



---

## EFFECT OF HIGH NUTRIENT-DENSITY DIETS ON STARTER PIG PERFORMANCE<sup>1,2</sup>

Bob C. Thaler, Jim L. Nelssen,  
and Gary L. Allee

---

### Summary

Two experiments and an on-farm trial were conducted to compare the performance of weanling pigs fed a high nutrient-density diet (HNDD) to the performance of pigs fed standard corn-soybean meal (C-SBM) diets. A total of 358 crossbred weanling pigs (approximately 21 days of age) were allotted to experimental treatments based on initial weight and ancestry. Average initial pen weights ranged from 6.5 to 21.9 lb for the three trials. Dietary treatments consisted of feeding HNDD for 1 or 2 weeks followed by either 20% whey diets and/or 1.25% lysine C-SBM diets, a 20% whey diet for 2 weeks followed by a 1.25% lysine corn-SBM diet, a 20% whey diet for five weeks, or a 1.25% lysine C-SBM diet for 5 weeks.

In Trial 1, heavy (14.4 lb) and light (10.7 lb) pigs fed HNDD for 1 and 2 weeks, respectively, gained faster and more efficiently than pigs fed the 20% whey C-SBM diet during the initial phase of the starter period. In Trial 2, both the heavy (9.3 to 9.6 lb) and light (6.5 to 8.5 lb) pigs fed HNDD for 1 and 2 weeks, respectively, exhibited performance superior to like groups fed a 20% whey, corn-soybean meal diet. In Trial 3, optimum gains for the first 2 weeks were attained by the light pigs (< 12.5 lb) when fed HNDD for 1 week followed by a 20% whey diet for 1 week. Heavier pigs (> 14.1 lb) in Trial 3 fed the 20% whey diet for 2 weeks exhibited the highest rate of gain for that period. These results suggest that the smaller weanling pig (< 9 lb) should be fed a HNDD for 2 weeks, whereas the medium-sized pig (< 15 lb) should be fed a HNDD for 1 week before switching to a whey-based diet and/or corn-soybean meal diet. Pigs heavier than 15 lb do not appear to benefit from the feeding of a HNDD.

### Introduction

One problem area in today's swine industry is the post-weaning "lag" suffered by most early weaned pigs (3 weeks of age or less). Weaning at 3 weeks

---

<sup>1</sup>We gratefully acknowledge Keesecker Enterprises, Washington, KS for allowing part of this study to be conducted on their farm.

<sup>2</sup>Merrick Food Soweena Day-14.

of age results in several lightweight pigs (< 10 lb), which require increased nutrient density and diet palatability to maintain growth on a dry diet. If these pigs won't consume the diet, or fully utilize the nutrients in the diet, a "lag" in performance or even death can occur. One possible way to increase feed intake and utilization of the young pig is to replace much of the grain in the starter diet with milk products. Current research has shown that the protein and carbohydrate fractions in milk products are utilized more efficiently by the weanling pig than the protein and carbohydrate fractions of cereal grains. It also was noted that milk-based diets were more quickly accepted than grain-based diets. Since milk-based diets stimulated feed consumption and are better utilized than grain-soybean meal diets by the young pig, the postweaning lag should be reduced if milk products are incorporated into the starter diet. The high nutrient density diet (HNDD) is a type of milk-based diet and, therefore, should improve the starter pig initial performance.

### Experimental Procedures

Three trials were conducted in this study. Trial 1 was an on-farm trial and involved 208 crossbred pigs weaned at approximately 21 days. The pigs were divided into light (10.7 lb) and heavy (14.4 lb) groups. Half of the light pigs were fed HNDD for 2 weeks followed by a 20% whey C-SBM diet for one week and half of the heavy pigs were fed HNDD for 1 week and a 20% whey diet for 2 weeks. The rest of the pigs were fed a 20% whey C-SBM diet for 3 weeks. After 3 weeks, all pigs were fed a 1.15% lysine C-SBM diet. Pig weights were recorded on days 7, 14, and 42 postweaning, and all feed additions recorded.

Trial 2 was conducted at the KSU Swine Research Unit and involved 70 weanling pigs (21 days of age). Average pen weights ranged from 6.5 to 9.6 lb. Pigs averaging 9.3 lb or more were fed either HNDD for 1 week and a 20% whey diet for the next 4 weeks or a 20% whey diet for 5 weeks. Pigs weighing less than 9.3 lb were fed either HNDD for 2 weeks and a 20% whey diet for 3 weeks, or a 20% whey diet for 5 weeks. Pig weights were obtained weekly for 5 weeks and all feed additions were recorded.

