

Republic of Iraq

Ministry of Higher Education for Sciences

Al- Zahra University for Women

Health and Medical Colleges

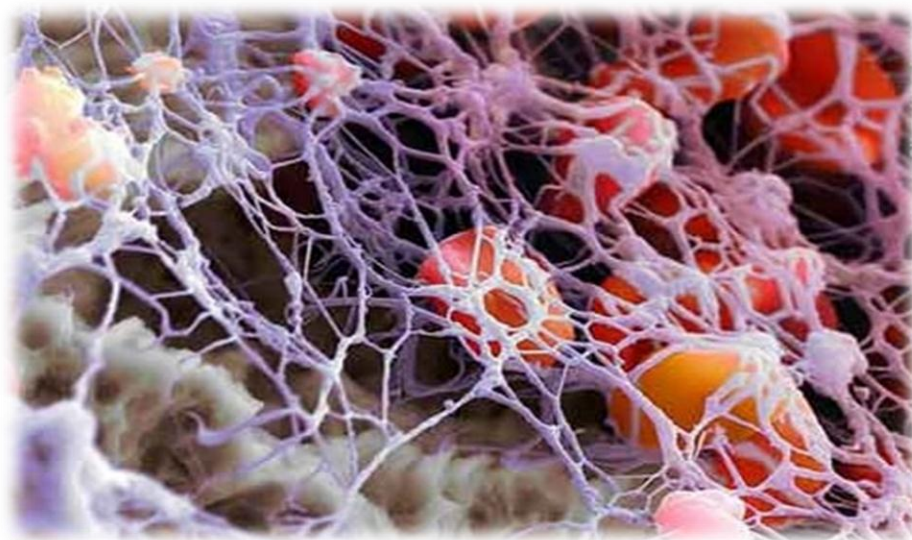
Department of Anesthesia Techniques



BIO CHEMISTRY

Title of the lecture:

Vitamins and coenzymes, fat soluble vitamins, water soluble vitamins.

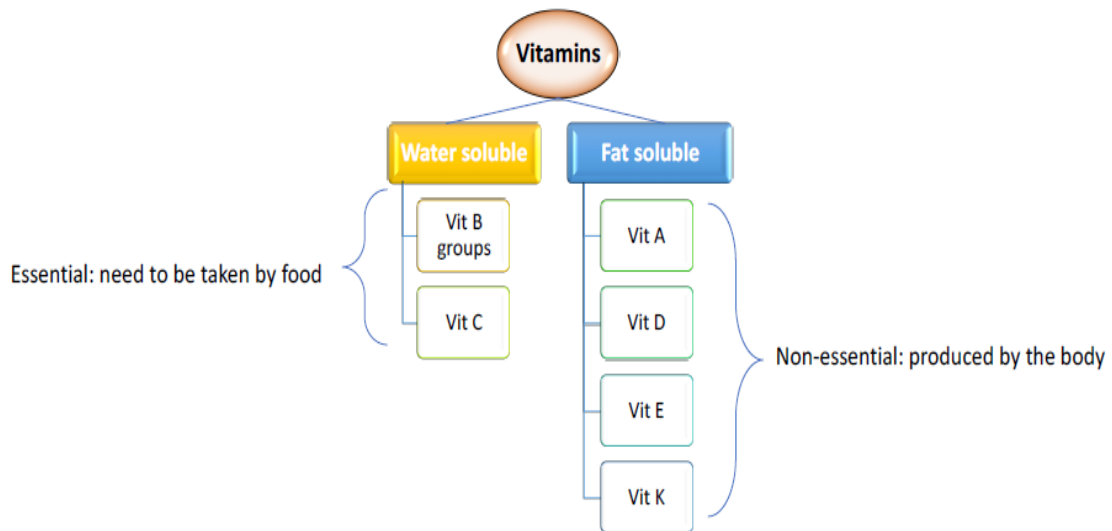


KADHIM ADNAN ALI

Vitamins

Vitamins are organic compounds that are required by the body but in very small amounts, could be hundreds of grams. They may serve as catalysts for some **biochemical reactions** in our body and act as **coenzyme**. There are 2 types of Vit: either essential or non-essential Vit..

- Classification of Vitamins:



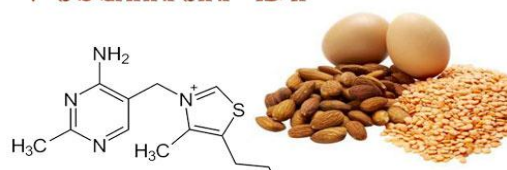
Water soluble Vit.

1. **B groups vitamins:** This group of Vit. B (B1+ B2+ B3+ B6+ B7+ +B9+ B12) act as coenzymes to help the body to get energy from food. B vitamins are also essential for good vision, healthy skin, healthy nervous system, and for red blood cell formation. Most of them are **not stored** in the body.

