

Definition of Vitamin:

Vitamins are organic compounds and minerals or chemical components that are needed as nutrients in tiny amounts by an organism.



• A vitamin is:

A chemical compound distinct from fats, carbohydrates and proteins

- Natural element of foods, gift in minute amounts
- Is essential for traditional physiological operate, typically in minute amounts
- Cause a selected deficiency syndrome once absent or underutilized
- Is NOT synthesized by the host in amounts capable meet
- normal physiological needs: human will create vitamins D3 and B3

Vitamers square measure completely different types of a selected nourishment, e.g. vitamins K1 and K2, v amins D2 and D3, A and retinal (vitamin A), etc.

Origin of Vitamin

. • Beriberi: a historic malady prevailing in Asian population because of major consumption of white rice

- 1897, medico found vitamin B1 in water or alcohol extracts of rice polishing
- 1901, Gerrit Grins suggested beriberi-producing diets lack a certain substance that are important in central nervous system.
- 1911, Casimir Funk isolates amine-containing concentrate from rice polishing that cured avitaminosis in Associate in Nursing animal model and names it as “vitamin” for “vital amine”. This was later found to be B complex, vitamin B1

- 1912, Funk published the vitamin theory: antiberiberi, ant rickets, ant scurvy, and ant pellagra vitamins.
- 1920, Jack Drummond suggested to drop “e” from “vitamin” since not all of them are proven to be amines.

Pre-Vitamin History

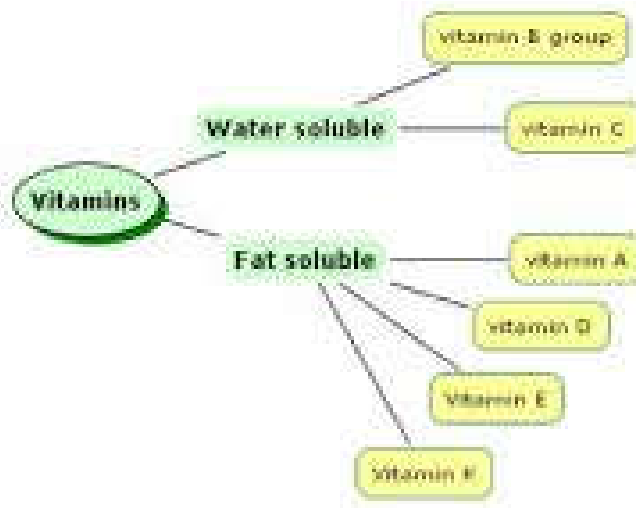
- 1500 BC – Ancient Egyptians used liver - rich in vitamin A – applied to the eye to treat night blindness.
- 1536 – Jacques Cartier, exploring the St. Lawrence River, uses local native knowledge to save his men from scurvy by boiling the needles from cedar trees to make a vitamin C-rich tea.
- 1795 – British navy adds lemons to sailors' rations, 40 years after a Scottish naval surgeon, James Lind, had urged that citrus fruits be used to prevent scurvy.
- 1884 – Japanese navy eradicates beriberi by feeding sailors meat and fruit in addition to polished white rice, which lacked the thiamine-rich husks.
- 1911 – Casimir Funk names antiberiberi factor as vitamin.
- 1912 – Xavier Mertz – Antarctic explorer – dies of vitamin A poisoning from ingesting sled dog liver after supplies are lost in a crevasse.

History of Discovery – cont'd

Year discovered	Vitamin	Source
1912	Vitamin A (thiamin)	Rice bran
1912	Vitamin C(ascorbate)	Lemons
1913	Vitamin A	Milk/egg yolk
1918	Vitamin D	Cod liver oil
1920	Vitamin B2 (riboflavin)	Eggs

