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The ABC's of Vitamins

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Vitamins have been defined as organic compounds that take part in a wide range of metabolic functions. They are present in minute amounts in various ingredients, but can also be provided in pure form. In order to be classified as a vitamin, a substance must meet the following criteria: "1) it must be an organic compound different from fat, protein, and carbohydrate, 2) it must be a component of the diet, 3) it must be essential in minute amounts for normal physiologic function, and 4) its absence must cause a deficiency syndrome." (Gross, et al. 1)

Vitamins are divided into two categories. The fat soluble vitamins are A, D, E and K. These vitamins can accumulate in the body and, at certain levels (especially vitamins A and D), can cause toxicity. The B-complex vitamins, which are essential to the metabolism of all cells, and vitamin C, are water soluble. Excess amounts of these vitamins are eliminated in the urine. Although each of these vitamins has more than one function in the body, only the major roles will be listed in this article.

Fat Soluble

Vitamin A plays a role in vision, reproduction, metabolism, and keeping the skin and hair healthy. It aids in the adaptation of the eye to darkness, and the synthesis of certain hormones and proteins. Vitamin A also plays a vital part in fetal development. It is absorbed in the small intestine and stored in the liver. Meat, eggs, whole milk, and liver are some of the sources of Vitamin A.

Vitamin D regulates the metabolism of calcium and phosphorus. It helps increase absorption of these nutrients in the intestine, and helps to reduce the loss of them in the urine. Vitamin D also plays an important role in bone formation. In large-breed puppies, an excess of Vitamin D can cause osteochondritis (inflammation of bone and cartilage) resulting in malformation. Natural sources include fish liver oil, egg yolks, and milk.

Vitamin E is used as a nutritional weapon to prevent or treat many diseases resulting from free-radical activity. It is an active antioxidant in cell membranes, providing protection and helping to keep the membrane from being damaged by free-radicals. Vitamin E also boosts the immune system. It is found mainly in foods that are made from plants, and wheat germ is the most abundant source of this vitamin. It can also be found in fat and liver.

Vitamin K is most closely associated with blood clotting. However, it also has a function in bone formation, and the kidney's ability to reabsorb calcium. The liver is the primary place for storage of this vitamin. Meat and vegetables are the main sources.

Water Soluble

Vitamin B₁ (also known as **thiamine**) is considered to be one of the earliest known vitamins. In fact, symptoms of its deficiency in dogs were described even before the vitamin was discovered. It is necessary to help individual cells carry out intricate biochemical reactions that generate energy for each cell. This vitamin is crucial for the precise functioning of the nervous system. Vitamin B₁ is stored in the brain, liver, heart, and kidneys. Major sources are wheat germ and yeast, but it is also found in meat. It is very sensitive to heat.

Vitamin B₂ (also known as **riboflavin**) supports energy metabolism, and it is also one of the first B vitamins to be

discovered. It is required for activation and support of Vitamin B₆, folic acid, niacin, and Vitamin K. This vitamin helps support the skin and coat. It is important that this nutrient be supplied in the daily diet as there is very little storage in the body. Milk is a primary source of vitamin B₂. It is found in yeast, liver, cheese, and eggs. The intestinal bacteria of dogs also produce this vitamin. It is very sensitive to light.

Vitamin B₃ (also known as **niacin**) is important to dogs and cats to keep the skin healthy and the coat shiny. It also helps to drive the metabolic reactions which contribute to the production of energy from fats and sugars. Vitamin B₃ is an important component of a special blend of other nutrients which are very effective at protecting the skin barrier and limiting skin dehydration. It is present in most foods but is found in abundance in meat, fish, cereal, and mushrooms.

Vitamin B₅ (also known as **Pantothenic acid**) and is very common in food. It has an important role in almost every metabolic reaction that produces energy for the cell, whether that energy comes from protein, carbohydrate, or fats. Pantothenic acid is an important component of a special blend of other nutrients which are very effective at protecting the skin barrier and limiting skin dehydration. Meat, eggs, and dairy products are the primary sources of this vitamin.

Vitamin B₆ (also known as **pyridoxine**) is especially important for metabolism of amino acids, the building blocks of proteins. It also plays a role in the synthesis of Vitamin B₃, the immune response, and the functions of red blood cells and the nervous system. Main sources include yeast, wheat germ, and meat.

Vitamin B₈ (also known as **biotin**) is one of the best vitamins for maintaining a beautiful coat. It functions in the metabolism of glucose, fatty acids, and some amino acids. To some degree, Vitamin B₈ is synthesized by intestinal microbes. The main source in food is found in yeast, liver, kidney, and cooked eggs. Raw egg whites have a protein that binds with biotin, making it unavailable to the body. This protein is inactivated by heat so cooked eggs do not bind with the vitamin.

Vitamin B₉ (also known as **folic acid**) is for rapidly growing and dividing cells, such as those in a developing embryo. In fact, pregnant bitches that received supplemental folic acid had fewer puppies affected with cleft palate. This vitamin also plays a part in the development of the nervous system. Sources are liver, egg yolks, and green vegetables. It is sensitive to heat and extended freezing.

Vitamin B₁₂ (also known as **cobalamin**) is the only vitamin in which a mineral (cobalt) is part of its structure. It plays an important role in the production of red blood cells and protein synthesis. It is produced only by intestinal microbes. Main sources are meat, fish, and liver. It is not found in significant quantities in vegetables.

Vitamin C (also known as **ascorbic acid**) has an important role as an antioxidant. It also functions in the metabolism of iron, and the regeneration of Vitamin E. Dogs and cats can synthesize Vitamin C from glucose in the liver.

Choline & Inositol, while not true vitamins by definition, are sometimes attached to one of the group B vitamins. They are essential for preventing the buildup of fatty acids in the liver. These nutrients help to construct the cell membranes, and they are important components of a special blend of other nutrients which are very effective at protecting the skin barrier and limiting skin dehydration. Choline can be made from glucose in the liver, and inositol is produced by the conversion of glucose by intestinal bacteria. Dietary sources include meat, eggs, nuts (choline), and bovine liver and heart (inositol).

Vitamins are organic substances which, with few exceptions, cannot be made in the body. They must come from the diet or be supplemented. Without them, vital and complex metabolic reactions, important to sustaining health and life, could not happen.

References available upon request.

Unlike canines who have been man's companion for close to 12,000 years, cats were domesticated only a few centuries ago.



Want a gorgeous coat? Certain nutrients such as tyrosine and copper can intensify coat color.

I am just thrilled, and more importantly, so are my very picky little doggies! The other food we used to use is totally being ignored by my little pets, and I will no longer feed it to them.

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