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Abstract

Pigs weaned in a segregated early weaning (SEW) environment achieved maximum performance when fed a sequence of diets containing a gradual decrease in spray-dried animal plasma. Furthermore, pigs weaned at approximately 19 days responded positively to 20% soybean meal. Increased levels of lactose enhanced the increases in performance from soybean meal.; Swine Day, Manhattan, KS, November 16, 1995

Keywords

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INTERACTIONS AMONG LACTOSE, SPRAY-DRIED ANIMAL PLASMA, AND SOYBEAN MEAL LEVELS MAY AFFECT SEGREGATED EARLY-WEANED PIGS

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Summary

Pigs weaned in a segregated early weaning (SEW) environment achieved maximum performance when fed a sequence of diets containing a gradual decrease in spray-dried animal plasma. Furthermore, pigs weaned at approximately 19 days responded positively to 20% soybean meal. Increased levels of lactose enhanced the increases in performance from soybean meal.

(Key Words: Lactose, Spray-Dried Plasma, Soybean Meal, Early-Weaned Pigs.)

Introduction

Segregated early weaning (SEW) has enabled swine producers to maximize the efficiency of their operations through maximum efficiency of their breeding herd, decreased postweaning mortality, and increased throughput of the operation. Research at Kansas State University has been dedicated to developing diets for the early-weaned pig. In the development of these diets, the goal has been to maximize performance while minimizing the cost of the diet. This research has developed an SEW diet containing 6.7% animal plasma, 6% select menhaden fish meal, 25% dried whey, and 23% total lactose. This diet is formulated to 1.7% lysine and .47% methionine. After this complex initial diet, a defined sequence of diets is fed, matching the animal's increased feed consumption with less nutrient dense and less expensive diets.

Research has shown that the early-weaned pig requires a diet consisting of available protein and highly digestible carbohydrate sources. However, very few data show how these ingredients interact to influence performance of the early-weaned pig. Therefore, it is our goal to determine if increased levels of highly digestible carbohydrate sources will maintain performance in animals fed low levels of complex protein sources and if high levels of complex protein sources will maintain performance in pigs fed a diet low in highly digestible carbohydrate sources.

Procedures

Two experiments were conducted to realize the interaction between lactose and protein source in SEW diets. All pigs were housed in off-site, environmentally controlled nurseries in 4 × 4 ft pens. Animals were allowed ad libitum access to water and feed for the duration of the trial. For the first week of the trial, temperature was maintained at 98°F and then reduced 3 to 5 degrees per week for pig comfort.

In the first experiment, 360 barrows were used in a 35-day growth assay. Initial weight and age were 11.7 lb (16.8 to 8.0) and 19 d (17 to 21 d), respectively. Pigs were allotted by initial weight in a 3×2×2 factorial arrangement with five pigs per pen and six replicate pens per treatment. Twelve dietary treatments were fed from d 0 to 14 (Table 1). Diets consisted of three levels of pure lactose (0, 20, and 40%); two levels of animal

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plasma (0 and 7.5%); and two levels of soybean meal (SBM, 0 and 20%). Formulated to 1.7% lysine, .48% methionine, .9% calcium, and .8% phosphorus, the experimental diets were fed in a pelleted form. A 50% casein - 50% fish meal blend was used as a protein source in diet formulation with SBM and plasma replacing the blend. Experimental diets were followed by a common phase II (d 14 to 28) diet formulated to 1.35% lysine, .41% methionine, .9% calcium, and .8% phosphorus. This diet, containing 10% dried whey and 2.5% spray-dried blood meal, was fed in a meal form. From d 28 to 34, a common phase III diet, formulated to 1.3% lysine, .36% methionine, .9% calcium, and .8% phosphorus, was fed in a meal form. Pigs in trial 1 were weighed and feed disappearance measured on d 7, 14, 21, 28, and 35 to calculate ADG, ADFI, and F/G.

