

# Vitamins and Minerals

*They represent only a tiny portion of your horse's feed intake, but they pack a nutritional wallop*

## Overview

Vitamins and minerals are two of the six essential nutrients required by horses (the other four are water, carbohydrates, protein, and fat). According to nutritionists, most adult, non-breeding horses not involved in moderate to heavy work and that are on good pasture can obtain sufficient amounts of all six nutrients from forage alone (plus free-choice salt and water). However, a lot of forages are low in trace minerals, so forage alone is not always adequate.

Horses only need relatively small quantities of vitamins and minerals, but the lack of those tiny amounts can be devastating to your horse's health.

## Vitamins

Vitamins are organic nutrients an animal must obtain from the normal diet or thorough supplements as they cannot be synthesized by the body in large enough amounts to support biological functions. These nutrients have a diverse range of functions, including enzyme cofactors, hormones, and antioxidants. Vitamins are often described as either fat- or water-soluble, based on their chemical composition.

**Fat-soluble vitamins** As the name implies, these vitamins are only able to dissolve in fat, not water. Vitamins A, D, E, and K are fat-soluble and are absorbed from the intestinal tract with the assistance of small fat droplets. Unlike water-soluble vitamins, which are readily excreted in urine, fat-soluble vitamins can be stored in the body's fatty tissues and in the liver. Thus, hypervitaminosis—a vitamin overdose—is possible and should be avoided by feeding only recommended amounts (particularly vitamin A).

**Vitamins A, D, E, K** Vitamin A is important for vision, reproduction, healthy skin, and bone growth. The precursor to vitamin A is present in fresh grass, but it is rapidly



lost in hay. Vitamins D and E are found in fresh grass, alfalfa, and grass hay. Vitamin D, which becomes a hormone once “activated” in the body, is important for calcium and phosphorus absorption and bone formation. Vitamin K plays a role in blood clotting.

**Vitamin E** is a potent antioxidant that promotes nerve health. A deficiency of vitamin E has been linked to equine degenerative myeloencephalopathy (EDM) and equine motor neuron disease (EMND) in horses not at pasture (a source of vitamin

E). Researchers recommended all horses without access to green forage for more than a year be routinely tested for plasma vitamin E, then supplemented, if needed. Hay can be deficient in vitamin E, especially if it is not fresh. Natural vitamin E has 36% greater biological activity than synthetic vitamin E. Wheat germ, stabilized rice bran, and soybean oil are excellent natural sources of vitamin E.

**Water-soluble vitamins** Vitamins B and C are water-soluble and are not typically stored in the body, as are fat-soluble vitamins. So, the horse must have a consistent daily intake.

**B vitamins** have a variety of functions, such as maintaining healthy skin and muscle, promoting cell growth and division, and enhancing the immune and nervous systems. Of the eight B vitamins, B7 (biotin) is one of the most familiar to horse owners as a popular supplement for healthy hooves and coats.

B vitamins (except B12) are found in good-quality forages and are synthesized by bacteria in the equine hindgut. Vitamin B12 is synthesized in adequate amounts when there is sufficient cobalt in the diet.

Vitamin B supplementation might be useful in horses with an altered population of bacteria in the hindgut, such as young, old, and hard-working horses as well as those fed high grain rations.

**Vitamin C** has a wide array of biological activities. It is a potent antioxidant; involved in a variety of enzyme-driven processes; and is required for the synthesis of collagen (a structural protein found in tendons, ligaments, and cartilage), among other jobs. Vitamin C deficiencies are rare as this vitamin is synthesized from glucose in most mammals, including horses.

Conditions such as hot weather, stress, rapid growth, old age, high-level performance, or horses with a dietary deficiency that interferes with vitamin C

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synthesis, might benefit from vitamin C supplementation.

## Minerals

Minerals are defined as elements or chemical compounds that are normally crystalline and that have been formed as a result of geological processes.

In animals, minerals support biochemical processes that serve structural and functional roles.

Calcium (Ca) and phosphorus (P), for example, are important components of bone, and iron (Fe) binds oxygen inside red blood cells and transports the oxygen from the lungs to cells throughout the body, such as skeletal muscle cells. Other examples include (but are not limited to):

**Sulfur (S)** is an important component of structural proteins, such as those found in articular cartilage and connective tissues;

**Zinc (Zn)** has a wide range of roles in animals' bodies and is essential for the function of a large number of biologically important enzymes;

**Copper (Cu)** is found in a number of enzymes and elastic connective tissues; and

**Selenium (Se)** is important for antioxidant

pathways (with vitamin E) and for proper function of the immune and muscular systems.

Minerals also function as electrolytes, which are minerals that form charged particles called ions when dissolved in water. Important electrolytes in horses include sodium, potassium, and chloride. Electrolytes are important in muscle contraction and conducting nerve impulses.

Controlling fluid and electrolyte losses in horses performing or residing in hot, humid conditions is important to avoid serious and potentially life-threatening health conditions.

## A Little Goes a Long Way

If a little bit of something is a good thing, you should not assume that a lot is better. Vitamins can be toxic, and excessive supplementation of minerals such as copper, iron, and zinc can interfere with the absorption and metabolism of other minerals.

In horses the importance of balance between dietary intake of calcium and phosphorus is well documented. It is currently recommended that the Ca:P

ratio in adult horses should be in the range of 1:1 to 2.5:1. The ratio should not exceed 6:1, and phosphorus intake should not exceed calcium intake.

Details regarding nutrient requirements for horses based on age, size, and work are available.<sup>1</sup>

Horse owners are encouraged to discuss dietary supplements with their veterinarians or an equine nutritionist. All dietary changes, including the addition of nutritional supplements, should be instituted slowly.

When multiple supplements are offered, it is important to determine the total amount of each supplement to ensure the horse is not being oversupplemented. In addition to being potentially detrimental to the horse, oversupplementing is not economical. 🐾

## FOR MORE INFORMATION

1. See the National Research Council's book, *Nutrient Requirements of Horses* for detailed information.
2. See [www.TheHorse.com](http://www.TheHorse.com) article library under Nutrition/Supplements, then Vitamins/Minerals.

*Authored by Stacey Oke, DVM, MS;  
reviewed by Laurie Lawrence, PhD.*



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