Use of Animal Byproducts in Practical Swine Diets for Young Pigs

B.G. Harmon and M. Libey
Department of Animal Sciences

The objective of this study was to evaluate animal byproducts in diets for young pigs with genetics for high lean growth capability in segregated early weaning facilities.

The advent of segregated early weaning management in swine production has forced the industry to reevaluate nutritional demands of newly weaned, high herd health pigs.

The challenge is to develop nutrient and ingredient programs that allow these pigs weaned at 13-18 days to meet their genetic potential in a minimal disease environment.

Materials and Methods

One hundred fifty pigs weaned at 14-18 days of age were transported from an external source to the Purdue University SEW nursery units. The pigs, selected for high lean growth potential, averaged 9.9 lb at the start of the experiment. Pens of pigs were allotted randomly to 5 dietary treatments, with major ingredients consisting of corn, soybean meal, dried whey, and yellow grease (swine), formulated to contain 1.45% lysine, .90% calcium and .77% phosphorus (Table 1). Phase 1 diet 1 contained 3% meat and bone meal (MBM), 3% fishmeal (FM), and 1% blood meal (BM); diet 2 contained 5% MBM and 2% BM; diet 3 contained 2% BM and 5% FM; diet 4 contained 7% spray dried plasma protein (SDPP); and diet 5 contained none of the variable animal protein sources.

Phase 2 diets of similar composition were fed from days 15 to 35 and contained 1.3% lysine, .85% calcium, and .72% phosphorus. In Phase 2, the variable animal protein sources were reduced by 50% and whey was reduced from 15 to 10%. Diet 1 contained 1.5% MBM, 1.5% FM and 0.5% BM; diet 2 contained 2.5% MBM and 1% BM; diet 3 contained 2.5% FM, and 1% BM; diet 4 contained 3.5% SDPP; and diet 5 was devoid of the variable animal protein sources.

Pigs were placed 6 per pen on plastic slotted floors in an environmentally controlled room, and allotted by weight and gender to 5 replications. The initial room temperature was 34°C (93°F) and was reduced 1.5°C per week. Each pen was 4.9' x 4.9' and pigs had ad libitum access to feed and water. Pigs and feeders were weighed at 7, 14 and 35 days post weaning to evaluate daily gain, feed intake and feed efficiency (gain:feed). Data were analyzed with pens being the experimental unit.

Results

Results of the growth study are shown in Table 2. The pigs fed spray dried plasma protein ate more ($P<.05$) and gained more ($P<.05$) during the first week. Although not statistically significant, all pigs receiving the additional animal protein exhibited greater efficiency than did pigs receiving the corn, soybean meal and dried whey based diet during the first week of the study. Pens receiving meat and bone meal and blood meal gained more efficiently ($P<.05$) during the second week of the phase 1 segment. During the phase 2 segment

of the trial, gain was similar across treatments. By the end of the 35-day feeding trial, there were no differences in performance across the treatments.

A comparison of feed cost is shown in Table 3. The diet containing spray dried plasma protein was considerably more expensive per unit and per unit of gain than were the other diets.

Summary

The spray dried plasma protein diet, although more expensive per unit of feed, did increase gain during the first week of the study, but supported performance similar to the other diets after the first week. The results suggest a phase 1 program might be most advantageous when fed for 1 week postweaning followed by a less highly fortified diet during the remainder of the segregated early weaning feeding period. With dried whey incorporated at 15% or 10% of the diet, there was no consistent advantage of including other animal protein sources in the diet.

Acknowledgment

This research was sponsored by the Fats and Protein Research Foundation.

Table 1. Composition of experimental diets (lb/ton). Phase 1 fed 0-14 days postweaning; Phase 2 fed 15-35 days postweaning.

