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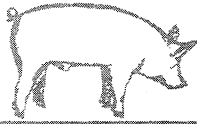
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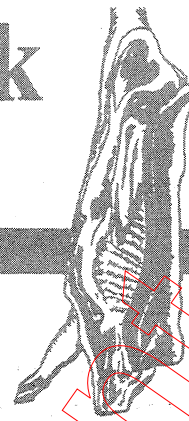
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# Pigs to Pork



NUTRITION



Cooperative Extension Service PURDUE UNIVERSITY Lafayette, Indiana

## Vitamins for Swine

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### Introduction

The addition of specific vitamins to swine rations is a necessity. The cost of adding these vitamins is not great and is usually less than five per cent of the total feed cost.

### What are vitamins?

Vitamins are organic compounds of relatively simple structure. They are required by pigs in very small amounts. Vitamins are not used as sources of energy or amine acid nitrogen, but they are needed for specific metabolic reactions to proceed normally. Lack of a vitamin produces certain characteristic deficiency symptoms in the pig.

### Which vitamins should be added?

Each vitamin has been found to have specific functions in the body chemistry. Most vitamins must be furnished in the diet. However, a few can be made from other chemicals within the body, and a few are produced by microorganisms living in the intestinal tract. Natural ingredients used in swine rations also furnish some vitamins. In fact, only a few vitamins need to be added to swine rations made up of normal feedstuffs. Vitamins which should be added to swine rations usually include vitamin A, vitamin D, vitamin B<sub>12</sub>, riboflavin, niacin and pantothenic acid. Sometimes vitamin E and choline are also added.

Table 1 gives the primary functions, symptoms of deficiency and sources of

vitamins commonly added to swine diets. Table 2 gives important information on other vitamins required by swine.

### Vitamin requirements and allowances

Research has been conducted to determine the amounts of each vitamin required in the pig's diet. All of this work has been surveyed and evaluated by a group of swine nutritionists on the National Research Council (NRC). They periodically publish a list of nutrient requirements for swine. Tables 3 and 4 present the most recent NRC vitamin requirements for swine. The requirements for breeding stock are presented in "amounts per animal per day" because most breeding stock are now limit-fed specific amounts of feed per day.

The levels and amounts listed in the tables are requirements. They do not include extra amounts for a margin of safety. A margin of safety is necessary for several reasons. The vitamin content of feedstuffs varies because of variety, length of storage, processing conditions, and so forth. Environmental conditions (such as temperature, humidity) influence vitamin requirements. There are individual (genetic) differences in vitamin requirements. Some vitamins lose potency with time in mixed feeds.

The vitamin requirement plus a margin of safety is called a recommended allowance. One way to provide margins of safety is to furnish the NRC requirements in a vitamin premix and rely on the vitamin content of feedstuffs for the margins of safety. This

method was used when formulating the suggested vitamin premix listed in Table 5.

#### Mixing instructions

The premix in Table 5, many commercial vitamin premixes, and other recommended premixes are formulated to be added to the ration at the rate of 10 pounds per ton. Unless special care is taken when mixing, this small amount of vitamin premix will not be equally dispersed throughout the batch of feed. Prior to entry into the batch mixer, critical ingredients such as vitamins, trace minerals and antibiotics should be premixed

in a minimum of two per cent of the batch weight (40 pounds per ton) if a "vertical-type" mixer is used and in one per cent of the batch weight (20 pounds per ton) if a horizontal mixer is used. This means that many vitamin premixes should be further premixed before adding to the mixer. There are various ways to conveniently carry out this premixing step. The concentrated premix can be added slowly to the ingredient dump of the mixer, while at the same time dumping in bulk ingredients. Another method would be to blend the concentrated premix with finely ground corn in a basket using a hand scoop to accomplish the mix.

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Table 1. Specifications of vitamins commonly added to swine rations

Vitamin	Function	Characteristic symptoms of deficiency <sup>a/</sup>	Natural Sources
Vitamin A (carotene is a precursor)	Normal maintenance of epithelial tissues (surface linings of organs)	xerophthalmia (an eye inflammation), abnormal fetuses (stillborn, blind, deformed), night blindness, tilted head, back weakness	green forage, pasture, dehydrated alfalfa meal, new yellow corn
Vitamin D	Normal metabolism of calcium and phosphorus	rickets (weak abnormal bones), posterior paralysis, leg stiffness	sun rays on skin, fish oils, sun-cured hay
Riboflavin	Component of enzyme systems necessary for energy conversion	crooked legs, diarrhea, rough hair coat, exudate around eyes	green forage, pasture, quality hays, dairy by-products and distillers' solubles
Niacin	Component of enzyme systems necessary for energy conversion	diarrhea, increased susceptibility to necrotic enteritis, sores in mouth, dry and rough hair coat	fish meal and solubles, peanut meal, animal by-products
Pantothenic Acid	Component of an important coenzyme	wobbly gait (goose-stepping) and rhythmic kicking of hind legs, dry and flaky skin, exudate around eyes, ears and neck, diarrhea	milk by-products, forages, wheat, oats, milo, peanut meal and fish solubles
Vitamin B <sub>12</sub>	For normal protein, fat and carbohydrate metabolism	exudate around eyes, anemia, extreme irritability, sensitive to touch, voice failure, posterior incoordination with tendency to roll over, rough skin and hair coat	dairy and animal by-products