In the second trial, 324 pigs were used in a 26 d growth assay. Initial weight and age were 8.2 lb (5.5 to 10.6 lb) and 10 d (8 to 12 d), respectively. Pigs were allotted by initial weight in a 3×2×2 factorial arrangement with four to five pigs per pen and five replicate pens per treatment. Twelve dietary treatments were fed from d 0 to 10 (Table 2). Diets were similar to those fed in trial 1, except extruded soy protein concentrate replaced the fish meal - casein blend as the protein source substituted when plasma and SBM were added to the diet. Additionally, all experimental diets in this trial contained 6% fish meal. A common transition diet followed the experimental diets from d 10 to 17. Formulated to 1.45% lysine, .40% methionine, .9% calcium, and .8% phosphorus, the common transition diet was fed in pelleted form. The transition diet consisted of 2.5% spray-dried animal plasma, 2.5% spray-dried blood meal, 2.5% fish meal, and 20% dried whey. From d 17 to 26, pigs were fed a common phase II diet formulated to 1.3% lysine .36% methionine, .9% calcium and .8% phosphorus. This diet, containing 10% dried whey and 2.5% spray-dried blood meal, was fed in a meal form. Pigs in trial 2 were weighed and feed disappearance measured on d 5, 10, 17, and 26 to calculate ADG, ADFI, and F/G.

Data were analyzed as a randomized block design in a 3×2×2 factorial arrangement. Data were analyzed for lactose × soybean meal × plasma interactions. Analysis of variance was performed using the GLM procedure of SAS. Linear and quadratic polynomials were evaluated for lactose.

Results and Discussion

In the first experiment, no 3-way interactions occurred between lactose, soybean meal, and spray-dried animal plasma. Individual treatment means are presented in Table 3, and treatment main effect means are presented Table 4. From d 0 to 7, ADG and ADFI increased (P<.05) for pigs fed diets containing 6.7% spray-dried animal plasma compared to pigs fed diets without plasma. A linear improvement (P<.05) in ADFI also was shown for pigs fed diets containing increasing levels of lactose. A trend for lower (P<.17) ADFI was observed for pigs fed diets containing SBM compared to pigs fed diets without SBM. A plasma by lactose interaction (P<.05) affected F/G from d 0 to 7. Adding plasma to a diet containing 0% lactose resulted in an improvement in F/G. However, when pigs were fed a diet with lactose levels of 20 or 40%, F/G was not affected when plasma was added to the diet. Pigs fed diets containing SBM had improved (P<.05) F/G compared to pigs fed diets without SBM.

From d 7 to 14, pigs fed diets containing 20% SBM had higher (P<.05) ADG than pigs fed diets without SBM. This increase in ADG was improved with increasing levels of lactose in the diet, resulting in a lactose by SBM interaction (P<.05). Increasing levels of lactose in the diet resulted in a linear improvement in ADFI. Pigs fed diets containing SBM had increased ADFI with the greatest responses observed at the highest levels of lactose, resulting in a lactose by SBM interaction (P<.05). A trend for improvements (P<.17) in ADFI was observed for pigs fed diets containing plasma compared to pigs fed diets without plasma. A trend for poorer (P<.1) F/G was observed for pigs fed diets containing plasma compared to pigs fed diets without plasma. Furthermore, pigs fed diets containing SBM had improved ($P<.05$) F/G compared to pigs fed diets with no SBM.

For phase I (d 0 to 14), ADG was improved ($P<.05$) for pigs fed the diets containing plasma. Similar to the d 7 to 14 period, a SBM by lactose interaction ($P<.05$) affected ADG. Average daily gain was increased as SBM was added to the diet, with the greatest benefit in the diets containing higher levels of lactose. Pigs fed diets with plasma and SBM had improved ($P<.05$) ADFI for phase I. There was a trend for a lactose by SBM interaction ($P<.1$) affecting ADFI. The greatest improvement in ADFI from SBM was in pigs fed diets containing high levels of lactose. Pigs fed diets containing 20% SBM had improved F/G compared with pigs fed diets with 0% SBM. However, the greatest improvement resulted when the diet did not contain plasma, resulting in a plasma by SBM interaction ($P<.17$).

