TO THE EARLY-WEANED PIG DURING PHASE I (D 0 - 9) ON THE RESPONSES TO VARIOUS PROTEIN SOURCES FED DURING PHASE II (D 9 - 28)[1]

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Summary

A total of 468 weanling pigs (initially 13.2 lb and 21 d of age) was used in a 28 d growth assay to determine the influence of protein source fed during phase I (d 0 to 9) on the response to various protein sources fed during phase II (d 9 to 28). Phase I diets contained 20% dried whey, 10% lactose, and either 10.3% spray-dried porcine plasma or 15.2% moist-extruded soy protein concentrate and formulated to contain 1.5% lysine. On d 9, pigs were switched to diets containing 10% dried whey and either 3.9% spray-dried porcine plasma, 2.5% spray-dried blood meal, or 5.7% moist-extruded soy protein concentrate and formulated to contain 1.25% lysine. During phase I, pigs fed spray-dried porcine plasma had improved average daily gain (.30 vs .16 lb), average daily feed intake (.40 vs .29 lb), and feed efficiency (1.35 vs 2.08) compared to pigs fed moist-extruded soy protein concentrate. During phase II, pigs fed diets containing spray-dried porcine plasma had increased average daily gain and average daily feed intake compared with pigs fed diets containing spray-dried blood meal and higher average daily feed intake than pigs fed extruded soy protein concentrate. There were no interactive effects between phase I and phase II protein sources; therefore, growth responses observed during phase I apparently are additive with those observed during phase II.

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

Introduction

Previous research has shown spray-dried porcine plasma to be an effective protein source in the high nutrient density diet for the early-weaned pig. However, interest in using a soy protein-based product in these diets has increased because of the potential for decreasing diet cost. In the phase II diet, spray-dried blood meal has been shown to be a very effective protein source to replace a portion of the soybean meal. With various ingredient options available to the producer, the consequences of using protein sources in a certain sequence could be important for obtaining maximum pig performance. Therefore, the objective of this experiment was to evaluate the influence of various protein sources fed in the phase I period on subsequent performance in the phase II period when pigs were either fed the same protein source or switched to a different protein source to determine any interactive effects.

Procedures

A total of 468 weanling pigs (initially 13.2 lb and 21 d of age) was used in a 28 d growth trial to determine the influence of protein source fed during phase I (d 0 to 9) on the response to various protein sources fed during phase II. Pigs were allotted by weight and sex to six replicates with 13 pigs/pen. The trial was arranged in a 2 × 3 factorial based on protein sources fed in the phase I (spray-dried porcine plasma or moist-extruded soy protein concentrate) and II

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(spray-dried porcine plasma, spray-dried blood meal, or moist-extruded soy protein concentrate) starter diets. Phase I diets contained 20% dried whey, 10% lactose, and either 10.3% spray-dried porcine plasma or 15.2% moist-extruded soy protein concentrate and were formulated to contain 1.5% lysine (Table 1). On d 9 postweaning, pigs were switched to one of three diets containing 10% dried whey and either 3.9% spray-dried porcine plasma, 2.5% spray-dried blood meal, or 5.7% moist-extruded soy protein concentrate. All phase II diets were formulated to contain 1.25% lysine. Thus, pigs fed plasma diets in phase I continued on a blood source diet or switched to a soy-based diet in phase II. Similiarly, pigs fed a soy-based diet in phase I either continued on a soy-based diet or switched to a blood source diet in phase II. Therefore, the possibility of complementary effects of protein source fed in the phase I diet on subsequent performance in phase II could be evaluated. All experimental protein sources were substituted on an equal lysine basis. Pigs were housed in an environmentally controlled nursery and were allowed ad libitum access to feed and water. Pigs and feeders were weighed on d 9, 16, and 28 postweaning to evaluate average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (F/G).

