

ANGRY DOGS EAT KITTENS



Vitamins are organic substances that cannot be synthesized by humans but are essential in small quantities. They are either water soluble or fat soluble. The fat soluble vitamins are Vitamins A, D, E, and K, or the mnemonic from medical school “Angry Dogs Eat Kittens”. Let us take a brief look at the fat soluble vitamins.

First since our bodies cannot make any vitamins, we must get them in our food, in supplements, or use the sun to help us. Because these vitamins are fat-soluble, people who have problems absorbing fat from their diet are particularly susceptible to deficiencies of these vitamins; some of those disorders include cystic fibrosis, celiac disease, liver disease, Crohn’s disease and pancreatic insufficiency.

VITAMIN A

History – More than 2,000 years ago, the Egyptians discovered that eating liver seemed to treat night blindness. It wasn't until the 1920's that a Swiss scientist isolated the fat-soluble compound in liver; it was called Vitamin A. Vitamin A comes in three basic forms, retinols, beta-carotenes, and carotenoids.

Biologic Actions - Vitamin A has several functions in the eye, specifically related to the cornea, the conjunctiva and the rods, those cells responsible for night vision. In undeveloped countries of the world, Vitamin A deficiency causing blindness is a major public health problem in children. Additionally Vitamin A is being used to treat skin disorders such as psoriasis, acne, and wrinkles.

Sources - Vitamin A is found in a wide variety of foods, both plant and animal. Common sources are liver, egg yolk, butter and green leafy vegetables. Supplementation is rarely indicated in the United States except in fat malabsorption conditions.

RDA – (Recommended daily allowance) 700 – 900 micrograms daily.

Toxicity – Toxicity from taking very large doses of Vitamin A can cause vomiting, vertigo, visual disturbances, fatigue, liver toxicity, bone and muscle pain, and hair loss. Additionally, large doses early in pregnancy can cause spontaneous abortions or fetal malformations (large doses include a single dose of 200,000 micrograms or chronic daily doses of 10,000 micrograms).

VITAMIN D

History – “Rickets” was first described in children in the 1600's. Bone demineralization, fractures and similar problems seemed to be caused by the deficiency of a fat soluble nutrient that wasn't discovered until the early 1900's; a short time later it was found that sunlight on skin produced the same or a very similar substance.

Biologic Actions - Vitamin D is responsible for the proper relationship of calcium in bone metabolism. Without Vitamin D, osteoporosis and osteomalacia can develop. Interestingly, sunlight and ultraviolet light turn a precursor in the skin into Vitamin D.

Sources - As above, the sun and skin are the primary determinants of Vitamin D in the human. In the diet, Vitamin D is found in fortified milk, fatty fish, cod liver oil and eggs. In some parts of the world, cereals and breads are fortified with Vitamin D.



RDA - A minimum intake of vitamin D of 200 IU (5 micrograms) is recommended. Higher doses are recommended in some people; pregnant and lactating women should take in 400 IU and the same is recommended for newborns (most formulas contain that much). Older adults at risk for osteoporosis should take 800 IU to minimize their risk of fracture.

Toxicity - A toxic dose of Vitamin D is not clearly established. It seems that 2,000 IU can easily be tolerated, although there have been cases of high calcium induced brain injury in children who had consumed large quantities in fortified milk and supplements.

VITAMIN E

History - In the 1920's, a research stable of infertile rats were found to be lacking a fat soluble substance; they became fertile when that substance was added to their diet. It was called tocopherol from the Greek "toc" (child) and "pherol" (to bring forth). It wasn't formally recognized as a vitamin until 1969.

Biologic Actions – Vitamin E protects cell membranes as an antioxidant and is essential in normal fetal and childhood development. It works as a free radical scavenger protecting the cells from oxidation and destruction.

Sources – Vitamin E is found in many foods, including oils, meat, eggs and leafy vegetables.

RDA – The actual recommended requirement is not clear since Vitamin E deficiency is very uncommon in humans except those with fat malabsorption disease. Additionally there are some genetic disorders that can lead to Vitamin E deficiency that can cause neurologic problems and blood diseases. Supplements have not been found to be of any benefit in any condition.

Toxicity - It is felt that supplementation of Vitamin E up to 400 IU per day is safe. Higher doses have caused deaths from bleeding and in fact all cause mortality.

VITAMIN K

History - This vitamin was first isolated in 1930; it was found to reverse bleeding problems in susceptible chicks and was named Vitamin K from the German/Danish word Koagulations Vitamin (clotting vitamin).

Biologic Actions - Vitamin K is required in blood clotting. When this vitamin is deficient there is a tendency for easy bruising, gum bleeding, GI bleeding and blood in the urine. In the newborn, this can lead to severe bleeding and thus it is given at birth.

Sources – Vitamin K is found in green vegetables like spinach and broccoli.

RDA - Although deficiency in the newborn is common (and thus supplemented), in adults it is rare since it is readily available in plants and easily recycled in cells.

Toxicity – There is no known upper limit of Vitamin K intake and thus toxicity is rare. However for patients on the anticoagulant, Coumadin, excessive dietary intake can diminish the therapeutic effect of the medication and definitely needs to be considered.