OMITTING VITAMIN AND TRACE MINERAL PREMIXES FROM DIETS DURING LATE FINISHING (190 TO 250 LB) DID NOT REDUCE GROWTH PERFORMANCE, CARCASS LEANNESS, OR MUSCLE QUALITY

I. H. Kim, J. D. Hancock, L. L. Burnham, D. H. Kropf, R. H. Hines, K. C. Behnke[1], M. M. Rantanen, and I. Mavromichalis

Summary

Average daily gain; F/G; dressing percentage; tenth rib fat thickness; and depth, marbling, color, and firmness of the longissimus muscle were not influenced by omitting the vitamin and(or) trace mineral premixes from diets during late finishing (190 to 250 lb). Thus, our data suggest that the KSU vitamin and trace mineral premixes can be omitted during late finishing to reduce cost of gain without decreasing growth performance, carcass merit, or muscle quality.

(Key Words: Finishing, Vitamins, Minerals, Meat Quality, Growth.)

Introduction

Diet costs represents 55-65% of the total cost of producing a market hog. Nutrient concentrations in diets for pigs typically are based on the minimum standards set by the National Research Council (NRC, 1988) with sometimes generous safety margins to ensure against deficiencies. However, as pigs increase in age and size, their nutrient needs as a percentage of the diet decrease, and with the current trend toward heavier slaughter weights, dietary excesses of most nutrients are common in late finishing. These excess nutrients are excreted as waste; thus, lower nutrient concentrations in diets for late finishing could help make livestock operations more environmentally friendly.

Many poultry producers are drastically reducing, and sometimes completely omitting, vitamin and trace mineral premixes just prior to slaughter to reduce cost of gain. This approach is based on the hypothesis that a short period exists during which deletion of vitamins and minerals would have no effect on performance and carcass characteristics, because body stores would last until slaughter.

Therefore, the objective of the experiment reported herein was to determine if short-term deletion of vitamin and(or) trace mineral premixes affects growth performance, carcass leanness, or muscle quality in finishing pigs.

Procedures

A total of 128 finishing pigs (initial wt of 189 lb) were blocked by weight and allocated to pens based on sex and ancestry. There were eight pigs (PIC Line 326 boars × C15 sows) per pen and four pens per treatment. Treatments were: 1) corn-soybean meal-based control with the KSU vitamin and trace mineral premixes; 2) diet 1 with the vitamin premix omitted; 3) diet 1 with the trace mineral premix omitted; and 4) diet 1 with the vitamin and trace mineral premixes omitted. The diets were corn-soybean meal-based and formulated to .7% lysine, .65% Ca, and .55% P (Table 1). The pigs were housed in a modified open-front building with 50% solid concrete and 50% concrete slat flooring. Each pen (6 ft × 16 ft) had a self-feeder and nipple waterer to allow ad libitum consumption of feed and water. Pigs and feeders were weighed at initiation and conclusion of the growth assay to allow calculation of ADG, ADFI, and F/G.

[1]Department of Grain Science and Industry.

When pigs in the heaviest pen of a weight block reached an average wt of 250 lb, the entire block was removed from the growth assay. Two blocks reached the ending weight on d 27 and two blocks on d 29 of the experiment. The pigs were killed at a commercial slaughtered plant to collect carcass measurements. Tenth rib fat thickness was measured 2 in from the midline using a Fat-O-Meter™ probe and adjusted to skin-on fat thickness by adding .1 to the probe reading. Dressing percentage was calculated with hot carcass weight as a percentage of slaughter weight. Color, firmness, and marbling of the longissimus muscle were determined according to NPPC (1991) guidelines. Additionally, chops from the 10th rib location were cut 1 in thick, placed on an absorbent pad in a styrofoam tray, and overwrapped with polyvinylchloride film. Measurements of longissimus muscle color were determined at d 0 (before display) and after 3 and 5 d of continuous (24 h/d) display at 36°F under 150 foot candle deluxe warm white fluorescent lighting. A Minolta CR-200 spectrocolorimeter (1 cm diameter aperture) was used to measure meat lightness and intensity of red, yellow, and pink color at d 0, 3, and 5.

All data were analyzed as a randomized complete block design with orthogonal contrasts used to separate treatment means. Pen was the experimental unit.

Results and Discussion

From 190 to 250 lb, ADG and F/G were not influenced ($P > .22$) by dietary treatment (Table 2). Dressing percentage; 10th rib fat thickness; fat free lean index; and subjective scores for marbling, color, and firmness of the longissimus muscle also were not affected by dietary treatment ($P > .11$).

Objective color determinations (Table 3) at d 0 (before display) suggested that pigs fed diets without the vitamin and(or) mineral premixes had redder meat and more vivid or intense pink color compared to pigs fed the control diet ($P < .06$). Meat color for pigs fed the diet without mineral premix was lighter and more yellow than that for pigs fed the diet without vitamin premix ($P < .05$). However, the color determinations for all treatments were considered to be well within normal ranges. Also, the rate of change for meat color to d 3 and 5 was similar for all treatments. Thus, withdrawal of the vitamin and(or) mineral premixes had no effect on pork muscle color stability during display.

