

University of Missouri Extension

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Vitamin E and Selenium in Swine Rations

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

Recommendations have changed because of problems that have occurred on some hog farms and further research on needs and requirements of hogs for these two nutrients.

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

Table 1
 Vitamin E-selenium requirements

	Weight	10 to 22	22 to 44	44 to 110	110 to 220	Breeding stock
Vitamin E	IU per pound	7.3	5.0	5.0	5.0	10.0
Selenium	PPM	0.3	0.25	0.15	0.10	0.3

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 could very likely be caused by shortages of these nutrients.

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

- 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 (Table 2).
- Increased cropping intensity resulting in depletion of soil selenium and production of crops with lower selenium content.
- 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.
- Increased growth rate of swine resulting in increased requirements for vitamin E and/or selenium.
- Increased use of plant protein supplements that tend to be lower in selenium and vitamin E than animal protein supplements.

Table 2
 Amounts of vitamin E in feeds

Feedstuff	Alpha-Tocopherol, milligrams per pound¹
Corn	1.8

Solvent soybean meal	0.36
Dehydrated alfalfa leaf meal	30 to 100
Fresh Alfalfa	19 to 24
Fresh young perennial ryegrass	27 to 36

¹Alpha-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:

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.

Hepatositis dietetica

In this condition, massive liver damage, which gives the liver a very roughened appearance, is the most characteristic lesion. 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 concurrently with the liver problem. Hepatositis dietetica is most common in feeder pigs.

Nutritional muscular dystrophy

A few cases of nutritional muscular dystrophy have been reported in Ontario. Affected pigs may appear stiff and lame and may be reluctant to move. Postmortem examinations usually are needed to confirm the diagnosis.

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 that 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 IU 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 0.3 parts per million (ppm) up to 40 pound weights and 0.1 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 combination of both, help prevent selenium deficiency symptoms 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 ppm selenium and 10,000 IU of vitamin E per ton should be adequate in Missouri rations and provide some margin of safety.

Take care when 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 pre-mix needs to be mixed carefully into large amounts before putting it into the mixer. Excess quantities of selenium can be toxic. Toxic levels are around seven parts per million. To meet the requirements of 1/10 part-per-million on finishing hogs, for example, 90.8 milligrams of selenium would be added to a ton. This might be added as follows:

- 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 milligrams per pound (0.002 percent).
- Salt to be added at the rate of five pounds per ton of complete ration, 18.16 milligrams per pound (0.004 percent).
- Trace-mineral premix to be added at the rate of one pound per ton of complete ration, 90.8 milligrams per pound (0.02 percent).

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Related MU Extension publications

- G2320, Nutrient Requirements of Swine
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2320>
- G2321, Vitamin Requirements of Swine
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2321>
- G2322, Mineral Requirements for Growing Swine
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2322>
- G2351, Evaluating Vitamin Premixes for Swine
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G2351>

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