Chapter 8 Vitamins

The Skinny on Vitamins

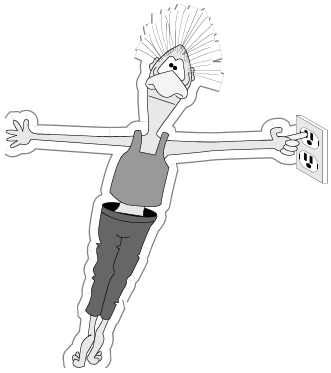
The body, itself, produces many substances which may, ultimately, form a vitamin. However, generally, vitamins cannot be made inside the body. Instead they must come from the foods we eat.

Unsolved Mysteries

These substances, although tiny in amounts, are quite **potent** and **essential** for several bodily functions and processes. Some vitamins are **soluble** in **water** and others in **oils**.

Many mysteries still exist about vitamins. Research to identify and isolate vitamins continues in laboratories all over the world. Sometimes they are "discovered" when a human or animal is steadily deprived of certain kinds of foods. The resulting conditions help researchers decide that a specific substance is causing the undesired effect. In other cases, a given malfunction or disorder in the body corrects itself when sufficient amounts of a specific substance is supplied.

"Do Vitamins Supply Energy?"



Vitamins are not "**true foods**." That is, they **don't supply energy**, nor do they **turn into tissue as do proteins**. They do not work like **fats** or **carbohydrates**. They have been compared to a **catalyst** or spark plug. They are **necessary** to make the process work properly or **optimally**.

As nutritional research moves forward, it is gradually being discovered that a certain vitamin, or combination of vitamins, is **essential** for health. This is because vitamins combine with **enzymes**. Vitamins are often termed **"co-enzymes."**

Simply stated, vitamins are substances that **regulate** a variety of everyday **biological functions** in your body. The **quantity** of each that is needed **varies** with each vitamin. Vitamins are **essential** for normal growth, good health and general day-to-day maintenance.

How to Identify a Vitamin

Two characteristics mark a particular compound for identification as a vitamin:

- The compound must be a **vital organic dietary substance** and not *carbohydrate, protein, fat* or *mineral*. It must be **necessary** in small quantities and perform a **specific metabolic function** or **be useful in preventing a deficiency disease.**

- It **cannot be produced by the body**. Instead, it must be supplied in food. (Vitamin D is the only exception to this rule).

Vitamin Classifications

Vitamins are classified in relation to their **solubility** in either **fat** or **water**. The fat-soluble group includes vitamins **A, D, E, & K**. These vitamins are usually associated with certain fatty foods, such as *animal meats, oil* or *dairy products*. These vitamins are more **heat-stable** than water vitamins. Therefore, less damage occurs during food preparation.

Fat Soluble

Vitamin A:

There are two basic forms of Vitamin A - **performed** and **provitamin A.** The performed vitamin A is found *only in animal sources*. It is usually associated with fats. The more common provitamin A (carotene) is found in *plants*. It was first discovered in carrots, thus deriving its name. The majority of human needs are obtained from plant sources, and carotene is converted into usable vitamin A by our bodies. When vitamin A enters your body, certain fat-related substances assist in its absorption. These substances are **bile salts**, **pancreatic lipase** and **fat** itself. The

most important functions are in the area of vision and tissue growth. Recent studies, however, associate vitamin A to *open-wound healing, severe burn healing, sexual functioning, diabetes,* and as a *possible aid in treating cancer patients*. Sources of vitamin A include colored fruits and vegetables, dairy products, eggs, margarine, fish liver oils and liver.

Vitamin D:

Vitamin D also requires the presence of **bile salts** to assist in its absorption. After being absorbed, vitamin D is carried to the **liver** and other organs to be utilized. Since Vitamin D is **stored in the liver**, there may be the same **potential for toxicity** as in Vitamin A. Vitamin D in the body is concerned mainly with the **absorption of calcium** and **phosphorus**. It makes the cell membrane more **permeable** to calcium and phosphorus, thus allowing the cell to utilize these materials. In the absence of Vitamin D, bones do not form properly, which can cause deformities during a child's growth years.

Vitamin E:

Vitamin E has been found to be a **group of related vitamins**. It is fairly stable to heat and acids, but can be **destroyed by alkaline**. One of the most important characteristics is its ability as an **anti-oxidant**. Vitamin E may be found in eight different **tocopherol forms**. However, most products contain only the **alpha-tocopherol**, and most contain the **synthetic** form. The synthetic form can be differentiated from the natural form by the **appearance of a small "1" after the "d" (i.e.:, d1-alpha tocopherol = synthetic).** Food sources of Vitamin E are mainly **vegetable oils**. Other food sources include: *milk, eggs, wheat germ, fish, green leafy vegetables,* and *cereals*.

Vitamin K:

Vitamin K has been known as the **blood clotting vitamin**. The major function of this vitamin is to **control the synthesis of prothrombin**. Prothrombin, which is produced by the liver, is necessary to initiate the blood clotting process of the body. Vitamin K is normally ***synthesized*** by the *bacteria in the intestinal tract*. An adequate supply is normally present in the average healthy person. The use of **antibiotics**, however, may **destroy or reduce the effectiveness** of the intestinal bacteria in producing adequate supplies. It is therefore suggested that when on

antibiotic therapy, substances that provide material to rebuild bacteria (such as acidophilus) should be considered. The first Vitamin K was derived from **alfalfa** which is still a good food source. Other sources include: *green leafy vegetables* and small amounts from *cheeses, tomatoes*, and *liver*.

