

VITAMINS

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Vitamins (1)

- *Vita* dari bahasa latin *hidup* dan *-amine* suffix is for *amine*; at the time it was thought that all vitamins were amines.



Vitamins (2)

- **Avitaminosis** adalah kekurangan vitamin dalam waktu yg lama
- **Hypervitaminosis** adalah kelebihan vitamin, biasanya kelebihan Vit yang larut dalam lemak.
- Pembagian vitamin:
 1. Vitamin larut dalam lemak (A, D, E & K)
 2. Vitamin larut dalam air (B dan C)



Vitamin yang Larut Dalam Air

- **Vitamin C** - Ascorbic acid
- **Vitamins B**
 - **Vitamin B-1** (Thiamine)
 - **Vitamin B-2**, also Vitamin G (Riboflavin)
 - **Vitamin B-3**, also Vitamin P or Vitamin PP (Niacin)
 - **Vitamin B-5** (Pantothenic acid)
 - **Vitamin B-6** (Pyridoxine and Pyridoxamine)
 - **Vitamin B-7**, also Vitamin H and Vitamin B-w (Biotin)
 - **Vitamin B-9**, also Vitamin M and Vitamin B-c (Folic acid) - important for pregnancies
 - **Vitamin B-12** (Cyanocobalamin)



Vitamin yang Larut Dalam Lemak

- **Vitamin A – Retinol**
- **Vitamin D**
 - **Vitamin D2 - Ergocalciferol**
 - **Vitamin D3 - Cholecalciferol**
- **Vitamin E - Tocopherol**
- **Vitamin K**

Attention!

Risk of hypervitaminosis!

Vitamin A

- **Nama Latin** : Retinol
- **Zat Pelarut** : Fat/lemak
- **Dosis harian** : 620 μ g
- **Sumber:**
 - **Tanaman** : sayuran hijau, buah-buahan berwarna cerah
 - **Hewan** : Susu, hati, telur, minyak ikan
- **Fungsi:**
 1. Antioxidant.
 2. Memproduksi rhodopsin (pigmen untuk penglihatan),
 3. memproduksi hormon pertumbuhan.
- **Kekurangan:**
 1. Ketajaman penglihatan berkurang
 2. Kurangnya kekebalan tubuh
 3. Metabolisme zat besi terganggu
- **Hypervitaminosis:** 7.5 mg or dosis tinggi.



Vitamin A toxicity

- Livers of certain animals, especially those adapted to polar environments (polar bears) contain toxic dose of vitamin A.
- Vitamin A supply:
 - Osteoporosis
 - Lung cancer
 - Teratological effects



Vitamin E

- **Chemical Name:** Tocopherol
- **Solubility:** Fat
- **Daily dose:** 12 mg
- **Source:**
 - **Plants:** Vegetable oils, nuts, green leafy vegetables
 - **Animals:** milk, eggs, meat
- **Function:** Antioxidant. Vitamin E is often used in skin creams and lotions because it is believed to play a role in encouraging skin healing and reducing scarring after injuries such as burns.
- **Deficiency disease:**
 - Persons who cannot absorb dietary fat, has been found in premature, very low birth weight infants
 - Individuals who cannot absorb fat may require a vitamin E supplement because some dietary fat is needed for the absorption of vitamin E from the gastrointestinal tract.
 - Muscle dystrophy, sterility.
- **Hypervitaminosis:** 4,000 mg or higher dose, not clear yet. May have anticoagulant effect and increase the risk of bleeding problems?



Vitamin D

- **Chemical Name:** D3 = cholecalciferol
- **Solubility:** Fat
- **Daily dose:** 2 µg for all Vitamin D
- **Source:** fish oil, fish liver
 - It is made in the skin when cholesterol reacts with ultraviolet light in the skin.
- **Function:** The most active form of the vitamin is calcitriol, a potent steroid hormone. Calcitriol is synthesized from calcidiol in the kidneys to perform its endocrine function of maintaining the calcium metabolism.
- **Deficiency disease:**
 - Rickets (kids) = bone pain, slowed growth, dental problems, muscle loss and increased risk of fractures.
 - Osteomalacia (adults) = lack of calcium results in bone fragility
 - In certain parts of the world, particularly at higher latitudes, total vitamin D input is usually not sufficient, especially in the winter (milk with D2 or D3)
- **Hypervitaminosis:** 1,250 mg or higher dose, hypercalcemia, atherosclerosis