Trial 3, also conducted at the Swine Research Unit, utilized 80 weanling pigs, 21 days old. Experimental treatments were as follows:

1. 1.25% lysine, C-SBM diet for 5 weeks.
2. 20% whey diets for 2 weeks, then a 1.25% lysine, C-SBM diet for 3 weeks.
3. HNDD for 1 week, followed by a 1.25% lysine C-SBM diet for 4 weeks.
4. HNDD for 1 week, a 20% whey diet for the next week followed by a 1.25% lysine, C-SBM diet for 3 weeks.

Initial average weight per pen ranged from 10.3 to 21.9 lbs. Weekly pig weights were recorded, as were all feed additions.

### Results and Discussion

The results of Trials 1, 2, and 3 are shown in Tables 1-3. In Trial 1, both the light and heavy pigs fed the HNDD regime gained faster (6%) and more efficiently (14.5%) than pigs fed the 20% whey diet (Table 1). All weight classes of pigs fed HNDD in Trial 2 gained more weight and were slightly more efficient than the pigs fed the 20% whey diet at both 1 and 5 weeks postweaning (Table 2). Combining all the groups in Trial 2, it can be shown that HNDD markedly increased average daily gain through day 35 (Figure 1). In Trial 3, maximum performance for pigs weighing 12.5 lb or less were attained at 2 and 5 weeks when pigs were fed HNDD for 1 week and a 20% whey diet for the next week (Table 3). For pigs weighing 14.2 lb or more in Trial 3, those fed the 20% whey diet C-SBM for 2 weeks outperformed those fed the other treatments after 2 or 5 weeks in the nursery.

From these studies, it can be seen that there is an advantage in feeding HNDD to smaller and/or young pigs in the initial part of the starter period. The reasons for the improved performance is most likely the fact that the young pig is better able to digest the milk products in the HNDD than the grain in a grain-SBM diet. Since the young pig is better able to utilize lactose from milk products than starch from cereal grains, the pig's daily caloric intake is increased. Also, since milk protein is digested better than cereal protein, and HNDD contains a larger complement of amino acids, the pig's daily intake of amino acids is also increased. Because of these factors, the young pig can use the increased amount of available nutrients in HNDD for early growth and, thus, post-weaning lag can be decreased.

Table 1. Effect of High Nutrient-Density Diet vs. 20% Whey Starter Diet (Trial 1).<sup>a</sup>

Item (lb)	Light Pigs		Heavy Pigs	
	20% Whey	HNDD	20% Whey	HNDD
Avg. pig wt.				
Initial	10.7	10.7	14.1	14.7
42 day	43.5	46.7	47.4	50.7
Avg. daily gain				
0 to 7 days	.23	.29	.19	.41
0 to 14 days	.40	.46	.43	.53
0 to 42 days	.78	.86	.79	.86
Feed/gain				
0 to 7 days	1.60	1.09	2.13	1.01
0 to 14 days	1.40	.99	1.45	1.17
0 to 42 days	1.55	1.26	1.65	1.48

<sup>a</sup> 208 pigs (13 pigs/pen/treatment); trial length, 42 days.

Table 2. Effect of High Nutrient-Density Diet vs. 20% Whey for the Young Pig (Trial 2).

Initial wt. (lb)	Week 1				Week 5	
	ADG		F/G		Final wt.	
	20% Whey	HNDD	20% Whey	HNDD	20% Whey	HNDD
9.6 <sup>a</sup>	.33	.54	.96	.67	35.26	37.23
9.3 <sup>a</sup>	.33	.38	1.22	.87	34.20	34.40
8.5 <sup>b</sup>	.17	.35	1.28	.89	26.40	31.93
7.5 <sup>b</sup>	.24	.40	1.49	.79	26.44	30.64
6.5 <sup>b</sup>	.17	.38	1.17	.86	26.13	26.84

<sup>a</sup>HNDD fed for 1 week postweaning.<sup>b</sup>HNDD fed for 2 weeks postweaning.

Table 3. Effect of Various Starter Diet Regimes on Performance at Week 2 (Trial 3).

Treatment	Pigs < 12.5 lb.		Pigs > 14.1 lb.	
	ADG	F/G	ADG	F/G
1 <sup>a</sup>	.58	.97	.54	1.04
2 <sup>b</sup>	.71	1.01	.93	1.26
3 <sup>c</sup>	.71	1.06	.74	1.08
4 <sup>d</sup>	.79	1.11	.77	1.09

<sup>a</sup>1.25% lysine C-SBM diet for 5 weeks.<sup>b</sup>20% whey diet for 2 weeks, 1.25% lysine C-SBM diet for 3 weeks.<sup>c</sup>HNDD for 1 week, 1.25% lysine C-SBM diet for 4 weeks.<sup>d</sup>HNDD for 1 week, 20% whey diet for 1 week, C-SBM diet for 3 weeks.

