



AL-Mustaqbal University College

**Medical laboratory Techniques
Department**

Clinical Biochemistry

**Lecture (8)
(Vitamins)**



Lecturer : M. Sc. Salam Mohammed Naser

Vitamins are Non-energy organic compounds that have no role in energy, such as proteins and lipids, which are compounds that we use in the process of releasing energy from food compounds and other biochemical processes.

The body needs it in small quantities and it cannot be manufactured in the human body, but rather gets it from food.

Classification of vitamins

a. The water-soluble vitamins. Such as

- Vitamin B1 (thiamine)
- Vitamin B2 (riboflavin)
- Vitamin B3 (niacin)
- Vitamin B5 (pantothenic acid)
- Vitamin B6
- Vitamin B7 (biotin)
- Vitamin B9
- Vitamin B12 (cobalamin)
- Vitamin C

The eight types:- it helps in the metabolic processes in the body, maintaining brain function, and the work of the heart

It is important in collagen

b. The lipid-soluble vitamins. Such as Vitamins A, D, E, and K are called the fat-soluble vitamins, because they are soluble in organic solvents and are absorbed and transported in a manner similar to that of fats.

Water-soluble vitamins are excreted, while fat-soluble vitamins remain in the body, and their quantity is large.

The primary role of vitamins?

A. Water soluble vitamins:-

1. They play an essential role in metabolism, as appetizing vitamins (called B complex) are digested, absorbed, transported into circulation and then entered into cells and tissues, and here metabolism occurs.
2. Speed up chemical reactions

Many of these vitamins are included in the enzyme-co structure, that is, they help speed up biochemical reactions.

B. Fat-soluble vitamins:-

It plays very important physiological roles, for example: forming bones, aiding vision, contributing to blood clotting, or acting as antioxidants. These vitamins have a common hydrocarbon chain that is formed by the polymerization of a pentacarbon compound called isoprene.

Vitamin properties

1. Its most important feature is that these compounds are not needed in large quantities.
2. Releasing energy by acting as an enzymatic aid.
3. Sensitive to light, heat and storage, and the sensitivity varies from one vitamin to another.

Examples:

- Vitamin B2 Newborns often develop jaundice (physiological jaundice) that occurs due to the immaturity of the basic enzyme system in the liver, and therefore the treatment is by applying phototherapy to it.
 - To get the active vitamin from food, it should be taken in a cold state.
4. Vegetables are the primary source of vitamins
 5. Vitamins storage

They are either stored in the liver or in the fatty tissue in small quantities (in milligrams), so when a certain period of time passes during which a person does not eat vegetables, the body uses the vitamins stored in the liver.

6. The need for vitamins varies according to gender, the woman's condition (pregnant or breastfeeding), growth rate, and body size.

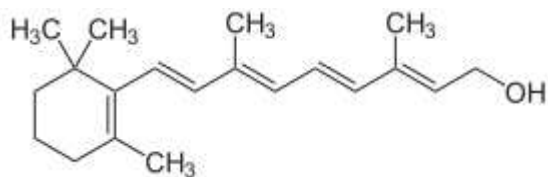
Some Important Vitamins In The Body

1-*Vitamin A*

It belongs to a family called **retinoids** that includes three parts that are similar with everything except the functional group that gives each of them their specific function.

These Parts Are:-

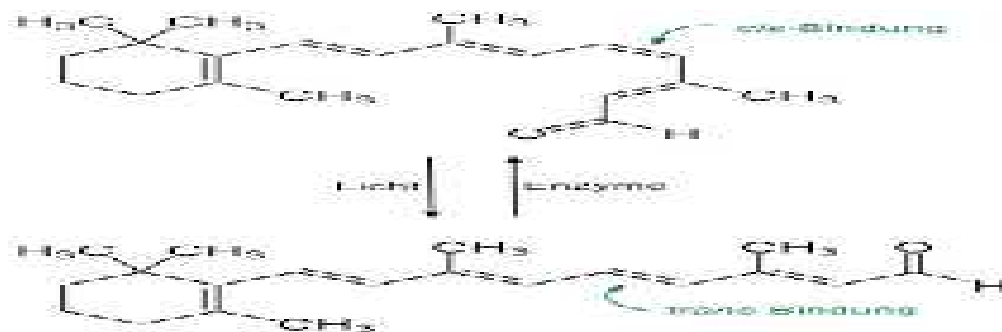
Retinol: A single OH functional group.