While pigs were fed a common diet during phase II (d 14 to 28), ADG was decreased ($P<.05$) for pigs fed diets with 7.5% plasma in phase I. Feed intakes during phase II were improved subsequently for pigs fed soybean meal in the phase I diet. Pigs that were fed plasma in the phase I diet had lower ADFI in phase II than pigs fed diets that did not contain plasma. Additionally, the positive ADFI effect of SBM was decreased in phase II if plasma was included with SBM in the phase I diet, resulting in a plasma by SBM interaction ($P<.10$). Adding lactose to the phase I diet resulted in a linear trend ($P<.10$) for an improvement in F/G during phase II. However, adding plasma or SBM to the phase I diet resulted in a trend for poorer ($P<.10$) F/G in phase II.

For the overall trial (d 0 to 34), ADG was increased ($P<.05$) for pigs fed SBM in the phase I diet compared to pigs fed diets without SBM during phase I. Surprisingly, adding lactose or plasma to the phase I diet had no influence on performance for the overall trial. There was a trend for a plasma by lactose interaction ($P<.17$) affecting overall ADFI. When the phase I diet did not contain lactose, adding plasma to the diet increased ADFI. However, when the phase I diet contained high levels of lactose, adding plasma to the diet did not consistently influence ADFI. A similar interaction ($P<.17$) between plasma and lactose was present for F/G. Adding plasma to the diets containing 0% lactose negatively influenced F/G. When plasma was added to diets containing 20 or 40% lactose, the response was inconsistent. The SBM level in the phase I diet had no influence on F/G for the overall trial.

In the second experiment, from d 0 to 5, ADG was increased ($P<.05$) for pigs fed diets containing plasma (individual treatment means are presented in Table 5, and treatment main effects are presented in Table 6). Pigs fed increasing levels of lactose had linear improvements ($P<.05$) in ADFI. A trend for improved ($P<.17$) F/G was observed for pigs fed diets containing SBM compared to pigs fed diets without SBM.

From d 5 to 10, pigs fed increasing levels of lactose had linear improvements ($P<.05$) in ADG. In addition, pigs fed diets containing SBM had lower ($P<.05$) ADG than pigs fed diets without SBM. From d 5 to 10, ADFI was increased linearly ($P<.05$) for pigs fed increasing levels of lactose. Pigs fed diets containing plasma had higher ($P<.05$) ADFI from d 5 to 10 compared with pigs fed diets without plasma. A trend for lower ($P<.17$) ADFI was observed for pigs fed diets with SBM compared to pigs fed diets without SBM. Pigs fed diets with SBM and plasma had the poorest F/G, resulting in an SBM and plasma interaction ($P<.1$).

During phase I (d 0 to 10), adding lactose to the diet improved ADG (linear, $P<.05$). Adding plasma to the diet also tended to improve ($P<.17$) ADG. Both of these responses were the result of an improvement ($P<.05$) in ADFI from adding lactose or plasma to the diet. Unlike the response in trial 1, the SBM level in the phase I diet had no influence on ADG or ADFI. This different response may have been due to the different protein source replaced when SBM was added to the diet in the second trial. Dietary treatment during phase I had no influence on F/G.

Dietary treatments fed during phase I had no subsequent influence on performance during phase II (d 10 to 26). No differences in growth performance were observed for the overall trial (d 0 to 26). There were two major differences in experimental designs between the two trials. First, the ages of the pigs used in the trials were different. Pigs used in the first trial were 9 days older and 5.5 lb heavier than pigs used in the second experiment. Furthermore, the dietary sequences fed in the two experiments were different. Spray-dried animal plasma was fed in the first trial at 7.5% of the SEW diet for 14 days, whereas pigs in the second trial consumed a 7% plasma SEW diet for only 10 days then were switched to a transition diet containing 2.5% plasma for 7 days. Additionally, protein in diets without SBM and/or plasma was replaced differently. In the first trial, a casein/fish meal blend was used as the replacement. However, the second trial utilized extruded soy protein concentrate as the protein replacement. In reviewing the data from these experiments, it is important to keep these differences in mind.