1.1. Thiamin: Vit. B1

Thiamin founds in peas, liver, whole grains and fortified grain products such as cereal, and enriched products like bread, pasta, rice.

Vitamin-B1



The amount of Thiamin/day = 1.1- 1.2 mg/da. Its presence in adequate amount helps to release energy from foods, promotes normal appetite, and is important in maintaining proper nervous system function.

Deficiency of Vit. B1

The deficiency of Vit. B1 is rare due to its availability in lots of grain sources. However, these are some factors could affect the daily amount:

1. If someone is making heavy diet or doing sever exercises
2. Consuming alcoholics.

Symptoms of thiamin deficiency: mental confusion, muscle weakness, wasting, water retention (edema), impaired growth, and the disease known as beriberi.

1.2. Riboflavin: Vit B2

B2 found in the liver, eggs, green vegetables, whole grain products, and milk.

What does Vit B2 do?

Riboflavin helps:

1. Helps release energy from foods, for a good vision and a healthy skin.
2. helps to convert tryptophan (which makes up protein) into niacin.

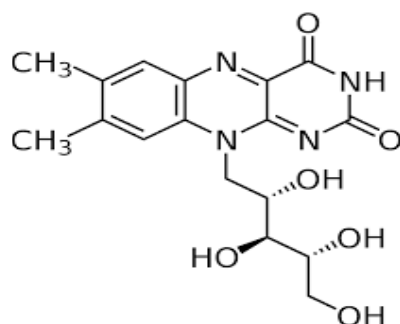
Ultraviolet light is known to destroy riboflavin, which is why milk is packaged in dark containers instead of clear.

The daily amount: 1.3 mg/day and Females: 1.1 mg/da.

Deficiency of Vit B2

The deficiency is rare. However, if it happened, it it could be due to:

1. Alcoholism,
2. Malignancy,
3. Hyperthyroidism,
4. Symptoms of deficiency may appear as cracks at the corners of the mouth, dermatitis on nose and lips, light sensitivity, cataracts, and a sore, red tongue.



1.3. Niacin: Nicotinamide or Nicotinic acid, Vit B3

This Vit is found in liver, fish, poultry, meat, peanuts, whole and enriched grain products.

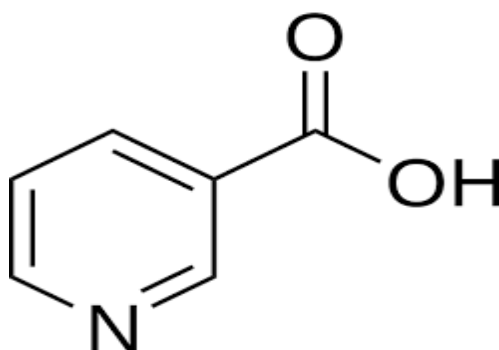
What does Vit B3 do?

It involves in energy production, enzyme function, digestion, promoting normal appetite, healthy skin, and nerves.

The daily amount of Vit B3 is 16 mg/day for male and; 14 mg/day for female.

Niacin deficiency: it is occurring with:

1. alcoholism,
2. protein malnourishment,
3. low calorie diets,
4. Sever deficiency will cause Pellagra with symptoms include cramps, nausea, mental confusion, and skin problems.

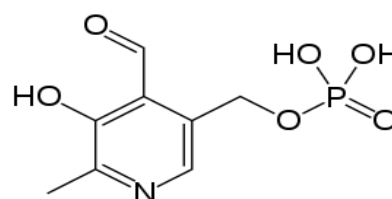


1.4. Pyridoxine, Pyridoxal: Vit B6

The food sources of Vit B6 are: meats, whole grains and cereals, legumes, and green, leafy vegetables.

What does Vit B6 do?

It aids in protein metabolism and red blood cell formation. It is also participating in the production of some chemicals such as insulin and hemoglobin.



The daily amount: 1.43 mg/da.

Vitamin B6 Deficiency

Deficiency causes skin disorders, dermatitis, cracks at corners of mouth, anemia, kidney stones, and nausea. **Excess** amount of vitamin B6 over time have been known to result in nerve damage

1.7. Biotin: B7

Biotin is liver, kidney, egg yolk, milk, most fresh vegetables, yeast breads and cereals. Biotin is also made by intestinal bacteria.

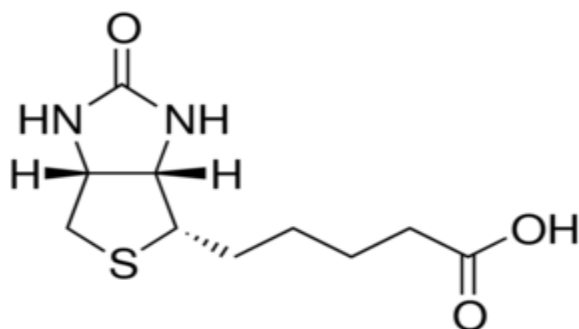
What does Biotin do?

