

Efficacy Of Lactose Equivalent-80 (LE-80) as an Alternative For Lactose In Phase II Nursery Diets

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Story in Brief

Lactose from several dairy by products including whey, lactose, and deproteinized whey is added routinely to Phase I and Phase 2 nursery diets to improve performance. Recent changes in milk supply and alternative markets for milk based by products could increase costs and decrease availability of lactose. Products containing sucrose could be an effective replacement for lactose. This study was conducted to determine the potential of Lactose Equivalent 80 (LE 80) as a replacement for lactose in Phase 2 nursery diets. Lactose Equivalent 80 is a blend of lactose and sucrose containing by products from the food industry. Gain and feed intake increased in pigs fed diets with 50 and 100% of the lactose (provided by deproteinized whey) replaced with LE80 during Phase 2. This study suggests that LE 80 can be used to replace deproteinized whey as a lactose source in Phase 2 nursery diets.

(Key Words: Pigs, Lactose, Sucrose, Growth Performance.)

Introduction

Dried whey has been shown to increase gain in young pigs as much as 15 to 17% (Malian, 1984; Cera et al., 1988, respectively). The lactose and lactalbumin fractions of dried whey have both been identified as components responsible for the performance response (Tokach et al., 1989). However, Malian (1992) demonstrated that the response to dried whey might be primarily due to the lactose fraction. Similarly, Nessmith et al. (1997) concluded that edible grade deproteinized whey and crystalline lactose can replace the lactose provided by high quality dried whey without affecting performance.

The swine industry has been fortunate to have a large supply of lactose available in several dairy by products including whey, lactose and deproteinized whey. However, recent changes in milk supply as well as increased alternative markets for milk based by products could substantially increase the cost and decrease the availability of the high lactose containing byproducts. Products containing sucrose could be an effective replacement for lactose in early weaning pig diets. Lactose Equivalent 80 (LE 80) is a blend of lactose and sucrose designed to provide alternative sugars for use in young animal diets. Although sucrase activity is very low in the newborn pig, studies have indicated that by 3 wk of age, the pig can effectively utilize diets with sucrose as the only carbohydrate source (Sewell and Maxwell, 1966). The objective of this study was to determine the potential of LE 80 as a replacement for lactose in Phase 2 nursery diets.

Materials and Methods

One hundred and twenty pigs (Hampshire, Yorkshire and HY cross) were group weaned when the oldest pigs were approximately 23 d old and the youngest pigs were 17 d of age. At weaning, pigs were sorted by weight, and divided into four weight groups (blocks). Pigs within each weight block were allotted into six equal subgroups (pens) of five pigs per pen with stratification based on litter and sex (boars and gilts). During the first 10 d following weaning, all pigs were fed a common Phase I diet containing 3.75% spray dried porcine plasma and 14.53% lactose (Table 1). Mean pen weights at the end of the Phase I period were similar within each block. After completion of Phase 1, pens within each weight block were randomly assigned to three dietary treatments (eight pens per treatment) consisting of the following: 1) A

control Phase 2 diet with deproteinized whey as the lactose source (Table 1, Treatment 1), 2) The Phase 2 control diet with LE 80 replacing 50% of the lactose in deproteinized whey (Treatment 2), or 3) The Phase 2 control diet with LE 80 replacing 100% of the lactose in deproteinized whey (Treatment 3). Dietary lactose or lactose equivalent levels (lactose + sucrose) remained constant across treatments. Following completion of Phase 2, pigs in each pen were fed a common Phase 3 diet for an additional 14 d (Table 1). Interim gain and efficiency estimates were obtained at the time of each diet change and at the completion of the study. The trial was conducted in an environmentally controlled nursery with temperature initially maintained at 85°F and decreased 2°F weekly until the temperature reached 78°F.

Data were analyzed as a randomized complete block design with pen as the experimental unit and blocks based on initial weight. Analysis of variance was performed using the GLM procedure of SAS (1988). Specific differences between dietary treatments were determined by t tests if the main effect of diet was significant.