From these experiments, some conclusions can be drawn to help maximize the performance of early-weaned pigs. Looking for similar ingredient responses between trials shows the positive aspects of plasma early in both trials. However, some negative responses are shown later (phase II and overall) in the first trial. Noting that these negative effects did not happen in the second trial, and remembering the different ways plasma was fed between trials, we may assume that gradually lowering the plasma level fed to early-weaned pigs will maximize performance compared to very rapidly lowering the plasma from a high level (> 5%) to 0%.

We were surprised at the relatively small response to the lactose level in the diet. Previous research at several universities has established lactose as a key component of the diet to encourage consumption and maximize performance of the early-weaned pig. The data from our second trial certainly supports this conclusion.

Data from trial 1 show strong positive responses to including SBM in the initial diet after weaning. However, these responses did not occur in trial 2. Age of pigs in the two experiments may have contributed to this differing response. However, the most likely reason is the different protein sources replaced when SBM was added to the diet. In either case, adding SBM to the diet during the initial period after weaning had no negative impact on ADG.

Table 1. Diet Composition in Trial 1, %[a]

Ingredients	Lactose, %	0	0	0	0	20	20	20	20	40	40	40	40	
	SBM, %	0	0	20	20	0	0	20	20	0	0	20	20	
	Plasma, %	0	7.5	0	7.5	0	7.5	0	7.5	0	7.5	0	7.5	Phase II[b]
Corn		64.70	65.60	54.30	55.10	43.70	44.50	33.20	34.00	22.60	23.50	12.10	13.00	53.80
Soybean meal (48 % CP)		--	--	20.00	20.00	--	--	20.00	20.00	--	--	20.00	20.00	23.90
Porcine plasma		--	7.50	--	7.50	--	7.50	--	7.50	--	7.50	--	7.50	--
Lactose		--	--	--	--	20.00	20.00	20.00	20.00	40.00	40.00	40.00	40.00	--
Soybean oil		6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	3.00
Fish-casein blend		26.10	16.90	15.80	6.50	27.00	17.90	16.70	7.60	28.00	18.80	17.70	8.50	--
Spray dried blood meal		--	--	--	--	--	--	--	--	--	--	--	--	2.50
Dried whey		--	--	--	--	--	--	--	--	--	--	--	--	10.00
Monocalcium phosphate		.65	.92	1.10	1.40	.80	1.10	1.30	1.60	1.00	1.30	1.50	1.70	11.90
Antibiotic		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Limestone		.33	.86	.65	1.20	.18	.71	.5	1.00	.02	.56	.35	.88	.81
Cystine		--	.01	.04	--	.05	.07	.09	.03	.11	.13	.15	.07	--
L-lysine·HCl		.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.15
DL-methionine		--	--	--	.06	--	--	--	.08	--	--	--	.10	.10
L-threonine		--	--	--	--	--	--	--	--	.06	--	.02	--	--
Vitamin premix		.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25
Trace mineral premix		.15	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
Zinc oxide		.38	.38	.38	.38	.38	.38	.38	.38	.38	.38	.38	.38	.25
Salt		.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.25
Total		100	100	100	100	100	100	100	100	100	100	100	100	100

[a]Phase I diets were formulated to contain 1.7% lysine, .48% methionine, .9% calcium, and .8% phosphorus.

[b]Phase II diet was formulated to contain 1.35% lysine, .37% methionine, .9% calcium, and .8% phosphorus.