Results and Discussion

During phase I, pigs fed spray-dried porcine plasma had improved ($P<.001$) ADG (.30 vs .16 lb), ADFI (.40 vs .29 lb), and F/G (1.35 vs 2.08) compared to pigs fed moist-extruded soy protein concentrate (Table 2). Phase I protein source did not influence phase II performance, and no interactions occurred between protein sources fed during phases I and II. During phase II, pigs fed diets containing spray-dried porcine plasma had improved ($P<.02$) ADG and ADFI compared with pigs fed diets containing spray-dried blood meal and higher ($P<.03$) ADFI than pigs fed diets containing moist-extruded soy protein concentrate (Table 3). Although there were no interactive effects, protein sources in both phases I and II influenced ($P<.05$) pig weight at the end of the starter period (d 28). Pigs receiving spray-dried porcine plasma during phases I and II had the greatest final weight. These results indicate that growth responses attributed to protein source in phases I and II are additive. Therefore, when planning a nursery phase feeding system, it is important to keep in mind the protein sources you will be using in order to take advantage of this additive effect for optimizing pig performance and reducing cost/lb of gain.

Table 1. Diet Composition

	Phase I[a]		Phase II[b]		
Item, %	SDPP[c]	ESPC[d]	SDPP	SDBM[e]	ESPC
Corn	32.58	27.79	52.28	53.71	50.54
Soybean meal, (48% CP)	19.34	19.34	25.23	25.23	25.23
Dried whey, edible grade	20.00	20.00	10.00	10.00	10.00
Spray-dried porcine plasma	10.28	-	3.90	-	-
Extruded soy protein concentrate	-	15.2	-	-	5.77
Spray-dried blood meal	-	-	-	2.50	-
Lactose	10.00	10.00	-	-	-
Soybean oil	3.00	3.00	4.00	4.00	4.00
Monocalcium phosphate (21% P)	2.47	2.01	1.95	1.92	1.78
Limestone	.65	.76	.81	.81	.86
Antibiotic[f]	1.00	1.00	1.00	1.00	1.00
Salt	-	.30	.25	.25	.25
Vitamin premix	.25	.25	.25	.25	.25
Trace mineral premix	.15	.15	.15	.15	.15
Copper sulfate	.10	.10	.075	.075	.075
Vitamin E	.05	.05	.05	.05	.05
Selenium premix	.05	.05	.05	.05	.05
DL-methionine	.078	.003	.007	-	-
Total	100.00	100.00	100.00	100.00	100.00

[a]Phase I diets were fed from d 0 - 9 and were formulated to contain 1.5% lysine.
[b]Phase II diets were fed from d 9 - 28 and were formulated to contain 1.25% lysine.
[c]Spray-dried porcine plasma.
[d]Extruded soy protein concentrate.
[e]Spray-dried blood meal.
[f]Provided 200 g furazoladone, 100 g oxytetracycline, and 90 g arsenilic acid per ton.

Table 2. Phase I (d 0 - 9) Growth Performance[a]

Item	SDPP[b]	ESPC[c]
d 0 - 9		
ADG, lb[d]	.30	.16
ADFI, lb[d]	.40	.30
F/G[d]	1.35	2.08

[a]Four hundred sixty eight pigs were used (initially 13.2 lb and 21 d of age), 13 pigs/pen.
[b]Spray-dried porcine plasma.
[c]Extruded soy protein concentrate.
[d] $P < .001$.

Table 3. Growth Performance of Pigs Fed Various Protein Sources in Phases I and II[a]

	I:SDPP			I:ESPC			
Item	II:SDPP	SDBM	ESPC	II:SDPP	SDBM	ESPC	CV
d 9 - 28							
ADG, lb[b]	.74	.64	.67	.73	.65	.70	10.6
ADFI, lb[bc]	.95	.87	.92	1.03	.85	.88	10.8
F/G	1.29	1.37	1.37	1.41	1.31	1.26	8.5
d 0 - 28							
ADG, lb	.59	.53	.56	.55	.49	.52	9.9
ADFI, lb	.77	.72	.74	.79	.67	.69	10.7
F/G	1.31	1.37	1.33	1.45	1.37	1.33	5.8
d 28 wt[d]	30.2	28.4	28.9	28.9	27.4	28.7	4.0

[a]468 weanling pigs were used (initially 13.2 lb and 21 d of age), 13 pigs/pen.
[b]Spray-dried porcine plasma vs spray-dried blood meal ($P < .02$).
[c]Spray-dried porcine plasma vs extruded soy protein concentrate ($P < .03$).
[d]$P < .05$.