

# Vitamins

- Vitamins are organic compounds that regulate cellular metabolism, assisting the biochemical processes that release energy from digested food.
- Vitamins are called micronutrients because they are needed in small quantities when compared with other nutrients (water, carbohydrates, proteins, and fats).
- Vitamin requirements are dependent on many factors, such as:
  - a. body size.
  - b. amount of exercise.
  - c. rate of growth, and,
  - d. pregnancy.

- Vitamins cannot be manufactured by the body in sufficient quantities to sustain life, so it must be supplied by the diet .
- The total volume of vitamins a healthy person normally requires each day would barely fill a teaspoon , Thus the units of measure for vitamins ( e.g. milligrams or micrograms ) , all vitamins are essential to life

Thus, when vitamins are lacking in the diet, metabolic deficits result

## Classifications of vitamins

**Water-soluble vitamins**, include : •

1. Vitamin C and ,
2. B-complex vitamins:
  - B 1(thiamine),
  - B (riboflavin),
  - B3 (niacin or nicotinic acid),
  - B6 (pyridoxine),
  - B~ (folic acid),
  - B 12 (cobalamin),
  - pantothenic acid, and biotin.

**The body cannot store water-soluble vitamins; thus, people must get a daily supply in the diet. Water-soluble vitamins can be affected by food processing, storage, and preparation.** •

## **Fat-soluble vitamins, include :**

1. Vitamin A.

2. Vitamin D.

3. Vitamin E, and,

4. Vitamin K.

- The body can store these vitamins, although there is a limit to the amounts of vitamins E and K the body can store.
- Therefore, a daily supply of fat-soluble vitamins is not absolutely necessary.
- Vitamin content is highest in fresh foods that are consumed as soon as possible after harvest.

## Functions of Vitamins

**Although each vitamin has specific metabolic task , general functions of vitamins •  
are**

1. components of coenzymes .
2. antioxidants .
3. hormones that affect gene expression .
4. a component of cell membranes , and
5. a component of the light – sensitive rhodopsin molecule in the eyes ( vitaminA)

## Vitamin metabolism

- The way in which our bodies digest , absorb , and transport vitamins depends on the vitamin's solubility .
- Vitamins traditionally are classified as either fat soluble or water soluble
- The fat – soluble vitamins are A,D,E, and K .
- The water – soluble vitamins are C and all the B vitamins .
- **Fat –Soluble vitamins**
- Unlike water – soluble vitamins fat soluble vitamins can be stored in the liver and in adipose tissue for long periods.
- The body uses this reserve in times of inadequate intake.
- Fat soluble vitamin accumulation in the liver and in adipose tissue is the reason that excess intake can result in toxicity overtime.

## Water Soluble vitamins

- With the exception of vitamins B12 and B6 and folic acid the body does not store water – soluble vitamins to any significant extent.
- Therefore, the body does not have a reserve supply and requires foods rich in water – soluble

Vitamin	functions	Sources
Vitamin A (retinol, retinal, retinoic acid)	<ul style="list-style-type: none"><li>• Epithelial tissue proliferation</li><li>• Retinal pigmentation</li><li>• Immune system (antigen recognition).</li></ul> Antioxidant	Whole milk and whole milk products, eggs, fruits and vegetables (green leafy and yellow), fish, animal liver, fish liver oil. Caution: Do not exceed a daily dose of over 10,000 international units if pregnant or history of liver disease

<p><b>Vitamin D</b> (cholecalciferol, ergosterol)</p>	<ul style="list-style-type: none"> <li>• <b>Bone and tooth development.</b></li> <li>• <b>Enhances immunity</b></li> </ul>	<p><b>Fortified milk, margarine, eggs, fish, cod liver oil, oatmeal, sweet potatoes, vegetable oils</b></p>
<p><b>Vitamin E</b> <b>Vitamin E(tocopherol)</b></p>	<ul style="list-style-type: none"> <li>• Synthesis of heme.</li> <li>• Antioxidant.</li> <li>• prevents oxidation of polyunsaturated fatty acids and of vitamins A and C</li> </ul>	<p><b>Cold-pressed vegetable oils, dark green leafy vegetables, milk, eggs, meats, legumes, nuts, seeds, whole grains</b></p>
<p><b>Vitamin K</b></p>	<ul style="list-style-type: none"> <li>• <b>Formation of prothrombin, blood clotting</b></li> <li>• <b>Bone formation &amp; repair; synthesis of osteocalcin.</b></li> </ul>	<p><b>Dark green leafy vegetables, asparagus, broccoli, Brussels sprouts, cabbage, cauliflower, egg yolks, liver, oatmeal, oats, rye, safflower oil, soy beans, wheat</b></p>



