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Effects of increasing levels of spray-dried blood meal and blood cells on nursery pig performance

Abstract

Three hundred fifty weanling pigs (initially 14.6 lbs and 17 Â± 2 d of age) were used in a 19-d growth assay to determine the effects of increasing levels (2.5, 5.0, and 7.5%) of spray-dried blood meal or blood cells in the diet on growth performance. Overall, the dietary inclusion of both blood products improved ADG and feed efficiency. However, spray-dried blood meal improved ADG, ADFI, and F/G from d 0 to 7 more compared to blood cells. The greatest differences during this period occurred at the 5 and 7.5% inclusion levels. No differences in growth performance were detected from d 7 to 14. Therefore, when high levels (>5%) of blood products are used in nursery diets immediately after weaning, spray-dried blood meal provides some advantage over blood cells, but the advantage may be lost in the overall period.; Swine Day, Manhattan, KS, November 16, 2000

Keywords

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EFFECTS OF INCREASING LEVELS OF SPRAY-DRIED BLOOD MEAL AND BLOOD CELLS ON NURSERY PIG PERFORMANCE[1]

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Summary

Three hundred fifty weanling pigs (initially 14.6 lbs and 17 ± 2 d of age) were used in a 19-d growth assay to determine the effects of increasing levels (2.5, 5.0, and 7.5%) of spray-dried blood meal or blood cells in the diet on growth performance. Overall, the dietary inclusion of both blood products improved ADG and feed efficiency. However, spray-dried blood meal improved ADG, ADFI, and F/G from d 0 to 7 more compared to blood cells. The greatest differences during this period occurred at the 5 and 7.5% inclusion levels. No differences in growth performance were detected from d 7 to 14. Therefore, when high levels (>5%) of blood products are used in nursery diets immediately after weaning, spray-dried blood meal provides some advantage over blood cells, but the advantage may be lost in the overall period.

(Key Words: Nursery Pig, Blood Meal, Blood Cells.)

Introduction

The benefits of increased growth performance of newly weaned pigs fed spray-dried blood meal and blood cells are well known. However, the response to increasing levels of these animal products has not yet been well established. Typically, high levels of spray-dried blood meal and blood cells are not included in nursery pig diets. This is because amino acids such as methionine and isoleucine may become limiting if crystalline amino acids are not used. Spray-dried blood meal contains the plasma fraction of the blood, but blood cells do not. Plasma has been proven to help increase growth performance; thus, including blood meal at increasing levels in the diet could be beneficial. Therefore, our objective was to determine the effects of increasing levels (2.5, 5.0, and 7.5%) of spray-dried blood meal and blood cells on nursery pig performance.

Procedures

A total of 350 pigs (BW of 14.6 lbs and 17 ± 2 d of age) was used in a 19-d growth assay. Pigs were blocked by weight and allotted to one of seven dietary treatments with five pigs/pen and 10 pens/treatment. Pigs were housed in the Kansas State University Segregated Early Weaning Facility. Each pen was 4 × 4 ft and contained one self-feeder and one nipple waters to provide ad libitum access to feed and water. The temperature was 90°F for the first 5 d and was lowered approximately 3°F each week thereafter.

All pigs were fed the same pelleted SEW diet (Table 1) to 5 d after weaning. Then the pigs were fed experimental diets, which included a control with no added blood products and diets containing either spray-dried blood meal or blood cells at 2.5, 5.0, and 7.5% of total ingredients. The blood products replaced soybean meal in the diet on a lysine basis. Crystalline amino acids

[1]Appreciation is expressed to Jerry Ball of California Spray Dry Company, Stockton, CA, for partial financial support.

[2]Food Animal Health and Management Center.

(methionine, threonine, isoleucine, and tryptophan) were included as the level of the blood products was increased, especially for the diets containing blood cells to maintain similar ratios of amino acids related to lysine that met or exceeded NRC, 1998 ratios . Treatment diets were fed in meal form; formulated to contain 1.40% lysine, .90 Ca, and .54 available P; and balanced for Na and Cl concentrations (Table 2). Average daily gain, ADFI, and F/G were determined by weighing pigs and measuring feed disappearance on d 5, 12, and 19 after weaning.