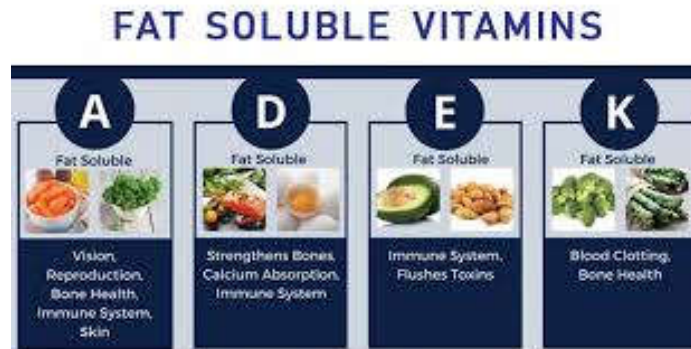
1922	Vitamin E	Wheat germ, Seed oils
1926	Vitamin B12 (cobalamin)	Liver
1929	Vitamin K	Alfalfa
1931	Vitamin B5 (pantothenic acid)	Liver
1931	Vitamin B7 (biotin)	Liver
1934	Vitamin B6 (pyridoxine, etc.)	Rice bran
1936	Vitamin B3 (niacin)	Liver
1941	Vitamin B9 (folate)	Liver

Classification of Vitamins Based on Solubility



• Fat-soluble vitamins: A, D, E, K:

- Small amounts of A, vitamin D, fat-soluble vitamin and antihemorrhagic factor are required to keep up healthiness.
- Fat-soluble vitamins won't be lost once the foods that contain them are saluted.
- The body doesn't want these vitamins daily and stores them within the liver and fat (fat) tissue once not used



• **Water-soluble vitamins:**

- Thiamin (Vitamin B1)
- Riboflavin (Vitamin B2)
- Niacin (Vitamin B3)
- Pantothenic Acid.
- Vitamin B6.
- Folic Acid.
- Vitamin B12.

Storage and Excretion

• **Fat-soluble vitamins: ADEK**

– Well preserved within the body and have a tendency to be hold on in fatty tissues: fatty muscles, liver so, it takes time to achieve a deficiency state, a lot of possible to cause toxicity on over-dosage as a result of the slow clearance

• **Water-soluble vitamins: BC**

Excreted speedily and not well maintained

– would like regular replacement

– solely cobalamin and B9 maintained and keep at vital level within the body

Functions

- Per definition, vitamins are essential to several life processes

- Energy production by oxidation of biological molecules
- creating biological molecules
- Maintenance, growth, development, and/or production
- Some vitamins participate in protection processes as antioxidants directly or indirectly:
E, C, A, B2

Multivitamins

- it's calculable that ~30% of the adult North American nation population take multivitamins daily.
- A clinical test of male physicians taking multivitamins finished there was a really modest, however (statistically) important, reduction in total cancers with daily multivitamin pill use (NEJM, 308:1871 (2012)).
- can we got to supplement diets with vitamins/ multivitamins? underneath bound circumstance

When square measure nutriment Supplements Worthwhile?

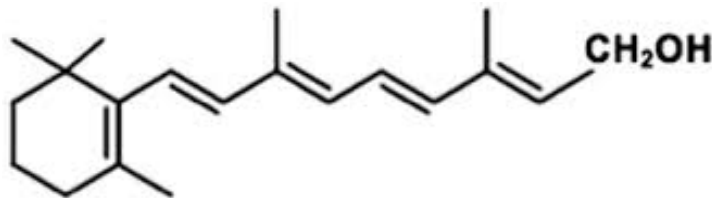
- Inadequate intake – alcoholics, poor, old dieters, poor diet
- redoubled wants – gestation, lactation, infants, smokers, injury, trauma, recovery from surgery, infection, bound genetic disorders of metabolism
- Poor absorption – old, canal disorders, specific GI surgeries, e.g. bladder removal, viscus bypass, pancreatic fibrosis, severe looseness of the bowels, drug-induced nutriment deficiencies – e.g. future antibiotic use, cholestyramine, oil

Reference Intakes (DRI)

- DRI Reports made by the Food & Nutrition Board of the Institute of drugs, National Academies of Science. <https://www.nal.usda.gov/fnic/dietary-referenceintakes>
- calculable average necessities (EAR): the common daily nutrient intake level calculable to satisfy the necessities of half the healthy people in an exceedingly cluster.