It helps release energy from carbohydrates and aids in the metabolism of fats, proteins and carbohydrates from food.

The daily amount: 30 mcg/day for adult males and females

Biotin Deficiency

Biotin deficiency is uncommon under normal circumstances, but symptoms include fatigue, loss of appetite, nausea, vomiting, depression, muscle pains, heart abnormalities and anemia.



1.5. Folic Acid, Folate: B9

Folic acid is found in liver, kidney, dark green leafy vegetables, meats, fish, whole grains, fortified grains and cereals, legumes, and citrus fruits

What does Folic acid do?

It aids in:

1. protein metabolism,
2. promoting red blood cell formation.
3. Folate may also play a role in reducing the risk for coronary heart disease.

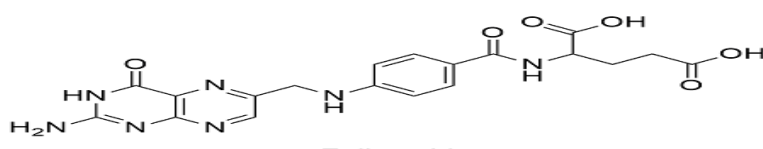
The daily amount: is 400 mcg/day for adult males and females.

For pregnancy = 600 mcg/day.

Folate Deficiency

Folate deficiency affects:

1. cell growth and protein production, which can lead to overall impaired growth.
2. anemia and diarrhea.



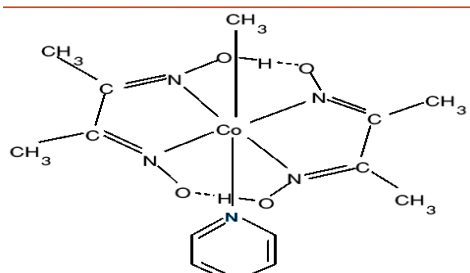
1.6. Cobalamin: Vit B12

Vitamin B12 is found in meats, liver, kidney, fish, eggs, milk and milk products, oysters, shellfish.

What does Vit B12 do?

It aids in

1. the building of genetic material,
2. production of normal red blood cells,
3. maintenance of the nervous system.



The daily amount of B12 is 2.4 mcg/day for adult males and females.

Vitamin B12 Deficiency

The deficiency affects:

1. infants of vegan mothers, and the elderly.
2. anemia,
3. neurological disorders
4. degeneration of nerves resulting in numbness and tingling. In order to prevent vitamin B12 deficiency, a dietary supplement should be taken.

2. Vitamin C: Ascorbic acid

It is found in the citrus fruits (orange, kiwi fruit, grape)

What does Vit C do?

1. It helps holding cells together through collagen synthesis in a connective tissue that holds muscles, bones, and other tissues together.
 2. aids in wound healing, bone and tooth formation,
 3. strengthening blood vessel walls,
 4. improving immune system function,
 5. increasing absorption and utilization of iron,
 6. and acting as an antioxidant.
 7. Vitamin C act as an antioxidant and helps in neutralizing free radicals.
 8. Our body cannot produce or store vitamin C, therefore good nutrition or supplementary tablets are essential for optimum health.
- An antioxidant is a molecule that slow the oxidation process and reduce the free radicals. It acts to repair the damage of cells.

The daily amount= 90 mg/day for males and 75 mg/day for females.

For smokers= it should increase by 35 mg/day to reduce the effect of nicotine.

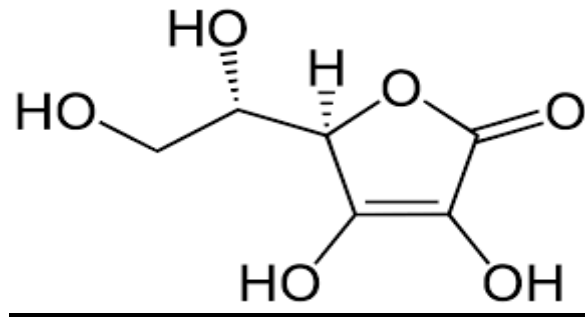
Vitamin C Deficiency

It causes:

1. Scurvy= a loss of collagen strength which leads to teeth loose, swollen gums, and improper wound healing.
2. alcoholics, the elderly, and in smokers are suffering Vit C deficiency.

Vitamin C toxicity

Deficiency causes kidney stones, gout, diarrhea, and rebound scurvy.



Fat soluble Vitamin

The fat-soluble vitamins, **A, D, E, and K**, are stored in the body for long time and therefore, no need for supplements. Any small extra dose of vitamins A, D, E and K may lead to cell toxicity. **Additionally**, some disease may decrease the absorption of these vitamins A, D, E and K.

