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COIMBATORE-641 035, TAMIL NADU

19FTB202- BIOCHEMISTRY FOR FOOD TECHNOLOGY

UNIT 4 VITAMINS AND HORMONES

TOPIC 1,2,3,& 4 Vitamins and Types

The vitamins are natural and essential nutrients, required in small quantities and play a major role in growth and development, repair and healing wounds, maintaining healthy bones and tissues, for the proper functioning of an immune system, and other biological functions. These essential organic compounds have diverse biochemical functions.

There are thirteen different types of vitamins and all are required for the metabolic processes. The discovery of the vitamins was begun in the year 1912 by a Polish American biochemist Casimir Funk. Based on his research and discoveries on vitamins, their sources, functions and deficiency disorders, he is considered as the father of vitamins and vitamin therapy.

Similar to minerals, vitamins cannot be synthesized by our body. Therefore, we need to get them from the food we consume or in extreme cases supplements to keep ourselves healthy.

Although there are several vitamin types, they are all grouped under two broad categories. Vitamins are either soluble in fat or water; otherwise, they are dissolvable. Therefore, based on their solubility properties in fats and water, vitamins are classified into the following categories:

Fat-soluble Vitamins

Fat-soluble vitamins are stored in body cells, fatty tissues, and the liver. They are not consumed by the body more often than water-soluble vitamins. If fat-soluble vitamins exceed certain limits, they can behave like toxic. Despite this, these vitamins can remain in the human body for days or months because they are consumed in adequate amounts.

Fat-soluble vitamins involve four different vitamins, such as **vitamin A**, **vitamin D**, **vitamin E**, and **vitamin K**.

Water-soluble Vitamins

Unlike fat-soluble vitamins, water-soluble vitamins are not collected in the body. They travel freely through the body, and an excess amount of these vitamins is discharged from the body by urine. However, the body keeps a small reserve, and therefore, small amounts of these vitamins are needed to prevent deficiency. Although water-soluble vitamins do not act as toxic in excess, they can cause some other serious harm in the body. Water-soluble vitamins contain nine different vitamins, such as **vitamin C** and all types of **B vitamins**

Types of Vitamins

Typically, **there are 13 important types of vitamins**, such as vitamin A, vitamin C, vitamin D, vitamin E, vitamin K, and B vitamins (B1, B2, B3, B5, B6, B7, B9 and B12).

Vitamin A

This vitamin has many chemical names, such as retinal, retinol, and 'the four carotenoids', including beta carotene. Vitamin A is essential for good vision and a strong immune system. This vitamin helps create or maintain various organs, bones, healthy skin, teeth, soft tissue, better reproductive system etc. Some common vitamin A sources include eggs, fish, broccoli, sweet potato, pumpkin, carrots, milk, and more.

Vitamin B1 (thiamine)

This vitamin helps in generating various enzymes needed to break down blood sugar. Also, vitamin B1 helps the body cells to convert carbohydrates into energy. Women must obtain adequate carbohydrates during pregnancy and breastfeeding. Thiamine is the chemical name for vitamin B1 and is very important in the heart's functioning and keeping nerve cells healthy. Some good sources of this vitamin include cereal grains, yeast, pork, brown rice, potatoes, sunflower seeds, oranges, and more.

Vitamin B2 (riboflavin)

This vitamin works with other types of B vitamins. It mainly helps in the growth of the body, production of red blood cells and metabolizing food. The chemical name for the B2 vitamin is riboflavin. Some good sources of this vitamin include bananas, eggs, fish, green beans, yogurt, milk, cheese and more.

Vitamin B3 (niacin)

Vitamin B3 helps the body maintain good skin, cells, and nerves. Additionally, it can also cause cholesterol to be reduced when high doses of it are consumed. Besides, when the level of vitamin B3 in the body is low, it can cause pellagra disease. The chemical names for vitamin B3 include niacin and niacinamide. Some good sources of this vitamin include leafy vegetables, nuts and seeds, carrots, eggs, tomatoes, milk, and more.

Vitamin B5

The chemical name for vitamin B5 is Pantothenic acid. This vitamin is mainly required for the food metabolism process. Also, it plays an essential role in the development of energy, hormones and cholesterol. Some good sources of vitamin B5 include yogurt, broccoli, whole grains, avocado etc.

Vitamin B6

Vitamin B6 is also known by its chemical names, such as pyridoxamine, pyridoxine, and pyridoxal. This vitamin is beneficial for the development of red blood cells and also helps maintain brain functioning. Despite this, vitamin B6 also plays a crucial role in the management of proteins in the body. The more protein we consume, the more vitamin B6 our body needs. Some good sources of vitamin B6 include nuts, squash, bananas, chickpeas, etc.

Vitamin B7 (Biotin)

Vitamin B7 mainly helps the body in the metabolism process of carbohydrates, fats and proteins. Furthermore, it is essential for the development of cholesterol and hormones in the body. Besides, vitamin B7 contributes to keratin, a structural protein required for skin, nails, and hair. The chemical name for vitamin B7 is known as biotin. If biotin levels are low in the body, it can cause dermatitis or intestinal inflammation. Some good sources of vitamin B7 are cheese, broccoli, egg yolk, spinach, and more.