- suggested Dietary Allowance (RDA): the common daily dietary intake level; enough to satisfy the nutrient necessities of nearly all (97-98%) healthy people in an exceedingly cluster. Calculated from the EAR.
- Tolerable higher Limit (UL): most adult daily intake unlikely to cause hurt.

1. Vitamin A



Vitamin A
All Trans Retinol

Vitamin A may be a cluster of unsaturated nutrition ARY organic compounds that features vitamin A, retinal, retinoic acid, and a number of other carotid carotenoids (most notably beta-carotene). Ant ophthalmic factor has multiple functions: it's necessary for growth and development, for the upkeep of the system, and permanently vision. Ant ophthalmic factor is required by the tissue layer of the attention within the kind of retinal, which mixes with super molecule protein to create visual purple, the light-absorbing molecule necessary for each low-light (scotopic vision) and vision. ant ophthalmic factor conjointly functions in a {very} very completely different role as retinoic acid (an irreversibly change kind of retinol), that is a vital hormone-like protein for animal tissue and different cells. In foods of animal origin, the foremost kind of ant ophthalmic factor is AN organic compound, primarily retinyl palmitate, that is born-again to vitamin A (chemically AN alcohol) within the gut. The vitamin A kind functions as a storage kind of the sustenance and might be born-again to and from its visually active organic compound kind, retinal. All kinds of ant ophthalmic factor have a beta-ionone ring to that AN isoprenoid chain is connected, referred to as a retinyl cluster. Each structural options square measure essential for sustenance activity. The orange pigment of carrots (beta-carotene) will be pictured as 2 connected retinyl teams, that square measure employed in the body to contribute to an ophthalmic factor levels. Alpha-carotene and gamma-carotene even have one retinyl

cluster, that provide them some sustenance activity. None of the opposite carotenes have sustenance activity. The pigment beta-cryptoxanthin possesses AN ionone cluster and has sustenance activity in humans.

Vita min A can be found in two principal forms in foods:

Retinol, the shape of fat-soluble vitamin absorbed once consumption animal food sources, could be a yellow, fat-soluble substance. Since the pure alcohol kind is unstable, the nutriment is found in tissues in an exceedingly type of retinyl organic compound. it's conjointly commercially created and administered as esters like retinyl acetate or palmitate. The carotenes alpha-carotene, carotene, gamma-carotene; and also the lutein beta-cryptoxanthin (all of that contain beta-ionone rings), however no alternative carotenoids, perform as provitamin A in herbivores and omnivore animals, that possess the protein carotene fifteen,15'-dioxygenase that cleaves carotene within the enteral mucous membrane and converts it to vitamin A.

Here are 6 important health benefits of vitamin A

- Protects Your Eyes From moon blindness and Age-Related Decline. ...
- May Lower Your Risk of sure Cancers. ...
- Supports a Healthy system. ...
- Reduces Your Risk of inflammatory disease. ...
- Supports Bone Health. ...
- Promotes Healthy Growth and copy. ...
- Taking an excessive amount of A may be Risky.

Deficiency

Vitamin A deficiency may result from inadequate intake, fat absorption, or liver disorders. Deficiency impairs immunity and hematopoiesis and causes rashes and typical ocular effects (egg, conjunctivitis arid, night blindness).

Signs and symptoms of vitamin A deficiency.

- Dry Skin. Share on Pinterest. ...

- Dry Eyes. Eye problems are some of the most well-known issues related to vitamin A deficiency. ...
- Night Blindness. ...
- Infertility and Trouble Conceiving. ...
- Delayed Growth. ...
- Throat and Chest Infections. ...
- Poor Wound Healing. ...
- Acne and Breakouts

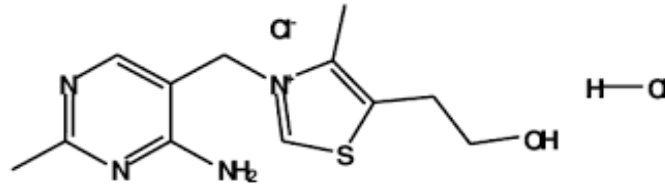
The best sources of vitamin A are:

- Cod liver oil.
- Eggs.
- Fortified breakfast cereals.
- Fortified skim milk.
- Orange and yellow vegetables and fruits.
- Other sources of beta-carotene such as broccoli, spinach, and most dark green, leafy vegetables

2. Vitamin B

B vitamins square measure a category of soluble vitamins that play necessary roles in cell metabolism. although these vitamins share similar names, they're with chemicals distinct compounds that usually be within the same foods. In general, dietary supplements containing all eight square measure cited as a B-complex vitamin B complex vitamin B|B vitamin |B |water-soluble vitamin} complex. Individual vitamin B complex supplements square measure cited by the precise variety or name of every vitamin: B1 = thiamin, B2 = B vitamin, B3 = vitamin B complex, etc. Some square measure higher renowned by name than number: vitamin B complex, vitamin B, B-complex vitamin and folic acid.

every vitamin B complex is either a chemical compound (generally a coenzyme) for key metabolic processes or may be a precursor required to form one



Vitamin B complex helps prevent infections and helps support or promote:

- cell health.
- growth of red blood cells.
- energy levels.
- good eyesight.
- healthy brain function.
- good digestion.
- healthy appetite.
- proper nerve function

Vitamin B12 Deficiency

Most people within the U.S. get enough of this nutrient. If you are not positive, you'll raise your doctor if you must get a biopsy to see your vitamin B complex level.

With age, it will become tougher to soak up this victual. It may happen if you've got had weight loss surgery or another operation that removed a part of your abdomen, or if you drink heavily. you will even be a lot of seemingly to develop vitamin B complex deficiency

- if you have: symptom rumor, during which your abdomen lining has cut
- Pernicious anemia, that makes it laborious for your body to soak up vitamin B complex
- Conditions that have an effect on your intestine, like colitis, disorder, microorganism growth, or a parasite
- Immune system disorders, like thyrotoxicosis or lupus
- Been taking bound medications that interfere with the absorption of B12. This includes some pyrosis medicines as well as nucleon pump inhibitors (PPIs) like rabeprazole, omeprazole, esomeprazole, Prefaced and pantoprazole; H2 Blockers

like alkalize, Pepcid and ranitidine; and bound polygenic disorder medicines like antidiabetic drug.

you'll conjointly get vitamin B complex deficiency if you follow a vegetarian diet (meaning you do not eat any animal merchandise, as well as meat, milk, cheese, and eggs) otherwise you area unit a feeder WHO does not eat enough eggs or dairy farm merchandise to satisfy your vitamin B complex wants. In each of these cases, you'll add fortified foods to your diet or take supplements to satisfy this would like.

Source of vitamin B

- Whole grains (brown rice, barley, millet)
- Meat (red meat, poultry, fish)
- Eggs and dairy products (milk, cheese)
- Legumes (beans, lentils)
- Seeds and nuts (sunflower seeds, almonds)
- Dark, leafy vegetables (broccoli, spinach, kai lane) Plus...

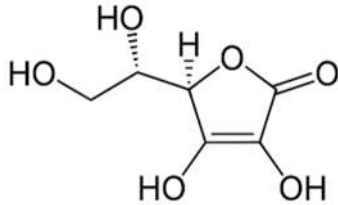
Types of vitamin B

There are eight types of vitamin B:

- thiamin (B1)
- riboflavin.
- niacin.
- pantothenic acid.
- biotin.
- vitamin B6 (pyridoxine)
- folate (called folic acid when included in supplements)
- vitamin B12 (cyanocobalamin)

3. Vitamin C

Vitamin C, conjointly referred to as vitamin C, may be a soluble nutrient found in some foods. within the body, it acts as AN inhibitor, serving to shield cells from the harm caused by free radicals. Free radical's area unit compounds shaped once our bodies convert the food into energy



Benefits of vitamin C

Vitamin C is one among the safest and simplest nutrients, specialists say. It's going to not be the cure for the communicable disease (though it's thought to assist stop additional serious complications). However, the advantages of antioxidant might embody protection against system deficiencies, disorder, prenatal health issues, disease, and even skin wrinkling.

