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Performance of weanling pigs fed diets containing various lactose sources

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PERFORMANCE OF WEANLING PIGS FED DIETS CONTAINING VARIOUS LACTOSE SOURCES[1]

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Summary

Two growth trials were conducted to evaluate the effects of replacing the lactose provided by dried whey in the phase II diet with either deproteinized whey or an alternative lactose source, DairyLac 80®. No differences in performance observed among pigs fed diets containing 10% dried whey or deproteinized whey or DairyLac 80®. These trials indicate that deproteinized whey and DairyLac 80® can be used to replace the lactose contained in dried whey for starter pig diets.

(Key Words: Weanling Pigs, Lactose, Deproteinized Whey, DairyLac 80®.)

Introduction

Numerous research reports have validated the necessity of lactose in starter pig diets, and dried whey is one of the most frequently used sources of lactose in phase I and II diets within the swine industry. Growth during phase I has been shown to increase linearly in response to increasing levels of dietary lactose. Research recently has focused on finding suitable alternative lactose sources including deproteinized whey and DairyLac 80®, which contains 80% lactose. Therefore, the objective of these studies was to evaluate the performance of pigs when fed corn-soybean meal-based diets containing dried whey or deproteinized whey (Exp. 1) or dried whey, dried whey and fish meal, or fish meal and DairyLac 80® (Exp. 2).

Procedures

Experiment 1. A total of 70 pigs (initially 11.45 lb and 21 d of age) were used in a 28 d growth trial. Pigs were blocked on the basis of weight and randomly allotted to one of two dietary treatments with five pigs per pen and seven replications (pens) per treatment.

The experimental diets, in meal form, were fed for 28 d postweaning. These diets contained 1.35% lysine, .90% Ca, .80% P, and at least .38% methionine (Table 1). The two dietary treatments consisted of a control diet with 10% dried whey and a second diet containing 8.70% deproteinized whey. The inclusion level of deproteinized whey and subsequent increase in level of spray-dried blood meal provided an equal replacement of the lactose and amino acids provided by the 10% dried whey in the control diet.

Experiment 2. A total of 153 pigs (initially 10.2 lb and 15 d of age) were used in a 28 d growth trial. Pigs were blocked on the basis of weight and randomly allotted to one of three dietary treatments with six, seven, or eight pigs per pen and seven replications (pens) per treatment. Each block had an equal number of pigs/pen.

A common segregated early-weaning (SEW) pelleted diet was fed to all pigs for 7 d postweaning. The common diet contained 1.70% lysine, .90% Ca, .80% P, and at least .48% methionine (Table 2). The phase II

[1]The authors thank Eichman Brothers, St. George, KS for the use of facilities and animals in Experiment 2 and Zepata Protein Inc., Hammond LA and International Ingredient Corp., St. Louis, MO for donating the fishmeal and DairyLac 80® used in Experiment 2.

experimental diets, in meal form, were fed for the remainder of the growth trial. These diets contained 1.35% lysine, .90% Ca, .80% P, and at least .38% methionine (Table 2). The immediate change from a SEW diet to a phase II diet was done to emphasize the quality of the protein in the experimental diets. The three dietary treatments consisted of a control diet with 10% dried whey, a diet containing 10% dried whey and 5% select menhaden fish meal, and a third diet containing 9.00% DairyLac 80® and 6.63% select menhaden fish meal. The inclusion levels of DairyLac 80® and fish meal in the third diet provided an equal replacement of the lactose and amino acids provided by the 10% dried whey in the other diets.

In both experiments, pigs were housed in environmentally controlled nurseries (4 ft × 5 ft pens in Exp. 1 and 5 ft × 5 ft pens in Exp. 2) and allowed ad libitum access to feed and water. Weekly weight gains and feed intakes were measured and used to determine ADG, ADFI, and F/G.

Data were analyzed as a randomized complete block design using the general linear model procedures of SAS. Initial pig weights were used to establish the blocks. In Exp. 2, single degree of freedom contrasts were used to determine the significance of the individual dietary comparisons.

Results and Discussion

Experiment 1. No effect of treatment ($P>.40$) was found on daily gain or on feed intake ($P>.10$) from d 0 to 14 and d 14 to 28. However, for the overall trial (d 0 to 28), pigs fed deproteinized whey tended (P=.07) to eat less (1.27 vs 1.38 lb). From d 0 to 14, F/G was improved (P=.05) for pigs fed deproteinized whey. Feed efficiency was numerically ($P>.10$) improved for pigs fed deproteinized whey through the study. These data suggest that deproteinized whey is an effective replacement for the lactose provided by dried whey in starter pig diets.

Experiment 2. No differences ($P>.40$) were observed for ADG, ADFI, or F/G throughout the experimental period (Table 4). Pigs fed the diets containing the dried whey and fish meal or DairyLac 80® and fish meal performed equally. Surprisingly, pigs fed the control diet, containing only dried whey, performed as well as the pigs fed the diets containing the specialty proteins.