	Phase 1					Phase 2				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Ingredients										
Blood meal	20.0	40.0	40.0	0.0	0.0	10.0	20.0	20.0	0.0	0.0
Meat-bone meal	60.0	100.0	0.0	0.0	0.0	30.0	50.0	0.0	0.0	0.0
Menhad. Fishmeal	60.0	0.0	100.0	0.0	0.0	30.0	0.0	50.0	0.0	0.0
Spray Dr Plas Prot	0.0	0.0	0.0	140.0	0.0	0.0	0.0	0.0	70.0	0.0
Soybean meal 48%	485.0	483.2	461.3	427.4	672.4	439.5	438.3	427.4	410.5	532.9
Corn	908.9	914.4	920.0	939.8	830.8	1111.0	1113.7	1116.5	1126.4	1071.9
Whey, dried	300.0	300.0	300.0	300.0	300.0	200.0	200.0	200.0	200.0	200.0
Yellow Grease	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
L-lysine HCI	3.3	4.0	2.0	0.9	3.5	7.0	7.4	6.4	5.8	7.1
Dical. phos.	15.2	13.5	25.4	29.5	35.8	25.2	24.4	30.3	32.4	35.5
Limestone	2.8	1.1	7.5	18.5	13.8	9.2	8.4	11.6	17.1	14.7
Salt	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Copper Sulfate	0.0	0.0	0.0	0.0	0.0	1.5	1.5	1.5	1.5	1.5
ZnO	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	0.0
Antibiotic[a]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
DL methionine	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Swine Vit Mix[b]	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Swine TM Mix[c]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Se 600 Premix	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Content										
Lysine, %	1.45	1.45	1.45	1.45	1.45	1.30	1.30	1.30	1.30	1.30
Ca, %	.90	.90	.90	.90	.90	.85	.85	.85	.85	.85
P, %	.77	.77	.77	.77	.77	.72	.72	.72	.72	.72
Protein, %	22.0	22.0	22.0	22.0	22.0	19.0	19.0	19.0	19.0	19.0

[a] Carbodox 2.5g/lb.

[b] Swine Vit Mix: Vit A, 1,100,000 IU/lb; Vit D3, 110,000 IU/lb; Vit E, 8,000 IU/lb; Vit B12, 6.4 mg/lb; Vit K, 1,106 mg/lb; Menadione, 365 mg/lb; Riboflavin, 1,280 mg/lb; d-Pantothenic Acid, 4,000 mg/lb; Niacin, 6,000 mg/lb.

[c] Swine TM Mix: Copper, 9,000 ppm; Iodine, 335 ppm; Iron, 9.70%; Manganese, 1.20%; Zinc, 9.7%.

Table 2. Effects of adding various protein sources to SEW pig diets.

		1 3% MBM, 3% FM, 1% BM	2 5% MBM, 2% BM	3 5% FM, 2% BM	4 7% SDPP	5 Control
Daily Gain, g						
Phase 1	Day 0-7*	91	77	77	113	77
	Day 7-14	173	191	168	186	177
	Day 0-14	132	136	123	150	127
Phase 2	Day 14-35	454	440	450	454	440
Entire Period	Day 0-35	325	318	319	332	315
Feed Intake, g						
Phase 1	Day 0-7*	132	117	124	157	142
	Day 7-14	265	237	252	310	242
	Day 0-14	203	180	192	241	194
Phase 2	Day 14-35	645	581	613	645	622
Entire Period	Day 0-35	468	420	445	483	451
Gain/Feed						
Phase 1	Day 0-7	.69	.66	.62	.70	.55
	Day 7-14*	.65	.81	.67	.60	.73
	Day 0-14	.66	.76	.64	.64	.64
Phase 2	Day 14-35	.70	.76	.74	.70	.70
Entire Period	Day 0-35	.69	.76	.71	.69	.69

* P<.05.

Table 3. Comparison of feed costs and cost of feed per pound of weight gained. Cost of experimental diets includes ingredients and manufacturing costs on a per ton basis.

	Cost/ton	Cost/lb	G:F	Cost of feed/ lb gain
Phase 1				
Diet 1: 3% MBM, 3% FM, 1% BM	$388.60	$0.19	.66	$0.29
Diet 2: 5% MBM, 2% BM	$380.65	$0.19	.76	$0.25
Diet 3: 5% FM, 2% BM	$391.15	$0.20	.64	$0.31
Diet 4: 7% SDPP	$641.80	$0.32	.64	$0.52
Diet 5: Control	$364.90	$0.18	.64	$0.28
Phase 2				
Diet 1: 1.5% MBM, 1.5% FM, .5% BM	$276.46	$0.14	.70	$0.20
Diet 2: 2.5% MBM, 1% BM	$272.38	$0.14	.76	$0.18
Diet 3: 2.5% FM, 1% BM	$278.80	$0.14	.74	$0.19
Diet 4: 3.5% SDPP	$405.12	$0.20	.70	$0.28
Diet 5: Control	$261.08	$0.13	.70	$0.18