Vitamin K

- **Chemical Name:** Naphthoquinone
- **Solubility:** Fat
- **Daily dose:** 75 µg
- **Source:** vegetables
- **Function:**
 - Involved in the carboxylation of certain glutamate residues in proteins to form gamma-carboxyglutamate residues.
 - blood coagulation (prothrombin-factor II, factors VII, IX, X)
 - bone metabolism
 - vascular biology
- **Deficiency disease:** Bleeding.
 - Normally it is produced by bacteria in the intestines, and dietary deficiency is extremely rare unless the intestines are heavily damaged.
 - Vitamin K-deficiency may occur by disturbed intestinal uptake (such as would occur in a bile duct obstruction), by therapeutic or accidental intake of vitamin K-antagonists
- **Hypervitaminosis:** GIT disorders, increased coagulation - anemia



Vitamin C (1)

- **Chemical Name:** Ascorbic acid
- **Solubility:** Water
- **Daily dose:** 75 mg
- **Source:**
 - **Plants:** Citrus fruits (orange, lemon, grapefruit, lime), tomatoes, potatoes, cabbage, wild roses
- **Function:**
 - Participation in hydroxylation, vitamin C is needed for the production of collagen in the connective tissue.
 - Strong antioxidant.
 - Required for synthesis of dopamine, noradrenaline and adrenaline in the nervous system or in the adrenal glands.
 - Vitamin C is also needed to synthesize carnitine, important in the transfer of energy to the cell mitochondria.



Vitamin C (2)

- **Deficiency disease: Scurvy**
 - loose teeth
 - superficial bleeding
 - fragility of blood vessels
 - poor healing
 - compromised immunity
 - mild anemia
- **Hypervitaminosis: Not known**



Vitamin B-1

- **Chemical Name:** Thiamine or thiamin
- **Solubility:** Water
- **Daily dose:** 1 mg
- **Source:**
 - **Plants:** yeast, pulse, cereal
 - **Animals:** liver
- **Function:** Cofactor in decarboxylation processes.
- **Deficiency disease:** Beri-beri, GIT disorders (*anorexia, nausea, vomiting*), tiredness, weakness, PNS disorders (*paresthesia, coordination disorders*), psychic disorders (*depression, irritation, disorders in memory and coordination*).
- **Hypervitaminosis:** Not known.



Beri-Beri

- In people whose staple diet consists mainly of polished white rice, which contains little or no thiamine.
- Disease of nervous system
- Symptoms
 - weight loss, emotional disturbances, impaired sensory perception (Wernicke's encephalopathy), weakness and pain in the limbs, and periods of irregular heartbeat.
 - Swelling of bodily tissues (edema) is common.
 - may cause heart failure and death.



Vitamin B-2 (1)

- **Chemical Name:** Riboflavin or Vitamin G
- **Solubility:** Water
- **Daily dose:** 1.1 mg
- **Source:**
 - **Plants:** leafy green vegetables, yeast, almonds, soybeans
 - **Animals:** milk, cheese, liver
- **Function:**
 - supports energy production by aiding in the metabolising of fats, carbohydrates, and proteins.
 - required for red blood cell formation and respiration, antibody production, and for regulating human growth and reproduction.
 - essential for healthy skin, nails, hair growth and general good health, including regulating thyroid activity.
 - helps in the prevention or treatment of many types of eye disorders, including some cases of cataracts.



