Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 10 *Swine Day (1968-2014)*

Article 911

1992

Influence of high levels of B-vitamins on starter pig performance

L J. Kats

Michael D. Tokach

Jim L. Nelssen

See next page for additional authors

Recommended Citation

Kats, L J.; Tokach, Michael D.; Nelssen, Jim L.; Goodband, Robert D.; and Dritz, Steven S. (1992) "Influence of high levels of B-vitamins on starter pig performance," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 10. https://doi.org/10.4148/2378-5977.6751

Influence of high levels of B-vitamins on starter pig performance

Abstract

A total of 318 pigs was used in a 25-d growth trial to determine the influence of high levels of B-vitamins on starter pig performance. At weaning (l6-d of age), pigs were blocked by weight to one of six dietary treatments based on B-vitamin level. The negative control diet contained the standard KSU B-vitamin additions. The next four diets contained vitamin B12, riboflavin, pantothenic acid, or niacin at lOx the level recommended by NRC (1988). The positive control diet contained all four vitamins at 10 x the levels suggested by NRC (1988). B-vitamin inclusion rate did not influence average daily gain or feed intake. High levels of riboflavin resulted in a slight improvement in feed efficiency compared to pigs fed the control diets. These results do not support including B-vitamins in the starter diet at levels higher than currently recommended by KSU.; Swine Day, Manhattan, KS, November 19, 1992

Keywords

Swine day, 1992; Kansas Agricultural Experiment Station contribution; no. 93-142-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 667; Swine; Starter; Performance; B-vitamins

Authors

L J. Kats, Michael D. Tokach, Jim L. Nelssen, Robert D. Goodband, and Steven S. Dritz

INFLUENCE OF HIGH LEVELS OF B-VITAMINS ON STARTER PIG PERFORMANCE[1]

M. D. Tokach, J. L. Nelssen, R. D. Goodband, L. J. Kats, and S. S. Dritz

Summary

A total of 318 pigs was used in a 25-d growth trial to determine the influence of high levels of B-vitamins on starter pig performance. At weaning (16-d of age), pigs were blocked by weight to one of six dietary treatments based on B-vitamin level. The negative control diet contained the standard KSU B-vitamin additions. The next four diets contained vitamin B_{12}, riboflavin, pantothenic acid, or niacin at 10 × the level recommended by NRC (1988). The positive control diet contained all four vitamins at 10 × the levels suggested by NRC (1988). B-vitamin inclusion rate did not influence average daily gain or feed intake. High levels of riboflavin resulted in a slight improvement in feed efficiency compared to pigs fed the control diets. These results do not support including B-vitamins in the starter diet at levels higher than currently recommended by KSU.

(Key Words: Starter, Performance, B-vitamins.)

Introduction

Recent research at University of Minnesota has investigated injection and dietary supplementation of B-vitamins for starter pigs. Results of this research has indicated that injecting B-complex vitamins into pigs at weaning increased daily gain and feed intake in the starter phase. Additional trials have proven that dietary supplementation of B-vitamins at 10 × NRC (1988) levels will improve daily gain and feed intake of starter pigs. This research has provided an excellent base to demonstrate the effectiveness of B-vitamins at levels above those suggested by NRC (1988). However, because four B-vitamins (vitamin B_{12}, riboflavin, pantothenic acid, and niacin) were added to the diet at the same time in the previous trials, it is impossible to determine which vitamin(s) is important. Additionally, the control diet in those experiments was formulated with B-vitamins at 100 to 140% of NRC (1988) recommendations. These levels are much lower than those used in the feed industry and recommended by KSU. Therefore, the objective of this trial was to determine which B-vitamins are necessary to elicit the growth response and if that response will occur when the control diet contains normal industry levels of B-vitamins.

Procedures

A 25-d growth trial utilizing 318 weanling pigs (initially 12.2 lb and 16 d of age) was conducted to evaluate high levels of B-vitamins in starter diets. At weaning, pigs were blocked by weight and allotted to the six experimental treatments. Pigs were housed eight or nine per pen (six pens per treatment) in an environmentally controlled nursery with metal flooring and allowed ad libitum access to feed and water. Pigs and feeders were weighed on d 7, 14, and 25 after weaning to

[1]Appreciation is expressed to Lonza, Inc. for partial financial support and to Merrick's, Inc., for donating plasma protein for the trial. The authors wish to thank Steve Eichman and Eichman Farms, St. George, KS, for use of facilities and animals in this experiment.

determine average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (F/G).

Experimental diets were split into two phases. During phase I (d 0 to 14 postweaning), high nutrient density diets containing 7.5% spray-dried porcine plasma, 1.75% spray-dried blood meal, and 20% dried whey were fed (Table 1). The phase I diet was formulated to 1.5% lysine, .9% calcium, and .8% phosphorus. Pigs were switched to the phase II diets on d 14 postweaning. Phase II diets contained 10% dried whey and 2.5% spray-dried blood meal and were formulated to contain 1.25% lysine, .9% calcium, and .8% phosphorus. Phase I diets were fed as 5/32 in. pellets. Phase II diets were fed in meal form. The negative control diet contained the standard KSU additions of vitamin B_{12} (30 mg/ton), riboflavin (7,500 mg/ton), pantothenic acid (26,000 mg/ton), and niacin (45,000 mg/ton). These levels are 1.9 to 3.3 × NRC (1988) requirements. Experimental diets were formed by replacing corn with premixes containing each B-vitamin. Final inclusion rates to achieve 10 × NRC (1988) levels for each treatment were: vitamin B_{12}, 158 mg/ton; riboflavin, 31,752 mg/ton; pantothenic acid, 90,720 mg/ton; niacin, 136,080 mg/ton. The positive control (All) contained all four B-vitamins at 10 × the level suggested by NRC (1988).