Table 2. Diet Composition in Trial 2, %[a]

	Lactose, %	0	0	0	0	20	20	20	20	40	40	40	40		
	SBM, %	0	0	20	20	0	0	20	20	0	0	20	20		
Ingredients	Plasma, %	0	7	0	7	0	7	0	7	0	7	0	7	Transition[b]	Phase II[c]
Corn		57.40	62.00	51.40	56.00	36.00	40.60	30.00	34.60	13.00	19.10	8.50	13.10	42.00	52.70
Soybean meal (48 % CP)		--	--	20.00	20.00	--	--	20.00	20.00	--	--	20.00	20.00	21.30	26.80
Porcine plasma		--	7.00	--	7.00	--	7.00	--	7.00	--	7.00	--	7.00	2.50	--
Lactose		--	--	--		20.00	20.00	20.00	20.00	40.00	40.00	40.00	40.00	--	--
Soybean oil		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.00
Ex. soy concentrate		26.80	15.30	12.90	1.30	28.10	16.50	14.20	2.60	3.90	17.80	15.40	3.87	--	--
Spray dried blood meal		--	--	--	--	--	--	--	--	--	--	--	--	2.50	2.50
Fish meal		6.50	6.50	6.50	6.50	6.50	6.50	6.50	6,50	6.50	6.50	6.50	6.50	2.50	--
Dried whey		--	--	--	--	--	--	--	--	--	--	--	--	20.00	10.00
Monocalcium phosphate		1.3	1.12	1.20	1.00	1.50	1.40	1.40	1.30	1.50	1.60	1.70	1.50	1.30	1.90
Antibiotic		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Limestone		.6	.76	.63	.77	.51	.65	.52	.66	.54	.54	.41	.55	.75	1.00
Cystine		--	--	--	--	.03	--	.03	--	.06	.06	.06	.06	--	--
L-lysine·HCl		.15	.15	.15	.15	.5	.15	.15	.15	.15	.15	.15	.15	.10	.15
DL-methionine		.09	.10	.08	.10	.12	.17	.11	.16	.17	.17	.15	.17	.12	.10
Vitamin premix		.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25
Trace mineral premix		.15	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15	.15
Zinc oxide		.38	.38	.38	.38	.38	.38	.38	.38	.38	.38	.38	.38	.38	.25
Salt		.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.30	.10	.20	.25
Total		100	100	100	100	100	100	100	100	100	100	100	100	100	100

[a]Phase I diets were formulated to contain 1.7% lysine, .48% methionine, .9% calcium, and .8% phosphorus.
[b]Transition diet was formulated to contain 1.45% lysine, .4% methionine, .9% calcium, and .8% phosphorus.
[c]Phase II diet was formulated to 1.3% lysine, .36% methionine, .9% calcium, and .8% phosphorus.

Table 3. Response Criteria from Trial 1[a]

Lactose, %	0	0	0	0	20	20	20	20	40	40	40	40									
SBM, %	0	0	20	20	0	0	20	20	0	0	20	20									
Plasma, %	0	7.5	0	7.5	0	7.5	0	7.5	0	7.5	0	7.5	L	S	P	L*S	L*P	S*P	Lin	Quad	CV
Week 1																					
ADG, lb	.46	.56	.49	.55	.51	.59	.53	.58	.48	.59	.51	.59			**						15.2
ADFI, lb	.41	.48	.40	.44	.44	.53	.41	.52	.43	.53	.42	.51	**	†	**				**	†	8.7
F/G	.92	.87	.82	.79	.85	.90	.78	.89	.91	.90	.84	.87		**			**				8.1
Week 2																					
ADG, lb	.91	.91	.96	.93	.79	.79	.97	.91	.72	.71	1.01	1.07	*	**		**			*	†	12.0
ADFI, lb	.89	.93	.92	1.00	.84	.80	.87	.89	.71	.76	.92	1.00	**	**	†	**			**	†	14.2
F/G	.98	1.03	.95	1.07	1.08	1.01	.89	1.02	.99	1.08	.90	.93		**	*						13.5
Phase I (0 - 14)																					
ADG, lb	.68	.73	.72	.74	.65	.69	.75	.75	.60	.65	.76	.83	**	**	**						11.0
ADFI, lb	.65	.71	.66	.72	.64	.66	.64	.71	.57	.65	.67	.75	**	**	*						11.4
F/G	.95	.97	.91	.97	.99	.96	.85	.96	.96	.99	.88	.91	**	*				†			9.1
Phase II (14 - 28)																					
ADG, lb	1.16	1.14	1.17	1.13	1.13	1.03	1.19	1.11	1.27	1.04	1.16	1.15			**						10.6
ADFI, lb	1.62	1.62	1.64	1.63	1.58	1.43	1.64	1.62	1.62	1.40	1.65	1.62		**	**			*	†		7.9
F/G	1.39	1.43	1.40	1.45	1.41	1.40	1.38	1.51	1.27	1.34	1.41	1.41	*	*	*				*		8.0
Overall (0 - 34)																					
ADG, lb	1.01	1.03	1.03	1.02	.99	.96	1.05	1.02	1.02	.93	1.04	1.07		**							7.3
ADFI, lb	1.30	1.36	1.32	1.38	1.29	1.24	1.34	1.34	1.30	1.20	1.33	1.35		**			†		*		7.3
F/G	1.28	1.32	1.28	1.35	1.30	1.30	1.29	1.32	1.27	1.30	1.28	1.26	*		**		†		**		3.7