Table 1. Composition of Common Diet[a]

Ingredient, %	SEW
Corn	33.37
Spray-dried whey	25.00
Soybean meal (46.5%)	12.80
Spray-dried animal plasma	6.70
Select menhaden fish meal	6.00
Choice white grease	6.00
Lactose	5.00
Spray-dried blood cells	1.65
Medication[b]	1.00
Monocalcium P (21% P)	.75
Limestone	.45
Zinc oxide	.38
Vitamin premix	.25
Salt	.20
Trace mineral premix	.15
L-Lysine HCl	.15
DL-Methionine	.15
Total	100.00
Calculated Analysis	
Lysine, %	1.70
Met:lysine ratio, %	30
Met & Cys:lysine ratio,%	57
Threonine:lysine ratio, %	65
Tryptophan:lysine ratio, %	18
ME, kcal/lb	1,595
Protein, %	22.4
Calcium, %	.90
Phosphorus, %	.80
Available phosphorus, %	.66
Lysine:calorie ratio, g/Mcal ME	4.83

[a]Pigs consumed SEW diet for 5 d, then were fed experimental diets.
[b]Provided 50 g per ton carbadox.

Data were analyzed as a randomized complete block design with pen as the experimental unit. Pigs were blocked based on weaning weight, and analysis of variance was performed using the GLM procedure of SAS. Linear and quadratic polynomial contrasts were used to determine the effects of increasing spray-dried blood meal and blood cells in the diet. Initial pig weight at the start of the experimental period was used as a covariate for statistical analysis.

Results and Discussion

From d 0 to 7, the inclusion of both blood products improved feed efficiency (P<.001) compared to the control diet (Table 3). In addition, pigs fed diets containing spray-dried blood meal had improved ADG (P<.001), ADFI (P<.04), and F/G (P<.001) compared to pigs fed blood cells. Furthermore, ADG (P<.07) and feed efficiency (P<.001) improved linearly with increasing levels of spray-dried blood meal, whereas ADG (P<.06) and ADFI (P<.03) decreased linearly as the level of blood cells was elevated above 2.5% of the diet.

From d 7 to 14, ADG (P<.001) and F/G (P<.002) were increased for pigs fed diets containing blood products versus the control. Also, feed efficiency increased (P<.03) for pigs consuming increasing levels of blood cells in the diet.

Overall, pigs gained faster (P<.005) and were more efficient (P<.001) when blood products were included into the diet. Also, ADFI was numerically higher (P<.09) for pigs consuming diets containing spray-dried blood meal compared to diets with blood cells, but no differences occurred in ADG or F/G. As spray-dried blood meal increased from 2.5% to 7.5% in the diet, F/G (P<.04) improved, and ADG showed a trend for increasing (P<.10). Increasing blood cells had no effect (P>.10) on ADG, ADFI, or feed efficiency, although efficiency of gain was improved by 9% as the blood cell level was increased in the diet.

In conclusion, the results from this experiment indicate that the inclusion of increas-

ing levels of spray-dried blood meal compared to blood cells in nursery diets was beneficial for the first week of the experiment. This may be attributed to the plasma that is present in this product. The decrease in performance with increased blood cells during the first week may indicate a possible palatability concern. In addition, regardless of blood source, improvements in ADG and F/G were realized compared to the diets containing no blood products. Also, efficiency of gain was increased with spray-dried blood meal (11%) and blood cells (9%) as the level of each was increased in the diet.

Table 2. Compositions of Experimental Diets (As-Fed Basis)[a]