## Water soluble vitamins

Vitamin	functions	Sources
B complex Vitamin B1 (thiamine)	<ul style="list-style-type: none"><li>• Metabolism of carbohydrates and some amino acids (energy).</li><li>• production of hydrochloric acid.</li><li>• Enhances circulation and,</li><li>• assists in blood formation</li></ul>	<b>Pork, fish, eggs, poultry, dried beans, whole grains, wheat germ, oatmeal, bread, pasta, brown rice, legumes, rice bran, peanuts</b>
<b>Vitamin B2 (riboflavin)</b>	<ul style="list-style-type: none"><li>• <b>Oxidation and reduction of carbohydrates, fats, and proteins.</b></li><li>• <b>Red blood cell (RBC) formation.</b></li><li>• <b>antibody production</b></li></ul>	<b>Milk, whole grains, green vegetables, liver, cheese, egg yolks, fish, legumes, meat, poultry, yogurt</b>

<b>Vitamin B6</b> <b>(pyridoxine)</b>	<b>Functions as coenzyme to:</b> <ul style="list-style-type: none"> <li>• <b>protein and amino acid metabolism.</b></li> <li>• <b>absorption of fats and protein</b></li> </ul>	<b>Whole grains, liver, fish, poultry, green beans, meats, nuts, potatoes, eggs, brewer's yeast</b>
<b>Vitamin B12</b> <b>(cobalamin compounds)</b>	<ul style="list-style-type: none"> <li>• Metabolically functions as a coenzyme: hydrogen acceptor and replication of genes</li> </ul>	<b>Milk, eggs, cheese, meat, fish, poultry, brewer's yeas</b>
<b>Biotin</b>	<ul style="list-style-type: none"> <li>• Synthesis of fatty acids.</li> <li>• Protein metabolism.</li> <li>• Utilization of glucose</li> </ul>	<b>Liver, kidneys, dark green vegetables, egg yolk, green beans, brewer's yeast, milk,</b>
		<b>poultry, saltwater fish, whole grains</b>
<b>Vitamin C (ascorbic acid)</b>	<ul style="list-style-type: none"> <li>• <b>Formation of RBCs.</b></li> <li>• <b>Production of collagen (capillary wall integrity)enzyme.</b></li> <li>• <b>Metabolism of amino acids.</b></li> <li>• <b>Prevention of oxidation of vitamins</b></li> </ul>	<b>Citrus fruits, strawberries, cantaloupe, fresh vegetables:potatoes, cabbage, tomatoes, broccoli, green peppers</b>

<b>Folic acid (pteroylglutamic acid)</b>	<ul style="list-style-type: none"> <li>• Synthesis of purines and thymine (DNA formation).</li> <li>• Maturation of RBCs.</li> <li>• Functions as coenzyme in DNA and RNA synthesis</li> </ul>	Liver, green leafy vegetables, meat, fish, poultry, whole grains, barley, bran, brewer's yeast, brown rice
<b>Niacin (nicotinic acid)</b>	<ul style="list-style-type: none"> <li>• Coenzyme in energy metabolism</li> </ul>	Meats, dairy products, whole grains, cereals, tuna, broccoli, carrots, cheese, corn flour
<b>Pantothenic acid</b>	<ul style="list-style-type: none"> <li>• Metabolism of carbohydrates and fats.</li> </ul>	Meats, whole grain cereals, legumes

symptoms of vitamin A toxicity include dry, itchy skin, headache, nausea, and loss of appetite. Signs of severe overuse over a short period of time include dizziness, blurred vision and slowed growth.

Vitamin A toxicity can also cause severe birth defects and may increase the risk for bone loss and hip fractures.

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Signs of vitamin D toxicity include excess calcium in the blood, slowed mental and physical growth, decreased appetite, nausea and vomiting.

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Megadose of supplemental vitamin E may pose a hazard to people taking blood-thinning medications such as Coumadin (also known as warfarin) and those on statin drugs.

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People taking blood-thinning drugs or anticoagulants should moderate their intake of foods with vitamin K, because excess vitamin K can alter blood clotting times. Large doses of vitamin K are not advised.