[a]Means represent 364 barrows (initially 11.7 lb and 19 d).

[b]**Represents mean differences or interactive means of $P<.05$. * Represents mean differences or interactive means of $P<.1$

†Represents mean differences or interactive means of $P<.17$.

Table 4. Main Effects of Treatment in Trial 1[a]

	Lactose, %			SBM, %		Plasma, %	
Item	0	20	40	0	20	0	7.5
Week 1							
ADG, lb	.52	.56	.54	.53	.54	.50	.58
ADFI, lb[d]	.43[b]	.48[c]	.47[c]	.47	.45	.42	.50
F/G	.85	.86	.88	.89[b]	.83[c]	.85	.87
Week 2							
ADG, lb	.93	.86	.88	.80[b]	.98[c]	.89	.89
ADFI, lb[d]	.94[b]	.85[c]	.85[c]	.82[b]	.93[c]	.86	.90
F/G	1.01	1.00	.98	1.03[b]	.96[c]	.97	1.02
Phase I (0 - 14)							
ADG, lb	.72	.71	.71	.67[b]	.76[c]	.70	.73
ADFI, lb	.68	.66	.66	.65[b]	.69[c]	.64	.70
F/G	.95	.94	.94	.97[b]	.91[c]	.92	.96
Phase II (14 - 28)							
ADG, lb	1.15	1.11	1.16	1.13	1.15	1.18	1.10
ADFI, lb	1.63	1.57	1.57	1.54[b]	1.63[c]	1.62	1.55
F/G	1.42	1.42	1.36	1.37	1.43	1.38	1.42
Overall (0 - 34)							
ADG, lb	1.02	1.00	1.01	0.99	1.04	1.02	1.00
ADFI, lb	1.34	1.31	1.29	1.28[b]	1.34[c]	1.31	1.31
F/G[d]	1.31	1.30	1.28	1.30[b]	1.30[c]	1.28	1.31

[a]Means represent 364 barrows (initially 11.7 lb and 19 d).
[bc]Represent mean differences ($P < .05$).
[d]Represent a linear lactose response ($P < .05$).

