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Abstract

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Keywords

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EFFECTS OF LACTOSE SOURCES ON NURSERY PIG GROWTH PERFORMANCE [1]

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Summary

A study was conducted to evaluate different sources of pure lactose as a substitute for spray-dried, edible-grade whey in starter diets. Results suggest that pure lactose can replace the lactose provided by dried whey in phase I starter diets. However, numerical differences in growth performance occurred among the lactose sources used.

(Key Words: Starter, Lactose, Performance.)

Introduction

Recent research at Kansas State University has shown that increasing lactose from 7 to 23% in a spray-dried plasma protein-based diet resulted in a linear improvement in pig performance. Pure lactose has been shown to be an effective replacement for dried whey in diets for the early-weaned pig. With increasing availability of lactose, we wanted to know if differences in nutritional value existed among different lactose sources. Therefore, the objective of this experiment was to compare growth performance of pigs fed different lactose sources as well as pigs fed a diet containing spray-dried, edible-grade whey.

Procedures

A total of 344 pigs (initially 9.6 lb and 13.97 d) was used in this 28 d growth trial. Pigs were blocked by weight and allotted to one of six dietary treatments with a total of seven to 11 pigs/pen and five to six pens/treatment. Treatments were based on lactose sources used to replace the lactose (14.4%) provided by dried whey in the phase I diet, as well as positive (20% dried whey) and negative control (7.2% lactose) diets.

The trial was divided into two phases with the pelleted, experimental diets fed during phase I (d 0 to 14 postweaning). All experimental diets were formulated to 1.6% lysine, .9% Ca, .8% P, and at least .44% methionine. The positive control diet contained 6.7% plasma protein, 1.75% spray dried blood meal, and 20% dried whey. Soybean oil was maintained at 5% in all diets. In the lactose-source diets, pure lactose was used to replace the lactose fraction of dried whey (14.4% lactose). Additionally, casein replaced the protein fraction contributed by dried whey, on an equal lysine basis. The negative control diet was formulated to contain only 7.2% lactose and no dried whey. The protein fraction provided by dried whey again was replaced by casein on a lysine basis.

In phase II (d 14 to 28), a common corn-soybean meal diet containing 2.5% spray-dried blood meal and 10% dried whey was fed in a meal form. This common diet was formulated to 1.35% lysine, .9% Ca, and .8% P.

[1]The authors would like to thank First District Association and Mid American Dairymen for providing lactose products. The authors also wish to thank Steve Eichman and Eichman Farms, St. George, KS for the use of facilities and animals in this experiment.

[2]Northeast Area Extension Office.

Pigs were housed in an environmentally controlled nursery in 5 x 5 ft pens. Pigs were provided ad libitum access to feed and water. Average daily gain, ADFI, and F/G were determined by weighing pigs and measuring feed disappearance on d 7, 14, 21, and 28 postweaning.

Data were analyzed as a randomized complete block design. General linear model procedures were used with blocks based on initial weight.

Results and Discussion

From d 0 to 7 and d 7 to 14 postweaning, lactose source had no effect on ADG, ADFI, and F/G. Additionally, lactose source had no effect on growth performance in phase I (d 0 to 14 postweaning).

When all pigs were fed a common diet during phase II (d 14 to 28), ADG was not affected by the diet fed during phase I. However, pigs fed the negative control or lactose source 2 in phase I had decreased ($P<.05$) ADFI in phase II compared to those fed all other diets. No differences were observed in F/G during phase II.

Although not significant, pigs fed lactose source 4 during phase I had 12.5% poorer ADG than pigs fed lactose source 3 or the diet containing 20% dried whey, for the overall trial (d 0 to 28). Pigs fed the positive control diet or lactose source 1 during phase I had higher ADFI than pigs fed the negative control. In addition, pigs fed the positive control had higher ADFI than pigs fed lactose source 2. Intermediate ADFI was observed for pigs fed diets with lactose sources 3 and 4. Feed efficiency was not affected by phase I lactose source.

In conclusion, only numerical differences in performance were observed among the lactose sources used. Moreover, pure lactose is an effective replacement for the lactose provided by dried whey in starter pig diets. However, further research is needed to determine the specific chemical characteristics of lactose from different sources and their effects on growth performance.

Table 1. Composition of Experimental Diets[a]

Ingredients, %	Positive control	Lactose source[b]	Negative control	Phase II[c]
Corn	41.60	43.70	51.30	56.80
Soybean meal, 48 % CP	20.50	20.50	20.50	25.90
Dried whey	20.00	--	--	10.00
Lactose	--	14.40	7.20	--
Casein	--	2.80	2.50	--
Plasma protein	6.70	6.70	6.70	--
Spray dried blood meal	1.75	1.75	1.75	2.50
Soybean oil	5.00	5.00	5.00	--
Monocalcium phosphate	1.40	2.00	1.90	1.90
Limestone	.90	1.00	1.10	.85
Antibiotic	1.00	1.00	1.00	1.00
L-lysine·HCl	.10	.10	.10	.125
DL-methionine	.14	.10	.10	--
Vitamin premix	.25	.25	.25	.25
Trace mineral premix	.15	.15	.15	.15
Zinc oxide	.38	.38	.38	.25
Salt	.10	.10	.10	.25
Total	100.00	100.00	100.00	100.00

[a]Phase I diets were formulated to contain 1.6% lysine, .44% methionine, .9% Ca, and .8% P.
[b]All four lactose sources were replaced at equal levels.
[c]Phase II diet was formulated to contain 1.35% lysine, .37% methionine, .9% Ca, and .8% P.

Table 2. Effects of Lactose Source on Starter Pig Performance[a]

	25% Dried whey	Lactose source, 14.4%				7.2% Lactose	
Item	Positive control	1	2	3	4	Negative control	CV
Day 0 to 7							
ADG, lb	.30	.27	.27	.28	.24	.24	24.1
ADFI, lb	.45	.42	.40	.40	.38	.40	13.7
F/G	1.62	1.67	1.64	1.48	1.73	1.52	24.9
D 7 to 14							
ADG, lb	.65	.63	.66	.69	.61	.60	12.2
ADFI, lb	.80	.73	.73	.73	.70	.67	11.7
F/G	1.24	1.17	1.11	1.05	1.16	1.12	12.5
D 0 to 14							
ADG, lb	.48	.45	.46	.48	.42	.44	10.2
ADFI, lb	.62	.57	.56	.56	.54	.54	9.9
F/G	1.32	1.29	1.23	1.16	1.30	1.24	10.0
D 14 to 28							
ADG, lb	.93	.88	.88	.92	.91	.83	7.6
ADFI, lb	1.49^{b}	1.46^{b}	1.40^{bc}	1.42^{b}	1.44^{b}	1.31^{c}	6.6
F/G	1.61	1.67	1.58	1.54	1.59	1.59	7.0
D 0 to 28							
ADG, lb	.70	.67	.67	.70	.66	.63	7.1
ADFI, lb	1.10^{b}	1.00^{bd}	.98^{cd}	.99^{bc}	.99^{bc}	.92^{c}	6.4
F/G	1.51	.154	.146	1.41	1.49	1.47	5.9

[a]Means represent a total of 344 weanling pigs (initially 9.63 lb and 13.97 d of age) with 7 to 11 pigs per pen and 5 to 6 replicate pens per treatment.
[b,c,d]Means on the same row with different subscripts differ ($P < .05$).