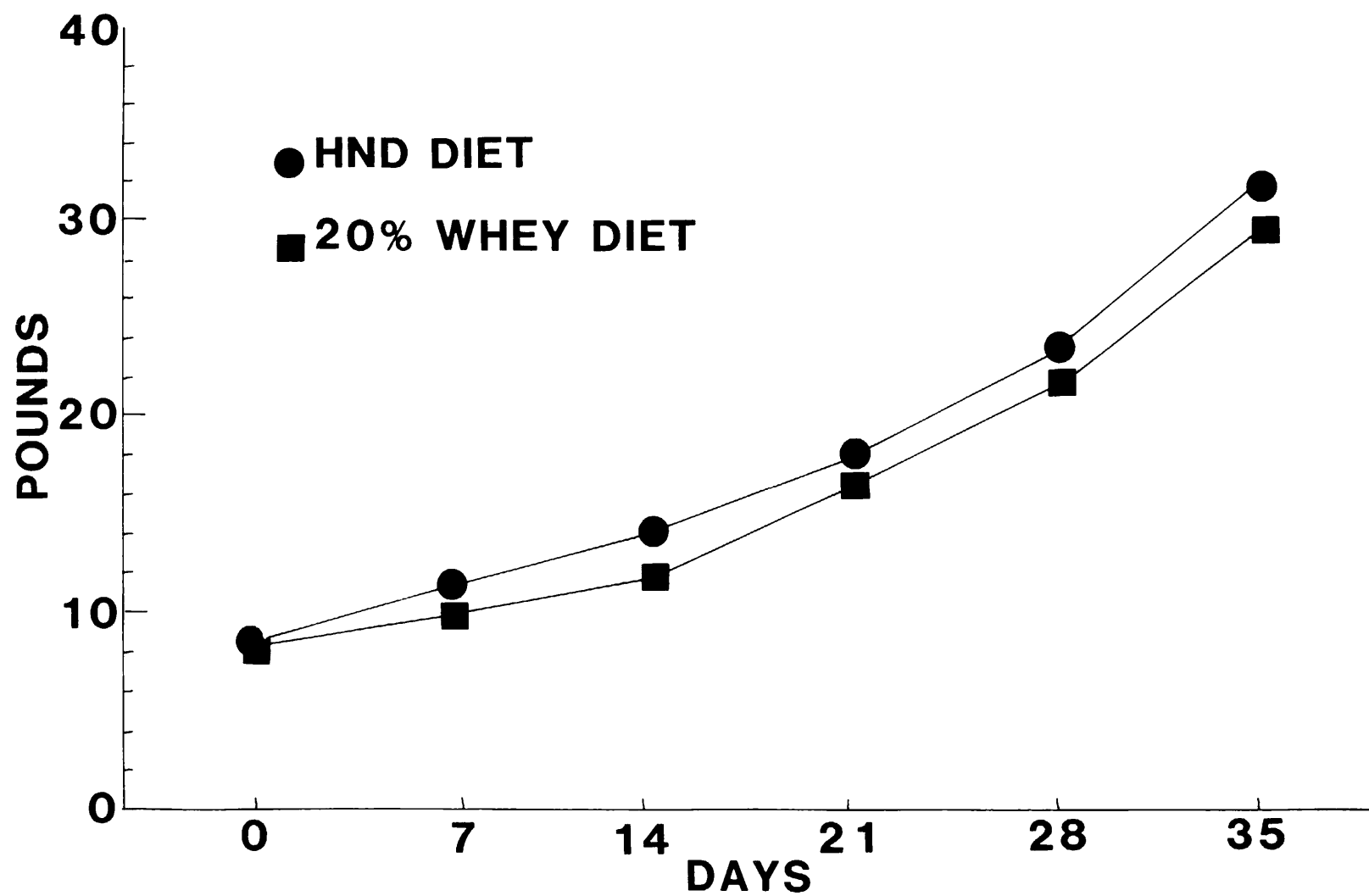


Figure 1. Effect of High Nutrient Density Diet (HND) Compared to a 20% Dried Whey Corn-Soybean Meal Diet on Starter Pig Performance (Trial 2).