Vitamin B9 (Folate or Folic Acid)

Vitamin B9 is mainly known as folate, which works well with vitamin B12 to make red blood cells in the body. Other chemical names of this vitamin include folic acid and folinic acid. To avoid any problems during childbirth, women are always said to have sufficient folate during pregnancy. Some good sources of this vitamin include sunflower seeds, leafy vegetables, some fortified cereals, peas, legumes etc. Most foods and fruits contain moderate amounts of folate.

Vitamin B12 (Cyanocobalamin)

Like most vitamins, vitamin B12 also helps in the metabolic process. Additionally, it can produce red blood cells in the body to keep the central nervous system healthy. The chemical names of vitamin B12 are cyanocobalamin, methylcobalamin, and hydroxocobalamin. Some good vitamin B12 sources include fortified soy products, fortified cereals, fortified nutritional yeast, fish, eggs, and many dairy products.

Vitamin C

Vitamin C acts as an antioxidant and participates in bone formation, collagen production, wound healing and maintaining healthy teeth and gums. It also helps the body to absorb a sufficient amount of iron to keep the body tissues healthy. Besides, vitamin C supports a strong immune system and blood vessel production. Ascorbic acid is the chemical name of vitamin C. Fruits and vegetables are best known for providing vitamin C; however, cooking destroys vitamins' presence.

Vitamin D

The main source of vitamin D is sunshine, and hence, it is also known as 'sunshine vitamin'. Usually, ten to fifteen minutes of sunlight without sunscreen is sufficient to meet the body's vitamin D requirement. Chemical names for this vitamin include ergo calciferol and chole calciferol. Like calcium, vitamin D also helps in the formation of bone tissue and strengthens bones. This ultimately plays an essential role in fighting germs. Some other vitamin D sources include fortifying cereals, fish, eggs, mushrooms, milk, and dairy products such as cheese and yogurt.

Vitamin E

Vitamin E acts as an antioxidant in the body and helps the body form a strong defense system against diseases. It also helps the body to produce red blood cells and prevent oxidative stress. Chemical names for vitamin E include tocopherol and tocotrienol. Although vitamin E deficiency is rare, it can cause hemolytic anemia in newborns. This problem usually destroys the red blood cells in the body. This problem usually destroys red blood cells in the body. Some good vitamin E sources include leafy green vegetables, wheat, corn, nuts, margarine, eggs, almonds, kiwis and vegetable oils.

Vitamin K

Vitamin K is essential for the body because it primarily participates in blood clots. Blood coagulation would not be possible without the presence of this vitamin. It can also sometimes help in the production of healthy bones. This vitamin is commonly found in natto, figs, parsley, pumpkin and leafy green vegetables such as kale, cabbage, broccoli, and spinach.

ABSORPTION OF VITAMINS:

Where are Vitamins Absorbed?

When you swallow a vitamin, it immediately enters the digestive system. With the help of hydrochloric acid and other enzymes in the stomach, the vitamins and nutrients are released from its carrier (food or pill) and the pancreas will release bile to assist the digestion process. The vitamins then move on to the small intestine, and then into your blood. These vitamins absorbed into your bloodstream are then passed to the liver. If the vitamins are needed immediately, or if they can be stored for later use. Excess vitamins absorbed will be passed through to your kidneys and then released through urine.

Are My Vitamins Absorbed Properly and Efficiently?

To make sure your vitamins are absorbed properly, take care of the organs that aid in absorption. Avoid excessive alcohol use, which can damage the liver, stomach and intestines. Because of the liver's involvement in vitamin absorption, many alcoholics suffer from low levels of folate and biotin, to name a few.

Some digestive or intestinal disorders speed up your digestion. If you suffer from one of these, take note of the vitamins you're ingesting as these vitamins absorbed might not be processed thoroughly due to your rapid digestive system.

How are Vitamins Absorbed?

Some vitamins absorbed by your body help others get absorbed better. For example, calcium relies on vitamin D in order to be absorbed. On the flip side, some vitamins can be toxic when taken together. For example, copper and zinc will compete with each other in the body, so if your body experiences an increase in zinc, the copper will have fewer places to absorb in the small intestine. This Harvard Health study explains how different vitamins work together in your body.

The percentage of the vitamin actually absorbed by the body is dependent on many factors including the vitamin itself, your age, how much of the vitamin your body needs due to your individual biomechanic needs (like pregnancy or growth in children) and even time of day. Optimize your body for vitamin absorption by eating well, sleeping well, caring for your body, and taking your vitamins at a consistent time daily.

What form of vitamin is best absorbed?

Now that you know how vitamins are absorbed, what's the best form to ingest? food and diet as the best form. But with busy work, life and social schedules, it's not always possible to eat a variety of foods in order to reach the daily recommended value of each vitamin. Therefore, we have to take matters into our own hands -- or skin -- to supplement your diet.

Do vitamin patches work the same way as vitamins in pill form?

Vitamins absorbed through your skins are just as effective as those in pill form, but with the added benefit of avoiding the nuisance of pill-swallowing to get all of the necessary daily vitamins and minerals.