	No Blood	Blood Meal			Blood Cells		
Ingredients, %	Control	2.5 %	5.0 %	7.5 %	2.5 %	5.0 %	7.5 %
Corn	45.68	49.65	53.62	57.45	50.49	55.22	59.87
Soybean meal, (46.5%)	39.45	32.94	26.43	19.93	31.99	24.53	17.09
Spray-dried whey	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Spray-dried blood meal	-	2.50	5.00	7.50	-	-	-
Blood cells	-	-	-	-	2.50	5.00	7.50
Monocalcium P, (21% P)	1.84	1.86	1.86	1.87	1.89	1.94	1.98
Limestone	.82	.80	.79	.78	.90	.98	1.06
Antibiotic[b]	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Salt	.36	.33	.30	.28	.32	.29	.25
Zinc oxide	.25	.25	.25	.25	.25	.25	.25
Vitamin premix	.25	.25	.25	.25	.25	.25	.25
Trace mineral premix	.15	.15	.15	.15	.15	.15	.15
Calcium chloride	.11	.14	.18	.21	.08	.04	-
DL-Methionine	.08	.11	.13	.16	.13	.18	.24
L-Threonine	.01	.02	.03	.05	.04	.08	.13
L-Isoleucine	-	-	.01	.11	-	.07	.20
L-Tryptophan	-	-	-	.01	.01	.02	.03
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated Analysis							
Lysine, %	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Met:lysine ratio, %	31	32	33	34	33	36	38
Met & Cys:lysine ratio, %	60	60	60	60	60	60	60
Threonine:lysine ratio, %	67	67	67	67	67	67	67
Isoleucine:lysine ratio, %	74	67	60	60	65	60	60
Tryptophan:lysine ratio, %	22	21	21	21	21	21	21
Chloride, %	.43	.43	.43	.43	.43	.43	.43
Sodium, %	.26	.26	.26	.26	.26	.26	.26
Potassium, %	1.19	1.07	.95	.83	1.06	.94	.81
Dietary electrolyte balance, mEq/kg	296	264	233	201	262	230	197
ME, kcal/lb	1458	1453	1449	1442	1452	1445	1438

[a]Experimental diets were fed from d 5 to 19 after weaning.

[b]Provided 50 g/ton carbodox.

Table 3. Effects of Increasing Levels of Spray-Dried Blood Meal and Blood Cells on Growth Performance of Weanling Pigs[ab]

									Probability					
	No Blood	Blood Meal			Blood Cells				Control vs	Meal vs	Blood Meal		Blood Cells	
Item	Control	2.5%	5.0%	7.5%	2.5%	5.0%	7.5%	SE	Others	Cells	Lin	Quad	Lin	Quad
Initial wt, lb	14.39	14.74	14.69	14.64	14.75	14.34	14.57	.17	.15[c]	.40	.55	.73	.62	.12
Day 0 to 7														
ADG, lb	.32	.35	.39	.40	.36	.31	.29	.02	.21	.001	.07	.73	.06	.74
ADFI, lb	.58	.58	.58	.57	.59	.58	.49	.03	.52	.04	.88	.85	.03	.46
F/G	1.81	1.65	1.48	1.43	1.64	1.87	1.69	.08	.001	.001	.01	.89	.16	.95
Day 7 to 14														
ADG, lb	.61	.70	.71	.73	.73	.73	.80	.04	.001	.21	.38	.94	.17	.32
ADFI, lb	.92	.98	.99	.97	.96	.91	.95	.04	.38	.25	.85	.88	.84	.29
F/G	1.51	1.40	1.39	1.33	1.32	1.25	1.19	.05	.002	.32	.25	.84	.03	.79
Day 0 to 14														
ADG, lb	.46	.52	.55	.57	.54	.52	.55	.02	.005	.60	.10	.91	.99	.40
ADFI, lb	.75	.78	.78	.77	.78	.71	.72	.03	.81	.09	.96	.85	.22	.32
F/G	1.63	1.50	1.42	1.35	1.44	1.37	1.31	.09	.001	.24	.04	.99	.16	.68
Final wt, lb	20.76	21.99	22.42	22.60	22.26	21.81	22.17	.46	.001	.94	.20	.88	.82	.29

[a]A total of 350 pigs (five pigs per pen and 10 pens per treatment) with an average initial BW of 14.6 lbs. at the beginning of the treatment period. All pigs were fed a common SEW diet for first 5 days. Thus, d 0 of the experiment is actually 5 days after weaning.

[b]Growth performance for the first 5 d after weaning was: ADG, .27 lb; ADFI, .24 lb; and F/G, .89.

[c]Initial pig weight was used as a covariate in the statistical analysis of growth performance.