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Vitamin E and Selenium in Swine Rations

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In recent years concern has increased for shortages of vitamin E or selenium in practical swine operations in Missouri or the Midwest.

Problems which have occurred on some hog farms and further research on needs and requirements of hogs for these two nutrients have resulted in a change in recommendations.

The National Research Council, "Nutrient Requirements of Swine," revised in 1988, lists the vitamin E and selenium requirements as shown in Table 1.

Table 1. Vitamin E - Selenium requirements

	Weight	10-22	22-44	44-110	110-220	Breeding Stock
Vit. E	IU/1b	7.3	5.0	5.0	5.0	10.0
Selenium	PPM	.3	.25	.15	.10	.3

Few Missouri swine producers have obtained a confirmed positive diagnosis for a vitamin E-selenium deficiency. However, with greater awareness of vitamin E-selenium deficiency more positive diagnoses have been reported. Some of the unexplained sudden deaths and other problems on swine farms very likely could be caused by shortages of these nutrients.

The reason for this change in these two nutrients compared to a few years ago is not completely resolved. Some of the possibilities that may have affected it are as follows:

1. Increased confinement of both breeding stock and growing-finishing pigs without access to soil or green forage, resulting in lower intakes of selenium and/or vitamin E. (See following table.)
2. Increased cropping intensity resulting in depletion of soil selenium and production of crops with lower selenium content.
3. Loss of vitamin E because of change in harvesting techniques. Considerably more corn is picked wet and dried, which may result in appreciable loss of vitamin E activity.
4. Increased growth rate of swine resulting in increased requirements for vitamin E and/or selenium.
5. Increased use of plant protein supplements which tend to be lower in selenium and vitamin E than animal protein supplements.

Feedstuff	Alpha-Tocopherol, mg./lb.*
Corn	1.8
Solvent Soybean Meal	.36
Dehydrated Alfalfa Leaf Meal	30-100
Fresh Alfalfa	19-24
Fresh Young Perennial Ryegrass	27-36

*Alpha-Tocopherol is the most active natural form of vitamin E.

Symptoms of deficiency

Probably the symptom most likely to be noticed is sudden death. Pigs that have been apparently healthy are suddenly found dead. These may have been pigs that were recently weaned and penned with pigs from other litters. Specific symptoms could include the following:

1. Mulberry heart disease. This condition usually causes sudden death. Occasionally pigs may be noticed breathing heavily; they have bluish discoloration of the skin and may die shortly thereafter.

   The incidence of affected animals varies considerably from herd to herd. Death is caused by degeneration of the heart muscle, which causes acute heart failure. Several other disease situations can cause sudden death. Thus, any time a pig dies in this fashion, it would be advisable to get a veterinarian's diagnosis on postmortem.
2. Hepatosis dietetica. In this condition massive liver damage is the most characteristic lesion, which gives the liver a very roughened appearance. Affected pigs usually die suddenly. Some pigs, however, develop large soft swellings under the skin one or two days before death.

   Pigs with this condition also have a high incidence of stomach ulcers. Usually there is degeneration of heart and skeletal muscles occurring con-

currently with the liver problem. Hepatosis dietetica is most common in feeder pigs.

3. Nutritional muscular dystrophy. This has been reported in a few cases in Ontario. Affected pigs may appear stiff and lame and may be reluctant to move. Postmortem examinations usually are needed to confirm the diagnosis.
4. Iron toxicity. Some research in Scandinavia has shown that pigs from dams fed diets marginal in vitamin E were much more susceptible to iron toxicity than pigs which nursed dams fed a vitamin E-supplemented diet. This may explain high death losses in some pigs shortly after treatment with iron.

Dr. D. E. Ullrey, Michigan State University, has done much of the work in establishing nutrient requirements for selenium and in getting approval for additions of selenium to swine rations. He said that pigs affected with these symptoms have been stressed in many cases by handling or environmental changes prior to their development.

Prevention of deficiencies

Including vitamin E in the diets of all pigs will aid in avoiding deficiencies. Many Missouri producers have used 10,000 to 20,000 I.U. of vitamin E per ton of swine rations.

The amount of selenium that may be added to swine rations is regulated by the U.S. Food and Drug Administration. It is limited to .3 ppm to 40 pound weights and .1 ppm for hogs heavier than 40 pounds, from sodium selenite or sodium selenate.

With recent Food and Drug Administration approval of selenium in swine rations, there is some question about vitamin E levels needed. Research work would indicate that both vitamin E and selenium, or a comination of both, help prevent deficiency symptoms of selenium in young pigs. Vitamin E helps reduce the problem but does not completely correct the deficiency.

With selenium added to many feeds, vitamin E fortification will probably be reduced. Many feeds were formulated to contain more vitamin E than needed in an effort to prevent selenium deficiencies. Under most practical feeding situations for grower-finisher rations, 0.1 part-per-million selenium and 10,000 I.U. of vitamin E per ton should be adequate in Missouri rations and provide some margin of safety.

Take care in mixing selenium in rations

If selenium is used it is important that an excess is not put into the diet. Selenium added in a salt-trace mineral or premix needs to be mixed carefully into large amounts before putting into the mixer. Excess quantities of selenium can be toxic. Toxic levels are around seven parts per million. To meet the requirements of one-tenth part-per-million on finishing hogs for example, 90.8 mg. of selenium would be added to a ton. This might be added as follows:

1. Salt to be added at the rate of 10 pounds per ton of complete ration. The amount of selenium in the material should be 9.08 mg. per pound (.002%).
2. Salt to be added at the rate of five pounds per ton of complete ration, 18.16 mg. per pound (.004%).
3. Trace-mineral premix to be added at the rate of one pound per ton of complete ration, 90.8 mg. per pound (.02%).

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