A drastic decrease in feed efficiency was observed when pigs were changed from an SEW diet to a phase II diet. Consequently, pigs gained faster and converted feed to gain much more efficiently in the first week than in the second week. The sudden diet change was intended to emphasize the quality of the protein in the experimental diets. Also, when dried whey was removed from the diets, it was replaced with specialty proteins (fish meal and blood meal) and alternative lactose sources (deproteinized whey and DairyLac 80®) for an equal replacement of the lactose and amino acids contained in the dried whey. The cost of the alternative lactose sources and added cost of supplementing the amino acids compared to the cost of dried whey is an important consideration when formulating diets to contain these products.

Table 1. Composition of Diets (Exp. 1)[a]

Ingredients, %	Dried Whey	Deproteinized Whey
Corn	52.69	52.39
Soybean meal (46.5%)	26.78	26.74
Dried whey	10.00	----
Deproteinized whey	----	8.70
Soybean oil	3.00	3.00
Spray-dried blood meal	2.50	3.70
Monocalcium phosphate	1.88	2.23
Limestone	1.00	1.06
Antibiotic[b]	1.00	1.00
Premix	.40	.40
Salt	.25	.25
Zinc oxide	.25	.25
L-lysine	.15	.15
DL-methionine	.10	.13
Total	100.00	100.00

[a]Diets were formulated to contain 1.35% lysine, .38% methionine, .90% Ca, and .80% P.
[b]Provided 50g/ton carbadox.

Table 2. Composition of Diets (Exp. 2)

		Phase II[b]		
Ingredients, %	Common SEW Diet[a]	10% Dried Whey	10% Dried Whey and 5% Fish Meal	9% DairyLac 80® and 6.63% Fish Meal
Corn	33.40	48.32	52.44	51.98
Soybean meal (46.5%)	12.73	33.79	25.57	25.57
Dried whey	25.00	10.00	10.00	----
Select menhaden fish meal	6.00	----	5.00	6.63
DairyLac 80®	----	----	----	9.00
Soybean oil	6.00	3.00	3.00	3.00
Spray-dried plasma protein	6.70	----	----	----
Lactose	5.00	----	----	----
Spray-dried blood meal	1.75	----	----	----
Monocalcium phosphate	.76	1.76	1.27	1.15
Limestone	.48	1.02	.62	.57
Antibiotic[c]	1.00	1.00	1.00	1.00
Premix	.40	.40	.40	.40
Salt	.10	.25	.25	.25
Zinc oxide	.38	.25	.25	.25
L-lysine	.15	.15	.15	.15
DL-methionine	.15	.06	.05	.05
Total	100.00	100.00	100.00	100.00

[a]SEW diet was formulated to contain 1.70% lysine, .48% methionine, .90% Ca, and .80% P and was fed from d 0 to 7 postweaning.
[b]Phase II diets were formulated to contain 1.35% lysine, .38% methionine, .90% Ca, and .80% P and were fed from d 7 to 28 postweaning.
[c]Provided 50 g/ton carbadox.

Table 3. Effect of Deproteinized Whey on Weanling Pig Performance (Exp. 1)[a]

Item	Diet		CV	Probability ($P<$)
	Dried Whey	Deproteinized Whey		
d 0 to 14				
ADG, lb	.70	.68	9.75	.71
ADFI, lb	.82	.73	12.14	.13
F/G	1.17	1.08	7.08	.05
d 14 to 28				
ADG, lb	1.20	1.17	8.82	.52
ADFI, lb	1.94	1.82	7.23	.12
F/G	1.62	1.57	11.31	.69
d 0 to 28				
ADG, lb	.95	.92	7.35	.48
ADFI, lb	1.38	1.27	7.76	.07
F/G	1.45	1.38	6.48	.19
Average pig weight, lb				
d 0	11.4	11.5	---	---
d 14	20.9	21.3	9.42	.75
d 28	37.8	37.6	6.52	.91

[a]Means represent a total of 70 pigs (initially 11.45 lb and 21 d of age) with five pigs per pen and seven replicate pens per treatment.

Table 4. Effect of Lactose Source on Starter Pig Performance (Exp. 2)[ab]

Item	10% Dried Whey (1)	10% Dried Whey and 5% Fish Meal (2)	9% DairyLac 80® and 6.63% Fish Meal (3)	CV	Probability ($P<$)		
					1 vs 2	1 vs 3	2 vs 3
d 7 to 14							
ADG, lb	.43	.43	.46	33.19	.97	.62	.65
ADFI, lb	.97	.98	1.05	18.53	.98	.45	.46
F/G	2.40	2.34	2.40	20.10	.82	.98	.80
d 7 to 28							
ADG, lb	.77	.75	.77	24.01	.90	.99	.91
ADFI, lb	1.15	1.15	1.16	19.61	.95	.92	.97
F/G	1.51	1.53	1.56	10.77	.84	.64	.80
Average pig weight, lb							
d 0	10.29	10.28	10.28	---	---	---	---
d 7	13.75	13.33	13.27	16.61	.73	.69	.96
d 14	16.58	16.11	16.52	19.11	.78	.97	.81
d 28	29.45	28.76	29.33	20.38	.83	.97	.86

[a]Means represent a total of 153 pigs (initially 10.2 lb and 15 d of age) with six, seven, or eight pigs per pen and seven replicate pens per treatment.
[b]From d 0 to 7 postweaning, pigs were fed a common diet and ADG, ADFI, and F/G were: .46, .45, and .99, respectively.