Results and Discussion

During Phase I when all pigs received a common Phase I diet, average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (gain/feed) were 234 g, 297 g, and .80, respectively. During Phase 2, ADG improved in pigs fed diets with 50% and 100% of the lactose replaced with LE-80; however, differences were significant only at the 50% replacement level ($P < .05$). The magnitude of increase in ADG was 8% and 3.51%, respectively, in pigs fed the 50 and 100% replacement diets when compared with those fed the control diet. The magnitude of response in ADFI was similar to that observed with ADG while gain/feed was not significantly affected by dietary treatment. This suggests that the response in gain was due primarily to enhanced feed intake in pigs consuming LE 80. During Phase 3, when all pigs were fed a common diet, ADFI remained elevated in pigs that previously received diets with either 50 or 100% replacement of lactose with LE 80 when compared with those previously fed the lactose control diet ($P < .05$). During the overall Phase 2 and 3 periods, pigs fed LE 80 grew faster and consumed more feed than the control pigs although the overall differences approached significance only for feed intake ($P < .10$). This suggests that LE 80 can be used to replace deproteinized whey as a lactose source in Phase 2 nursery diets. In fact, feed intake and daily gain were increased when LE 80 was added to the diet (Phase 2).

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Table 1. Composition of experimental diets, %.		
Phase 1	Phase 2	Phase 3

	Common	TRT 1	TRT 2	TRT 3	Common
Corn, ground	41.78	48.73	48.54	48.36	63.55
Steam rolled oats	5.00				
AP-920	3.75				
Deproteinized whey	17.50	10.00	5.00		
Lactose equivalent-80a			5.19	10.37	
Soy protein concentrate	5.70				
Soybean meal, 48%	10.00	30.00	30.00	30.00	28.50
Fishmeal	8.50	4.00	4.00	4.00	
Soybean oil	4.00	4.00	4.00	4.00	4.00
Lysine HCL	.15	.15	.15	.15	.15
DL-Methionine	.14	.07	.07	.07	.01
Calcium carbonate		.40	.40	.40	.61
Dicalcium phosphate	1.30	1.35	1.35	1.35	1.88
Salt	.30	.40	.40	.40	.40
TM & Vit premix	.38	.25	.25	.25	.25
Zinc Oxide	.30	.30	.30	.30	.30
CUS04	.07	.07	.07	.07	.07
Flavor	.10				
Ethoxyquin	.03	.03	.03	.03	.03
Neo-terramycin	1.00				
Tylan-40		.25	.25	.25	.25
Calculated Composition					
Lysine, %	1.58	1.35	1.35	1.35	1.15
Thr, %	.96	.84	.84	.84	.74
Try, %	.24	.25	.25	.25	.23
Met + Cys, %	.90	.77	.77	.77	.65
Lactose, %	14.53	8.30	6.22	4.15	
Sucrose, %			2.08	4.15	

aLE 80, produced by International Ingredient Corporation, is a blend of lactose and sucrose containing by products from the food industry. Product analyses indicate a lactose content of 40% and an equal level (40%) of sucrose.

Table 2. Effect of replacing deproteinized whey (DWH) with Lactose Equivalent 80 (LE 80) on performance of Phase 2 nursery pigs.*

Item	DWH	Diet ^b		SEM
		DWH:LE 80	LE 80	
Phase 2 (d 10 to 24 postweaning)				
ADG, g	391.3 ^c	423.1 ^d	405.1 ^{cd}	5.67
ADFI, g	513.10	551.2 ^f	532.4 ^{ef}	12.04
G:F	.77	.78.77	.02	
Phase 3 (d 24 to 38 postweaning)				
ADG, g	559.9	570.1	579.5	16.39
ADFI, g	903.7 ^c	960.5 ^d	958.7 ^d	15.68
G:F	.61	.60	.60	.01

Overall Phase 2 and 3 (d 10 to 38 postweaning)				
ADG, g	475.6	496.6	492.3	8.53
ADFI, g	708.4 ^e	755.9 ^f	745.6 ^f	12.17
G:F	.66	.66	.66	.01

^a Data are means of eight pens of five pigs each. Pigs averaged 8.12 and 21.81 kg at initiation of Phase 2 and termination of the study, respectively.

^b DWH: deproteinized whey; LE 80: Lactose equivalent 80 (blend of lactose and sucrose containing by products from the swine industry).

^{c,d} Means in the same row with different superscripts differ (P<.05).

^{e,f} Means in the same row with different superscripts differ (P<. 10).

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