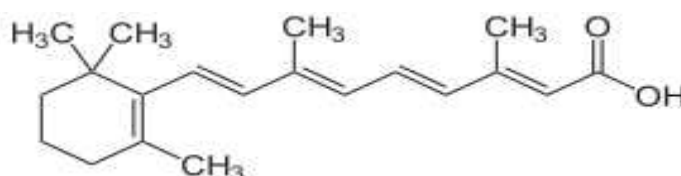
Retanal: the aldehyde has the functional group CHO.

Site 11 has a double transceiver link.

Site 11 has a Cis (coupled) double bond.



Retanoic acid: acid, its functional group (COO)



The mechanism of obtaining the **vitamin A** from food:-

- 1- Vitamin A is found in colored fruits (carrots). This plant Vanguard we call beta-carotene.
- 2-Vitamin A is not obtained from animal food freely, but is esterified in the form of retinyl esters.
- 3-Fat-soluble vitamins are digested, absorbed and transported as grease.

The necessary amounts of vitamin A include the following benefits:

- 1- Reducing the risk of cancer

Taking vitamin A with adequate levels from plant sources has been linked to a reduced risk of lung cancer.

- 2- Contribution to diabetes treatment

Retinoic acid is a type of vitamin A that has been found to play a role in maintaining the balance of blood sugar levels.

3- Maintain healthy skin and hair

Vitamin A is important for the growth of all body tissues, including skin and hair.

Decreased levels may cause the following:

- Night blindness
- High risk of infection, especially in the throat, chest and abdomen
- Dry skin
- Delayed growth in children.

2-Vitamin D

- Vitamin D has the structure of steroids, so cholesterol is one of the major of vitamin D.

Vitamin D sources

It has two main sources:

- vegetable source.
- animal source:

It is formed from cholesterol directly, and cholesterol is found in the epidermis or dermis in the form of D, since vitamin is an esterized cholesterol. It is also found in the adrenal cortex to form the primary precursor for the synthesis of the hormone cortisol and aldosterone and is stored in the ovaries and testicles for the production of sex hormones.

A mechanism to get vitamin D:-

he primary precursor (the esteric form) in the skin, called 7DHC.

➤ In order for it to become an effective form, it must pass through different stages that require two main organs, the liver and the kidneys, as follows:

1- On exposure to the sun, cholecalciferol is formed as a result of the opening of the B-ring in 7D Hydroxycholesterol, which is insoluble in water, is transported to the liver by blood proteins

2- In the liver, it undergoes a process of hydration and is at site 25 and we get this 25 hydroxycholecalciferol (the form of vitamin D has some effect).

3- In order for it to be transformed into the most effective form, it must be transferred to the kidneys, so that a mass is wasted at site 1 and we obtain 1-25 dihydroxycholecalciferol or calcitriol, and this is the active form of vitamin D and it is the most abundant.

4-1-25 dihydroxycholecalciferol into the intestinal mucosal cell, crosses the cytoplasmic membrane - 1 moves with special vectors and enters the nucleus membrane and then into the DNA of the intestinal mucosal cell, inducing the production of Calbindin

The main role of vitamin D : When we eat a food substance rich in calcium and phosphorous, it absorbs and transports it into the mucous cell intestinal.

The main function of Vitamin D:

Maintaining blood calcium and phosphorous levels through the regulating protein calbainidine absorption in the intestine. The normal level of calcium is 10-5.8 mg / dL.

Deficiency results from two causes:

- 1- Not transforming it into an effective form.
- 2- An imbalance of metabolism related to the two main organs, liver and kidney, resulting from hepatitis or kidney failure.

Symptoms resulting from deficiency:

- In adults: osteomalacia, which results from defective mineralization, as the bones remain soft.
- In children: rickets, as a result of errors of metabolism affecting bone calcium, or impaired liver and kidneys.
- Vitamin D deficiency may affect the teeth.