Table 5. Response Criteria from Trial 2[a]

Lactose, %	0	0	0	0	20	20	20	20	40	40	40	40									
SBM, %	0	0	20	20	0	0	20	20	0	0	20	20									
Plasma, %	0	7	0	7	0	7	0	7	0	7	0	7	L	S	P	L*S	L*P	S*P	Lin	Quad	CV
Day 0 - 5																					
ADG, lb	.20	.25	.23	.29	.25	.25	.23	.32	.26	.27	.24	.34			**						36.9
ADFI, lb	.18	.18	.19	.21	.22	.25	.20	.25	.23	.23	.22	.26	*						**		27.8
F/G	.92	.84	.84	.73	.90	.93	.87	.78	.90	1.00	.83	.77		†							32.7
Day 5 - 10																					
ADG, lb	.45	.55	.43	.37	.55	.58	.46	.54	.57	.57	.51	.48	**	**					**		23.3
ADFI, lb	.44	.55	.46	.47	.53	.60	.49	.65	.60	.61	.47	.55	**	†	**				**	*	17.6
F/G	1.04	1.02	1.12	1.31	.98	1.04	1.09	1.21	1.05	1.06	.97	1.14		**	**			*			15.0
Phase I (0 - 10)																					
ADG, lb	.32	.40	.33	.33	.40	.41	.35	.43	.41	.42	.37	.41	*		†				**		22.4
ADFI, lb	.31	.36	.32	.34	.37	.42	.35	.45	.42	.42	.34	.41	**		**				**	*	17.3
F/G	1.03	.92	1.02	1.05	.96	1.02	1.02	1.04	1.00	1.00	.92	1.00									11.8
Phase II (10 - 26)																					
ADG, lb	.93	.94	.96	.99	.90	.95	1.01	.95	.96	.94	.96	.90									12.6
ADFI, lb	1.17	1.28	1.27	1.26	1.20	1.22	1.26	1.27	1.30	1.23	1.24	1.16									12.6
F/G	1.26	1.35	1.32	1.28	1.33	1.29	1.26	1.34	1.35	1.31	1.29	1.29									7.3
Overall																					
ADG, lb	.69	.73	.72	.73	.71	.74	.75	.75	.75	.74	.73	.71									11.2
ADFI, lb	.83	.92	.90	.91	.88	.91	.90	.95	.96	.91	.89	.87									12.1
F/G	1.20	1.25	1.26	1.24	1.24	1.23	1.22	1.27	1.28	1.24	1.21	1.22									6.5

[a]Means represent 364 barrows (initially 8.2 lb and 10 d).
[b]** Represents mean differences or interactive means of P<.05. *Represents mean differences or interactive means of P<.1
†Represents mean differences or interactive means of P<.17.

Table 6. Main Effects of Treatment in Trial 2[a]

	Lactose, %			SBM, %		Plasma, %	
Item	0	20	40	0	20	0	7
Day 0 - 5							
ADG, lb	.24	.26	.28	.24	.27	.23[b]	.28[b]
ADFI, lb	.19	.23	.24	.22	.22	.21	.23
F/G	.83	.87	.87	.91	.80	.87	.83
Day 5 - 10							
ADG, lb	.45	.53	.53	.55[b]	.47[c]	.50	.52
ADFI, lb[d,e]	.48[b]	.56[c]	.56[c]	.55	.52	.50[b]	.57[c]
F/G	1.12	1.08	1.05	1.03[b]	1.14[c]	1.04[b]	1.13[c]
Phase I (0 - 10)							
ADG, lb	.34	.40	.40	.40	.37	.36	.40
ADFI, lb	.34[b]	.40[c]	.40[c]	.38	.37	.35[b]	.40[c]
F/G	1.01	1.01	.98	.99	1.01	.99	1.00
Phase II (10 - 26)							
ADG, lb	.95	.95	.94	.94	.96	.95	.94
ADFI, lb	1.24	1.24	1.23	1.23	.124	1.24	1.24
F/G	1.30	1.30	1.31	1.32	1.30	1.30	1.31
Overall							
ADG, lb	.72	.74	.73	.73	.73	.72	.73
ADFI, lb	.89	.91	.91	.90	.90	.89	.91
F/G	1.24	1.24	1.24	1.24	1.24	1.24	1.24

[a]Means represent 364 barrows (initially 8.2 lb and 10 d).
[b,c]Represent mean differences of $P<.05$.
[d]Represent linear response to lactose ($P<.05$).
[e]Represent quadratic response to lactose ($P<.1$).