1. Retinol: Vit A

1. It found in the food of animal origins such as liver and fish.
2. Beta-carotene from fruits and vegetables (orang or dark green colored vegetables).
3. Carrots, squash, apricot.

What does Vit A do?

1. It helps the eyes to adjust to light changes,
2. Plays an important role in bone growth, tooth development, reproduction, cell division, gene expression, and regulation of the immune system.
3. an important antioxidant that may play a role in the prevention of certain cancers

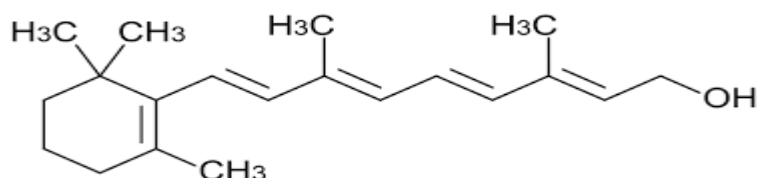
The daily amount: 900 mcg/ day for adult males and 700 mcg/ day for adult females.

Recent studies indicate that Vitamin A requirements may be increased if hyperthyroidism, fever, infection, cold, and exposure to excessive amounts of sunlight are indicated. Alcoholic people or those have renal disease should increase the intake of vitamin A.

Vitamin A Deficiency

It causes

1. night blindness and very dry, rough skin
2. decreased resistance to infections, faulty tooth development, and slower bone growth.



2. Vitamin D

It is found in the milk, oily fish, cod liver oil. Our skin produces Vit D in a response to sunlight.

What does Vit D do?

It helps the body to use of calcium and phosphorous. It increases the absorbance of calcium from the small intestine, helps to form and maintain bones. Vitamin D helps for controlling cell growth. Children especially need adequate amounts of vitamin D to develop strong bones and healthy teeth.

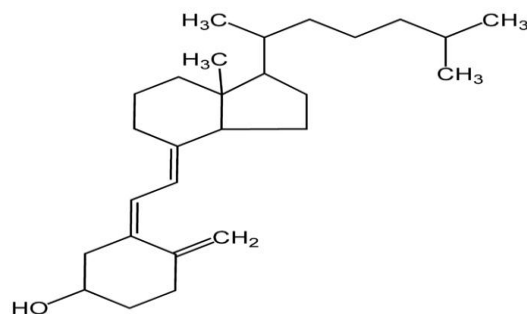
The daily amount

800 International units/day especially for adults over 50.

Exposure to sunlight for 10-15 min without sunscreen, twice a week, is sufficient to absorb Vit D. if the exposure was more than 15 min, sunscreen is important with SPF 15 or more.

Vit D deficiency

1. Rickets in children
2. Osteomalacia (muscle and bone weakness)
3. Osteoporosis (loss of bone mass)
4. Increase autoimmune disease
5. hypertension



3. Vitamin E

It founds in the vegetable oils (soybean, corn, cottonseed, and sunflower). Fruits and vegetables, grains, nuts (almonds), seeds, cereals.

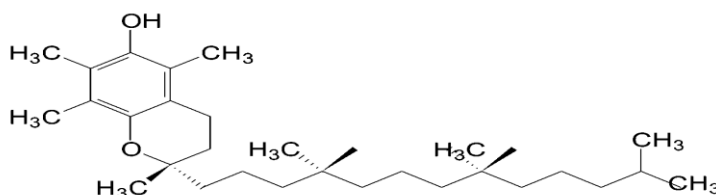
What does Vit E do?

It acts as antioxidant agent and protects Vit A and C, red blood cells, and essential fatty acids from destruction. Previous studies suggested that taking Vit E supplement may prevent heart disease and cancer. However, recent study argued this theory and suggested that taking supplements does not decrease the heart diseases or cancer. Eating fresh fruits and vegetables (not supplements) is necessary to have antioxidants and anticancer compounds.

The daily amount= 15 mcg of alpha-tocopherol/day

Vit D deficiency

1. premature infants and those unable to absorb fats
2. reduces the total dietary fat.



4- Vitamin K

Vitamin K is found in spinach, cauliflower, cabbage and broccoli, and certain vegetables oils including soybean oil, cottonseed oil, canola oil and olive oil, as well as animal food.

What does vit K do?

It is naturally produced by the bacteria in the intestines, and plays an essential role in blood clotting, supports bone health, and helps for producing proteins in blood, bones, and kidneys.

The daily amount

for age 14 – 18 Y= 75 mcg/day;
age 19 and older= 90 mcg/day

Vit K deficiency

1. Hemorrhage
2. People who are under anticoagulant treatment (blood thinner).
3. People who are under antibiotics treatment.
4. People with chronic diarrhea.