Vitamin B-2 (2)

- **Deficiency disease:**

- **lesion of GIT mucous** (*glossitis, stomatitis, corner of mouth, cheilitis*)
- **skin diseases** (*dermatitis*)

- **Hypervitaminosis:** Not known



Vitamin B-3

- **Chemical Name:** Niacin or Vitamin P, resp. PP or nicotinic acid
- **Solubility:** Water
- **Daily dose:** 12mg
- **Source:**
 - **Plants:** yeast, corn
 - **Animals:** eggs, liver
- **Function:** its derivatives such as NADH play essential role in energy metabolism in cell and DNA repair.
- **Deficiency disease:**
 - mild deficiency slows down the metabolism, which in turn decreases cold tolerance and is a potential contributing factor towards obesity.
 - **Pelagra:** caused by dietary lack of niacin and protein, especially the essential amino acid tryptophan. **Symptoms:** red skin lesions, diarrhea, dermatitis, weakness, mental confusion, and eventually dementia.
- **Hypervitaminosis:** 2,500 mg or higher dose. **Symptoms:** High blood pressure, low blood cholesterol levels



Vitamin B-5

- **Chemical Name:** Pantothenic acid
- **Solubility:** Water
- **Daily dose:** 10 mg
- **Source:**
 - **Plants:** yeast, whole grain cereals
 - **Animals:** eggs, liver
- **Function:** Part of CoA. Necessary for breaking down carbohydrates, proteins, and fats.
- **Deficiency disease:** allergies (e.g. stuffed or runny nose), adrenal insufficiency (Addison's disease) and rheumatoid arthritis. Dermatitis, enteritis, alopecia.
- **Hypervitaminosis:** Not known



Vitamin B-6

- **Chemical Name:** Pyridoxine
- **Solubility:** Water
- **Daily dose:** 1.1 mg
- **Source:**
 - **Plants:** yeast, whole grain cereals
 - **Animals:** liver
- **Function:** Balancing of Na⁺ and K⁺, promoting red blood cell production. It is linked to cancer immunity and helps fight the formation of homocysteine. Helps children with learning difficulties, may prevent dandruff, eczema, and psoriasis. Helps balance hormonal changes in women.
- **Deficiency disease:** Anemia, nerve damage, seizures, skin problems, and sores in the mouth. Pyroluria.
- **Hypervitaminosis:** 400 mg or higher dose. Causes temporary deadening of certain nerves (proprioceptive nerves) and feeling of disembodiment common with the loss of proprioception.



Vitamin B-7

- **Chemical Name:** Biotin or Vitamin H
- **Solubility:** Water
- **Daily dose:** 30 μg
- **Source:**
 - **Plants:** yeast
 - **Animals:** seafood, liver, kidneys, milk, eggs
- **Function:** Important in the catalysis of essential metabolic reactions to synthesize fatty acids, in gluconeogenesis, and to metabolize leucine.
- **Deficiency disease:** Hair loss which progresses in loss of eye lashes and eye brows. Dry skin, seborrheic dermatitis, fungal infections. Changes in mental status, depression, generalized muscular pains (myalgias), hyperesthesias and paresthesias
- **Hypervitaminosis:** Not known



Vitamin B-9

- **Chemical Name:** Folic acid or Vitamin M
- **Solubility:** Water
- **Daily dose:** 320 µg
- **Source:** Green vegetable, fruits, cereals
- **Function:** Production and maintenance of new cells (especially during infancy and pregnancy), necessary for replicating DNA and synthesizing RNA. Both adults and children need folate to make normal red blood cells and prevent anemia.
- **Deficiency disease:**
 - Diarrhea, loss of appetite, weight loss, weakness, sore tongue, headaches, heart palpitations, irritability, and behavioral disorders.
- **Hypervitaminosis:** 1,000 µg or higher dose. Low risk - may shade the B12 deficiency.



Vitamin B-12

- **Chemical Name:** Cyanocobalamin
- **Solubility:** Water
- **Daily dose:** 2 µg
- **Source:**
 - **Plants:** breakfast cereals (only source for vegetarians)
 - **Animals:** Liver, shellfish, eggs, milk
- **Function:** coenzyme in metabolism of aminoacids, stimulates erythropoiesis
- **Deficiency disease:**
 - **Megaloblastic anemia** = inadequate intake of B12
 - **Pernicious anemia** = autoimmune anemia (antibodies are directed against intrinsic factor). Intrinsic factor is required for vitamin B12 absorption, so impaired absorption of vitamin B12 can result. The term *pernicious anemia* is sometimes used more loosely to include non-autoimmune causes of vitamin B12 deficiency.
 - Malabsorption in terminal ileum, demyelination of periferal nerves.
- **Hypervitaminosis:** Now known