

# Vitamins and Minerals

*Vitamin and mineral supplements might be needed for the elite athlete*

## 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 horses that are not involved in moderate to heavy work can obtain sufficient amounts of all six nutrients from forage alone. That is, grain and nutritional supplements, including vitamin and mineral supplements, are not required for most healthy horses.

The only exceptions to this “forage only” rule are water and sodium. All horses should be offered water and a plain white salt block (as well as a red mineral block) free-choice. Since vitamins and minerals play vital roles in every organ system in the horse’s body, it is important their intake is in accordance with recommended guidelines.

## Vitamins

Vitamins are organic nutrients that an animal must obtain from the diet 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



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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).

**Vitamin A** is important for vision, reproduction, healthy skin, and bone growth. It is present in fresh grass, alfalfa, and grass hays, along with vitamins D and E. Vitamin D, which becomes a hormone once it is “activated” in the body, is important for calcium and phosphorus absorption and

bone formation. Vitamin E is most well-known for its antioxidant properties. Vitamin K plays a role in blood clotting.

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

Of the eight B vitamins, B7 (biotin) is probably the most familiar to horse owners. Biotin is a popular supplement for healthy hooves and coats. The B vitamins, as a group, have a variety of functions such as maintaining healthy skin and muscle, promoting cell growth and division (e.g., red blood cells), and enhancing the immune and nervous systems function.

Vitamin C also 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.

## 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 serve a variety of purposes. They support biochemical processes that serve both 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

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body, such as skeletal muscle cells. Other examples include (but are not limited to):

**Sulfur (S)** is an important component of various structural proteins, such as those found in articular cartilage and other 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 (Na<sup>+</sup>), potassium (K<sup>+</sup>), and chloride (Cl<sup>-</sup>). 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-known. It is currently recommended that the Ca:P ratio in adult horses should not exceed 1:6. When intake of P increases (i.e., the ratio approaches 1:1), then calcium absorption can be reduced.


All nutrients need to be consumed in a balanced fashion. Details regarding nutrient requirements for horses based on age, size, and work are available.<sup>1</sup>

### Vitamin and Mineral Supplements

For most horses, a salt-supplemented, forage-only diet is anticipated to meet all dietary requirements. Nonetheless, some exceptions exist where supplementation is needed.

If only poor-quality hay is available or

the horse is 1) under stress; 2) an elite athlete on a high-grain diet; or 3) not eating well (e.g., recovering from illness or surgery), then a vitamin and mineral supplement might be needed.

Horse owners are encouraged to discuss dietary supplements with their veterinarians. 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 TheHorse.com article library under Nutrition/Supplements, then Vitamins/Minerals.

*Authored by Dr. Stacey Oke; reviewed by Dr. Fairfield Bain.*