<sup>a/</sup> Deficiency of any of the vitamins listed decreases appetite and slows the growth rate.

Table 2. Specifications of other vitamins required by swine <sup>a/</sup>

Vitamin	Comments
Biotin	Deficiency causes baldness, skin ulceration, cracking and bleeding of feet.
Choline	Classed with vitamins but actually used as a structural component in the body. Deficiency produces lack of co-ordination and lack of rigidity of joints.
Folic acid	Deficiency results in anemia and a light hair coat. Synthesized by intestinal microorganisms.
Pyridoxine	Deficiency causes anemia, snapping movement of hind legs, tendency to run backwards, and elipeptic-like fits.
Thiamine	Deficiency results in slow respiration and heart rates, low body temperature and an enlarged heart.
Vitamin E	Deficiency produces fetal death or low viability after birth and dystrophy of muscles and liver. Destroyed if feed becomes rancid.
Vitamin K	Produced by intestinal bacteria. Necessary for blood clotting.

<sup>a/</sup> These vitamins are either present in adequate amounts in practical rations or are synthesized in the body.

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Table 3. Vitamin requirements for swine starting, growing and finishing pigs (per pound of ration) <sup>a/</sup>

Vitamin	Unit	Weight of pigs					
		10-25	25-50	50-75	75-125	125-175	175-225
Vitamin A	I.U. <sup>b/</sup>	1000	800	600	600	600	600
Vitamin D	I.U.	100	90	90	60	60	60
Riboflavin	mg.	1.5	1.4	1.2	1.0	1.0	1.0
Niacin	mg. <sup>c/</sup>	10.0	8.0	6.0	5.0	5.0	5.0
Pantothenic acid	mg.	6.0	5.0	5.0	5.0	5.0	5.0
Choline	mg.	500	400	--	--	--	--
Vitamin B <sub>12</sub>	mcg.	10.0	7.0	5.0	5.0	5.0	5.0

<sup>a/</sup> These requirements are based on National Research Council recommendations.

<sup>b/</sup> I.U. = International unit

<sup>c/</sup> The niacin requirement assumes that all of the niacin in the cereal grains and their by-products is in a bound form and thus is largely unavailable.

Table 4. Vitamin requirements for breeding stock (amounts per animal per day). <sup>a/</sup>

Vitamin	Unit	Bred		Lactating		Boars	
		Gilts	Sows	Gilts	Sows	Young	Adult
Vitamin A	I.U.	8,250	9,750	16,500	18,750	9000	11,250
Vitamin D	I.U.	550	650	1,100	1,250	600	750
Riboflavin	mg.	8.2	9.8	16.5	18.8	90	11.2
Niacin	mg. <sup>b/</sup>	44.0	52.0	88.0	100.0	48.0	60.0
Pantothenic acid	mg.	33.0	39.0	66.0	75.0	36.0	45.0
Choline	mg.	---	---	---	---	---	---
Vitamin B <sub>12</sub>	mcg.	27.5	32.5	55.0	62.5	30.0	37.5

<sup>a/</sup> These requirements are based on National Research Council recommendations.

<sup>b/</sup> The niacin requirement assumes that all of the niacin in the cereal grains and their by-products is in a bound form and thus is largely unavailable.

Table 5. A vitamin premix for swine

Ingredient	Total in 10 pounds	Amount per pound of premix
Vitamin A	2 million I.U. <sup>a/</sup>	200,000 I.U.
Vitamin D	0.20 million I.U.	20,000 I.U.
Riboflavin	2 grams	200 mg.
Pantothenic acid	8 grams	800 mg.
Niacin	12 grams	1,200 mg.
Vitamin B <sub>12</sub>	10 milligrams	1 mg.
Carrier (ground corn)	<u>enough to equal total</u>	
Total	10 lbs.	

<sup>a/</sup> I.U. = International unit

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