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Vitamin E, Copper, and Tylosin in the  
Diets of Growing-Finishing Swine

George W. Libal and Richard C. Wahlstrom

Recent research with growing pigs has shown that vitamin E may be deficient in some corn-soybean meal diets. Some possible reasons why vitamin E deficiencies are being experienced today are that fewer pigs are fed on pasture, which is a good source of vitamin E; more corn is being picked wet and then artificially dried, which can destroy vitamin E; and the presence of a low selenium content of corn.

Copper has been shown to produce a growth response similar to antibiotics when it is fed at levels of 125 to 250 ppm. The study reported herein was conducted during the winter of 1969-70 to study the effects on growing-finishing swine of supplementing diets with vitamin E, copper, tylosin and combinations of these ingredients.

Experimental Procedure

Ninety-six crossbred pigs were randomly allotted to four replications of six treatments on the basis of litter, weight and sex. The trial was initiated when the pigs weighed approximately 50 lb. The pigs were housed in open-front buildings with concrete pens. The feed and water were available ad libitum in the outside pen.

The six dietary treatments were as follows:

1. Basal ration
2. Basal ration plus vitamin E, 10 I.U./lb.
3. Basal ration plus copper, 250 ppm
4. Basal ration plus vitamin E and copper at above levels
5. Basal ration plus tylosin, 20 gm./ton
6. Basal ration plus tylosin and copper at above levels

The composition of the basal ration is shown in table 1.

The pigs were removed from their respective rations when they reached approximately 210 lb. and after an overnight shrink they were slaughtered. Blood samples were taken at that time. In addition to average daily gain, feed consumption and feed efficiency data, carcass data were obtained for carcass length, backfat, loin eye area and ham and loin percent, and liver tissue, blood and backfat were analyzed.

Results

A summary of the growth performance and carcass data is presented in table 2. Faster gains were obtained when pigs were fed diets containing either copper or tylosin or the combination of these two additives. However, these gains were not significantly different from those of pigs receiving no copper and tylosin. No significant differences due to treatment were found in daily feed consumption or feed per pound of gain.

Carcass data obtained from pigs slaughtered at an average weight of 210 lb. did not indicate any differences in carcass length, backfat thickness, loin eye area or ham and loin percent.

A summary of laboratory data obtained on liver, blood and fat is shown in table 3. Blood copper was not affected by copper content of the diet and remained fairly constant regardless of treatment. Liver copper storage, however, was much higher when the pigs were fed copper in the diet. Blood hemoglobin and hematocrit were not affected by dietary treatment. Slightly higher iodine numbers were obtained for the fat samples from pigs receiving copper, indicating a higher degree of unsaturation of the fat. However, these differences were not significant.

#### Summary

Ninety-six crossbred barrows and gilts were allotted to six treatment groups to study the effect of vitamin E, copper, tylosin and combinations of these ingredients upon average daily gain, feed consumption and efficiency, carcass data and blood, liver and fat composition.

Gains were higher for those pigs receiving copper or tylosin or the combination of the two, however, not significantly so. Daily feed consumption, feed per lb. of gain and carcass data were not affected by addition of these feed ingredients. Blood copper, hematocrit and hemoglobin levels were not affected but liver copper levels were higher when copper was added to the diet. Iodine numbers indicated a slightly more unsaturated fat when copper was included in the diet.

Table 1. Composition of Basal Ration

Ingredients	Percent
Ground yellow corn	82.85
Soybean meal (50%)	15.00
Ground limestone	0.75
Dicalcium phosphate	0.85
Salt (white)	0.50
Trace mineral mix <sup>a</sup>	0.05
Vitamin premix <sup>b</sup>	+
Calculated analysis:	
Protein	15%
Calcium	0.50%
Phosphorus	0.50%

<sup>a</sup> Provided 100 ppm zinc, 50 ppm iron, 27.5 ppm manganese, 5 ppm copper, 0.5 ppm cobalt and 0.75 ppm iodine.

<sup>b</sup> Provided 3,000,000 I.U. vitamin A, 300,000 I.U. vitamin D, 1 gm. riboflavin, 5 gm. pantothenic acid, 15 gm. niacin, 100 gm. choline and 16 mg. vitamin B<sub>12</sub> per ton of ration.

Table 2. Effects of Vitamin E, Copper and Tylosin in Performance and Carcass Characteristics of Swine

	Basal	Vitamin E	Copper	Copper + E	Tylosin	Tylosin + copper
No. of pigs <sup>a</sup>	16	16	16	16	16	16
Avg. daily gain, lb.	1.57	1.57	1.62	1.53	1.63	1.62
Avg. feed consumed, lb.	5.77	5.49	5.91	5.85	5.44	5.77
Avg. feed/gain, lb.	3.66	3.51	3.63	3.78	3.40	3.62
Carcass data						
Avg. length, in.	29.5	29.4	29.4	29.5	29.5	29.8
Avg. backfat, in.	1.21	1.26	1.16	1.14	1.26	1.18
Avg. loin eye area, sq. in.	5.12	4.58	4.95	5.18	4.82	4.75
Avg. ham-loin, %	40.3	39.7	39.0	40.0	39.6	40.4

<sup>a</sup> Four lots of 4 pigs per treatment. Average initial weight, approximately 50 lb.; average final weight, 210 lb.

Table 3. Effect of Vitamin E, Copper and Tylosin on Liver, Blood and Fat

	Basal	Vitamin E	Copper	E + copper	Tylosin	Tylosin + copper
Liver weight (lb.)	3.22	3.04	3.07	3.04	3.14	2.86
Liver copper (ppm)	18.56	20.13	52.00	61.25	24.88	53.38
Blood copper (ppm)	2.28	2.40	2.25	2.50	2.27	2.33
Blood hematocrit	41.75	41.91	43.36	42.72	42.00	41.56
Blood hemoglobin	14.50	14.66	14.80	14.68	15.14	14.82
Fat iodine number	64.55	64.64	66.74	57.70	65.95	68.00