In conclusion, cost of gain was decreased by omitting the vitamin and(or) trace mineral premixes during the late finishing phase. Also, concerns that omitting these premixes would result in fatter carcasses with poor meat color/quality were unwarranted.

Table 1. Diet Composition, %[a]

		Premix omitted		
Ingredient	Control	Vitamin	Mineral	Vitamin+ mineral
Corn	83.83	83.99	83.94	84.10
Soybean meal (46.5% CP)	12.37	12.35	12.36	12.34
Soybean oil	1.00	1.00	1.00	1.00
Monocalcium phosphate (21% P)	1.12	1.12	1.12	1.12
Limestone	.94	.94	.94	.94
Salt	.30	.30	.30	.30
Vitamin premix	.15	--	.15	--
Trace mineral premix	.10	.10	--	--
L-Lysine·HCl	.15	.15	.15	.15
Antibiotic[b]	.05	.05	.05	.05
Total	100.00	100.00	100.00	100.00

[a]All diets were formulated to .70% lysine, .65% Ca, and .55% P.
[b]Supplied 40 g/ton tylosin.

Table 2. Effects of Omitting Vitamin and Trace Mineral Premixes on Growth Performance, Carcass Characteristics, and Meat Quality in Finishing Pigs[a]

		Premix omitted				Contrasts[b]		
Item	Control	Vitamin	Mineral	Vitamin+ mineral	CV	1	2	3
ADG, lb	2.42	2.31	2.43	2.32	5.6	--[g]	--	--
ADFI, lb	7.81	7.12	7.35	7.28	3.5	.005	--	--
F/G	3.23	3.08	3.03	3.14	5.3	--	--	--
Dressing percentage	74.1	74.4	74.3	74.5	.7	--	--	--
Backfat thickness, in	.75	.72	.73	.74	6.4	--	--	--
Fat free lean index, %[c]	50.2	50.5	50.4	50.3	1.3	--	--	--
Meat Quality								
Color[d]	2.6	2.5	2.5	2.5	1.9	.12	--	.11
Firmness[e]	2.5	2.5	2.5	2.6	5.1	--	--	--
Marbling[f]	1.9	1.9	1.8	1.9	14.5	--	--	--

[a]A total of 128 pigs (eight pigs/pen and four pens/treatment) with an avg initial wt of 189 lb and an avg final wt of 254 lb.
[b]Contrasts were: 1) control vs other treatments; 2) omitting vitamins or minerals vs omitting both; 3) omitting vitamins vs minerals.
[c]Equation (NPPC, 1991) was: Fat free lean index=51.537 + (.035 × hot carcass wt) - (12.26 × off-midline backfat thickness).
[d]Scored on a scale of 1=pale pinkish-gray to 5=dark purplish-red (NPPC, 1991).
[e]Scored on a scale of 1=very soft and watery to 5=very firm and dry (NPPC, 1991).
[f]Scored on a scale of 1=practically devoid to 5=moderately abundant (NPPC, 1991).
[g]Dashes indicate P>.15.

Table 3. Objective Measurements of Longissimus Muscle Color[a]

Item[b]	Control	Premix omitted			CV	Contrasts[c]		
		Vitamin	Mineral	Vitamin+ mineral		1	2	3
Day 0								
Lightness	51.5	51.6	52.7	51.9	1.4	--[d]	--	.05
Redness	10.8	11.1	11.4	11.6	4.0	.06	--	--
Yellowness	7.4	7.4	7.9	7.7	4.1	.14	--	.05
Pink color intensity	13.1	13.3	13.9	13.9	3.7	.06	--	.14
Day 3								
Lightness	53.8	54.1	54.4	53.9	1.9	--	--	--
Redness	9.5	9.7	9.9	10.1	5.1	--	--	--
Yellowness	7.8	7.8	8.3	8.1	3.5	--	--	.02
Pink color intensity	12.3	12.4	12.9	12.8	3.9	--	--	--
Day 5								
Lightness	54.3	54.3	54.7	54.2	3.1	--	--	--
Redness	8.5	8.5	8.8	9.0	4.5	--	--	--
Yellowness	7.9	7.9	8.4	8.0	4.0	--	--	.07
Pink color intensity	11.7	11.6	12.2	12.1	3.2	--	--	.09

[a]A total of 128 pigs (eight pigs/pen and four pens/treatment) with an avg initial wt of 189 lb and an avg final wt of 254 lb.
[b]Minolta CR-200 spectrocolorimeter values (lightness is Hunter 'L' value; redness is Hunter 'a' value; yellowness is Hunter 'b' value; pink color intensity is saturation index).
[c]Contrasts were: 1) control vs other treatments; 2) omitting vitamins or minerals vs omitting both; 3) omitting vitamins vs minerals.
[d]Dashes indicate $P > .15$.