Water Soluble

Vitamin B:

B vitamins are directly related to three main areas of our nutritional needs and support system. The first group includes: **thiamin, riboflavin**, and **niacin**, which relate to *alleviating various disease factors*. The second group includes **pyridoxine** and **Pantothenic acid** which have a role in *providing coenzyme factors to the body*. The third group includes **folic acid** and **B12** which are important *blood-forming factors*.

Vitamin B1 (Thiamine):

The absorption of Thiamine takes place mostly in the first section of the small intestines, the **duodenum**. Removal of either part or all of the duodenum resulting from an ulcer or injury will significantly affect Vitamin B absorption due to its being destroyed by alkaline intestinal secretions found in the lower intestinal tract. Thiamine is **not stored in large quantities** in the body. Therefore, daily intake is important. Its main **metabolic function** in our bodies is as a **coenzyme in key reactions that produce energy from glucose**. Clinical effects that may relate to a B1 deficiency may be seen in the **gastrointestinal, nervous** and **cardiovascular systems**.

Vitamin B2 (Riboflavin):

Absorption of B2 takes place mainly in the **upper section of the small intestines**. Similar to B1, **B2 is a vital factor in protein metabolism** and is also a part of a key enzyme system relating to the **production of energy in the cell.** B2 deficiencies rarely occur alone. They are usually associated with other nutritional deficiencies. **The best source of B2 is milk**. Other sources include: *organ meats*, *whole grains* and some *vegetables.*

Niacin (Nicotinic Acid):

Niacin teams up with riboflavin as a control agent in the **cell coenzyme system** that **converts protein to glucose**. Deficiencies of niacin are closely related to those of riboflavin. They may include: *weakness, loss of appetite, indigestion* and *skin eruptions*. Niacin also has a close relationship to **Tryptophan**. When Tryptophan is present in adequate amounts, a niacin deficiency will not occur. Our body utilizes the Tryptophan to produce the niacin.

Vitamin B6 (Pyridoxine):

B6 is absorbed in the **upper portions of the small intestines** and is usually found throughout the body tissue. B6 is **essential** in **deamination** and **transamination** which involve *moving nitrogen around to form different amino acids*.

Vitamin B3 (Folic Acid):

The absorption of folic acid takes place **throughout the small intestines**. Small amounts may be synthesized by intestinal bacteria. A deficiency of folic acid produces a nutritional *megaloblastic anemia*. This **large blood cell is unable to transport oxygen properly**.

Vitamin B12 (Cobalamin)

The vitamin B12 was discovered during the search for a specific agent to control pernicious anemia. B12 is **unique** and one of the **most complex of the B vitamins**. Its uniqueness comes from its chemical makeup which reveals the mineral **cobalt** at its core. B12 is the **only human nutrient known that requires exposure to HCL** in the **stomach** before it can be absorbed. The HCL prepares the vitamin and allows it to be absorbed. *Improper absorption of Vitamin B12 is the key factor in pernicious anemia.* Sources of B12 are almost **solely animal foods**. The best sources are *liver* and *dairy products*.

Pantothenic Acid

Pantothenic Acid is widespread throughout the body. It is synthesized in considerable amounts by **intestinal bacteria**. Because of this, production deficiencies are unlikely.

Pantothenic Acid assists in cellular energy production. It also is essential for the formation of acetylcholine (the regulator of nerve tissue) and assists in the production of cholesterol, steroid hormones and Vitamin D. Some sources of Pantothenic acid are: *yeast, liver, egg yolk* and *skimmed milk.*

Biotin

Biotin is a **coenzyme necessary for a variety of important functions** in our bodies. Biotin helps in the metabolism of carbohydrates, proteins and fats. It is needed for normal growth, healthier hair and skin and maintenance of nerves, bone marrow, and sex glands. Sources are *yeast, lever, eggs, whole grains*, and *fish*.

Choline Bitartrate

Choline Bitartrate has a relationship to **fat metabolism**. If the body has a problem breaking down fat, the fats have a tendency to be deposited in the tissues of organs, such as the *kidneys, liver, heart* and *vascular* system. Excessive quantities of fat in these organs interfere with the normal functioning of the cells and may be a cause of premature aging of that organ.

PABA (Para-amino benzoic acid)

PABA (Para-amino benzoic acid) is a member of the B-complex family. It stimulates intestinal bacteria to produce folic acid, and is involved in the utilization by the body of Pantothenic acid. PABA is most widely known as a good therapeutic sunscreen.

Inositol

Inositol is a member of the B-complex family. It occurs in high concentrations in the *brain*. Inositol may have a cholesterol-lowering quality. It has a tendency to break up fat in our systems when given with Choline.

Vitamin C

Vitamin C is absorbed from the small intestines. **It is not stored or produced by the body**. Therefore, an ample supply **must be taken in daily**. It is a very **unstable** vitamin and can be *destroyed by oxygen, alkalines, high temperatures* and *light.* Since it's easily destroyed, cooking vegetables and fruits should be kept to a minimum. Also the **more surface of a vegetable that is exposed to air, the less Vitamin C content will be retained.** Vitamin C acts as an intercellular cementing substance. It also helps to build and maintain bone and connective tissue. It aids in formation of hemoglobin, is active in wound healing; helps fight infections; maintains body resistance against a variety of ailments and maintains strong blood vessels. Sources include: **Citrus fruits, vegetables, potatoes, strawberries, green pepper, broccoli, melons, etc.**