Results and Discussion

High levels of B-vitamins did not influence daily gain or feed intake during this experiment (Table 2). Additions of niacin improved F/G ($P<.04$) during phase I. However, this benefit was not present at the end of the experiment. Pigs fed the diet containing riboflavin at 10 × the level suggested by NRC (1988) had slightly improved F/G during phase I ($P<.10$), phase II ($P<.12$), and the overall trial ($P<.07$) compared to pigs fed the control diet. Adding high levels of riboflavin alone was superior to adding riboflavin in conjunction with the other four vitamins (All) during phase II ($P<.04$) and for the overall trial ($P<.07$). However, the extra cost of the vitamins offsets the small improvements in feed efficiency identified in this trial.

These results were dissapointing, considering the large improvements in performance previously identified by the University of Minnesota. However, there is a basic difference between the trial conducted at KSU and the earlier research. The control diet in this experiment contained much higher levels of B-vitamins than those used in the previous trials. Therefore, these results simply verify that the B-vitamin levels in the current KSU premix are sufficient to support maximal performance.

We have cooperated with the University of Minnesota to conduct an identical trial in their facilities. Their research supports our conclusion that the current KSU B-vitamin recommendations are adequate (Table 3). These levels are 1.9 to 3.3 × those suggested by NRC (1988). Because the previous research at the University of Minnesota has determined that levels suggested by NRC (1988) are deficient, further research is needed to determine the exact B-vitamin requirements.

Table 1. Composition of Diets[a]

Ingredient, %	Phase I	Phase II
Corn[b]	44.89	58.17
Soybean meal (48% CP)	16.95	21.86
Dried whey	20.00	10.00
Porcine plasma	7.50	
Spray-dried blood meal	1.75	2.50
Soybean oil	5.00	3.00
Monocalcium phosphate (21% P)	1.90	1.96
Limestone	.69	.83
Apralan	1.00	
Mecadox		1.00
Copper sulfate	.08	.08
L-lysine	.10	.15
DL-methionine	.10	.05
Vitamin premix[c]	.25	.25
Trace mineral premix[d]	.15	.15
Total	100.00	100.00
Calculated Analysis, %		
Crude protein	21.2	18.9
Lysine	1.50	1.25
Methionine	.38	.33

[a]Pigs were fed the phase I and II diets from d 0 to 14 and d 14 to 25, respectively.
[b]Each vitamin was added at the expense of corn to form the experimental diets.
[c]Each lb of premix contained: vitamin A, 2,000,000 IU; vitamin D_3, 200,000 IU; vitamin E, 8,000 IU; menadione, 800 mg; vitamin B_{12}, 6 mg; riboflavin, 1,500 mg; pantothenic acid, 5,200 mg; niacin, 9,000 mg; choline, 30,000 mg.
[d]Each lb of premix contained: zinc, 50 g; iron, 50 g; manganese, 12 g; copper, 5 g; iodine, 90 mg; selenium, 90 mg.

Table 2. Influence of High Levels of B-Vitamins on Starter Pig Performance[a,b]

Item	Control	B_{12}	Riboflavin	Pant. acid	Niacin	All	CV
D 0-14							
ADG, lb	.68	.68	.68	.68	.69	.69	6.8
ADFI, lb	.74	.73	.72	.74	.72	.73	6.6
F/G[c]	1.10	1.08	1.05	1.09	1.04	1.05	4.4
D 14 - 25							
ADG, lb	1.01	1.03	1.07	1.02	.99	1.03	8.4
ADFI, lb	1.60	1.65	1.63	1.65	1.60	1.66	5.5
F/G[d]	1.59	1.60	1.52	1.63	1.62	1.62	4.9
D 0 - 25							
ADG, lb	.83	.84	.86	.84	.83	.85	6.3
ADFI, lb	1.14	1.15	1.14	1.16	1.13	1.16	5.1
F/G[e]	1.37	1.37	1.32	1.39	1.36	1.37	3.4

[a]Each value is the mean of six pens containing eight to nine pigs per pen. Pigs were weaned at 16 days of age.
[b]Each B-vitamin was added to the diet individually or together (all) at 10 X NRC (1988) requirement to acheive the experimental diets.
[c]Contrasts: control vs all (P<.10); control vs riboflavin (P<.11); control vs niacin (P<.04).
[d]Contasts: control vs riboflavin (P<.12); all vs riboflavin (P<.04).
[e]Contrasts: control vs riboflavin (P<.07); all vs riboflavin (P<.07).

Table 3. Influence of High Levels of B-Vitamins on Starter Pig Performance[a,b]

Item	Control	B_{12}	Riboflavin	Pant. acid	Niacin	All	CV
D 0-14							
ADG, lb	.88	.89	.94	.86	.87	.88	8.9
ADFI, lb	1.04	1.05	1.08	1.01	1.07	1.02	7.5
F/G	1.18	1.18	1.15	1.18	1.24	1.17	4.7
D 14 - 28							
ADG, lb	1.07	1.08	1.06	1.03	1.08	.97	9.7
ADFI, lb	1.85	1.93	1.93	1.88	1.86	1.82	7.8
F/G	1.73	1.79	1.82	1.83	1.74	1.87	8.4
D 0 - 28							
ADG, lb	.98	.99	1.00	.94	.97	.92	7.4
ADFI, lb	1.44	1.49	1.50	1.44	1.46	1.42	7.1
F/G	1.48	1.51	1.50	1.53	1.51	1.54	4.1

[a]Each value is the mean of four pens containing 8 to 9 pigs per pen. Pigs were weaned at 25 days of age. This trial was conducted at the University of Minnesota.
[b]Each B-vitamin was added to the diet individually or together (all) at 10 X NRC requirement to acheive the experimental diets.