A recent study revealed in Seminars in Preventive and Practice of Medicine that checked out over a hundred studies over ten years disclosed a growing list of advantages of antioxidant.



"Vitamin C has received a good deal of attention, and with smart reason. Higher blood levels of antioxidant could also be the best nutrition marker for overall health," says study scientist Mark Moyad, MD, MPH, of the University of Michigan. "The additional we have a tendency to study antioxidant, the higher our understanding of however various it's in protective our health, from vas, cancer, stroke, eye health [and] immunity to living longer."

Sources of vitamin C in food:

Citrus fruits like orange, kiwi, lemon, guava, grapefruit, and vegetables like broccoli, cauliflower, Brussel sprouts and capsicums are unit wealthy, natural sources of water-soluble vitamin. different victuals C-rich fruits embody papaya, cantaloupe and strawberries



Vitamin C deficiency:

Deficiency, or a lack, of antioxidant in your body happens thanks to a scarcity of sufficient amounts of antioxidant in your diet. Over time, a scarcity of antioxidant means new scleroprotein can not be fashioned. This causes numerous tissues in your body to begin to interrupt down and also the health and repair of your body become affected. Persistent (chronic) antioxidant deficiency, typically over a amount of around 3 months or a lot of, will cause Associate in Nursing unwellness called scurv

What are the symptoms of vitamin C deficiency?

The first symptoms of vitamin C deficiency tend to be:

- Tiredness and weakness.
- Muscle and joint pains.
- Easy bruising.
- Spots that look like tiny, red-blue bruises on your skin
- Dry skin.
- Splitting hair.
- Swelling and discoloration of your gums.
- Sudden and unexpected bleeding from your gums.

- Nosebleeds.
- Poor healing of wounds.
- Problems fighting infections

4. Vitamin D

Vitamin D could be a nutrient found in some foods that's required for health and to keep up sturdy bones. It will thus by serving to the body absorb atomic number 20 (one of bone's main building blocks) from food and supplements



Benefits of vitamin d

Vitamin D has multiple roles within the body. It assists in:

- promoting healthy bones and teeth
- supporting immune, brain, and system health
- regulating hypoglycemic agent levels and supporting polygenic disease management
- supporting respiratory organ operate and vas health
- influencing the expression of genes concerned in cancer development

Deficiency

Although the body will produce fat-soluble vitamin, a deficiency will occur for several reasons.

Symptoms of fat-soluble vitamin deficiency might include:

- ✓ regular illness or infection

- ✓ fatigue
- ✓ bone and back pain
- ✓ low mood
- ✓ impaired wound healing
- ✓ hair loss
- ✓ muscle pain
- ✓ If fat-soluble vitamin deficiency continues for long periods, it should end in complications, such as:
 - ✓ cardiovascular conditions
 - ✓ autoimmune issues
 - ✓ neurological diseases
 - ✓ infections
 - ✓ pregnancy complications
 - ✓ certain cancers, particularly breast, prostate, and colon.
- ✓ Sources of fat-soluble vitamin

Sources of vitamin D

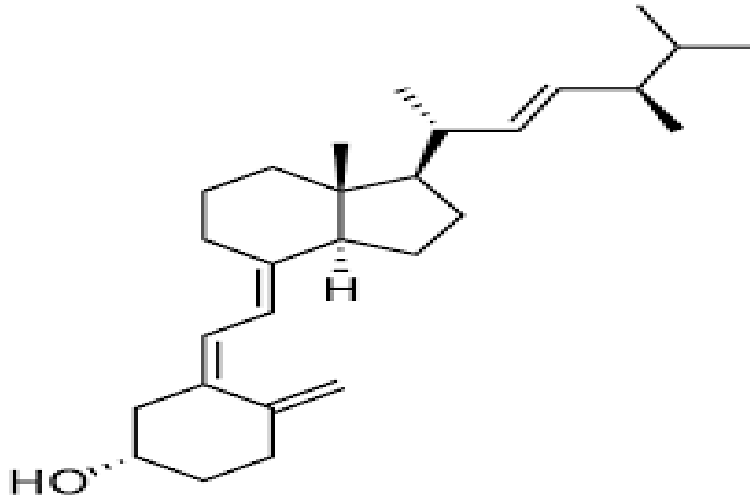
Getting spare daylight is that the best thanks to facilitate the body manufacture enough viosterol. Plentiful food sources of viosterol include:

- fatty fish, like salmon, mackerel, and tuna
- egg yolks
- cheese
- beef liver
- mushrooms
- fortified milk
- fortified cereals and juices

structure of vitamin D

Structure of itamin D:

Vitamin D may be a cluster of fat-soluble secosteroids to blame for increasing internal organ absorption of metal, magnesium, and phosphate, and multiple alternative biological effects. In humans, the foremost vital compounds during this cluster square measure nutriment D3 (also referred to as cholecalciferol) and nutriment D2 (ergocalciferol).



5. Vitamin E

Vitamin E could be a fat-soluble nutrient found in several foods. within the body, it acts as Associate in Nursing inhibitor, serving to to safeguard cells from the harm caused by free radicals. Free radicals area unit compounds shaped once our bodies convert the food we have a tendency to nettle energy.



Source of bitamin E:

Good dietary sources of E embody daft, like almonds, peanuts and hazelnuts, and vegetable oils, like flower, wheat germ, safflower, corn and soybean oils, in step with the U.S. National Library of medication (NLM).



Benefits of vitamin E:

Vitamin E supplements might stop coronary cardiovascular disease, support immune operate, stop inflammation, promote eye health, and lower the chance of cancer. However, the analysis on these edges is varied, and vitamin E supplementation isn't right for everybody.

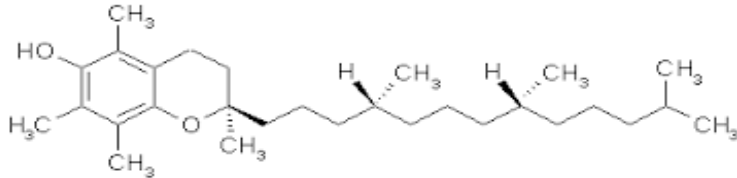


What causes vitamin E deficiency:

- chronic pancreatitis.
- cholestasis.
- cystic fibrosis.
- primary biliary cirrhosis.
- Crohn's disease.
- short bowel syndrome.

Structure of vitamin E:

Vitamin E exists in eight chemical forms: alpha, beta, and delta-tocopherol and alpha-, beta-, gamma-, and delta-tocotrienol. In general, E could be a fat-soluble inhibitor that forestalls the assembly of ROS fashioned throughout the method of the reaction of fat.

**6. Vitamin K:**

Vitamin K plays several vital roles within the body. Most conspicuously, it's renowned for promoting clotting, that permits wounds to heal quickly, and with as very little scarring as potential. it's conjointly thought to scale back bruising once injury

**Source of vitamin K.**

Vitamin K is found within the following foods: inexperienced unifoliolate vegetables, like kale, spinach, greens, collards, Swiss chard, Indian mustard, parsley, romaine, and inexperienced leaf lettuce. Vegetables like national capital sprouts, broccoli, cauliflower, and cabbage. Fish, liver, meat, eggs, and cereals (contain smaller amounts

Benefits of vitamin K.

Vitamin K refers to a bunch of fat-soluble vitamins that play a task in clotting, bone metabolism, and control blood metal levels. The body desires antihemorrhagic factor to provide factor II, a super molecule and coagulation factor that's vital in clotting and bone metabolism.



Causes of deficiency of vitamin K:

The most common causes of antihemorrhagic factor deficiency square measure scarce dietary intake, inadequate absorption, and minimized storage of the alimentation because of disease, however it should even be caused by minimized production within the intestines

Structure of vitamin K.

Vitamin K1 or vitamin K could be a polycyclic aromatic organic compound, based on 1, 4-naphthoquinone, with 2-methyl and 3-phytyl substituents. fat-soluble vitamin could be a family of phylloquinones that contains a hoop of 2-methyl-1, 4-naphthoquinone associate degreed an isoprenoid aspect chain