ODESSA NATIONAL MEDICAL UNIVERSITY

Department of General and Clinical Pharmacology and Pharmacognosy

METHODICAL DEVELOPMENT OF THE LECTURE

Course: "Pharmacognosy"

Lecture № 5

"Vitamins. General characteristics. LR and raw materials containing vitamins "

Course: 3rd Faculty: medico-pharmaceutical

The lecture was discussed
at the methodical meeting
departments
August 30, 2024
Protocol № 1

Head departments _____
prof. Rozhkovsky Ya.V.

Odessa-2024

Lecture № 5: "Vitamins. General characteristics. LR and raw materials that contain vitamins "- 1 hour.

1. Relevance of the topic. Rationale for the topic.

Vitamins are a group of organic substances of various chemical nature, required in minimal quantities for the normal functioning of the body. Together with hormones and enzymes, they form a group of biocatalysts and play a huge role in metabolic processes in the body. Vitamins are involved in cellular respiration, affect the functions of the nervous system, endocrine glands, enhance immunobiological processes, increase the body's resistance to functional diseases, have anti-inflammatory effects, etc.

In medicinal plants, vitamins are constant components, and in some of them accumulate in significant quantities. Currently, about 30 vitamins are known, of which about 20 enter the human body with plant and animal foods. Vitamin drugs are used in medical practice for the treatment of various diseases. The amount of knowledge gained by students in the study of this topic is necessary for the successful mastering of some sections of specialized disciplines, pharmacology and pharmacotherapy.

1. The purpose of the lecture:

- ***training*: to learn (level of mastering on - Bespalko - 11-)**

- Definition of "Vitamins", their classification. Distribution of vitamins in plant form and resources of the studied raw materials
- Terms, methods of collection and rules of storage of LRS containing vitamins. Morphological characteristics of plants, their habitats (areas of cultivation), habitats.
- The chemical composition of the LRS of the research topic. Know the

ways of using raw materials and their medical application.

- educational:

formation of a professionally significant substructure of personality with relevant aspects of deontological, ecological, legal, psychological, patriotic, professional responsibility.

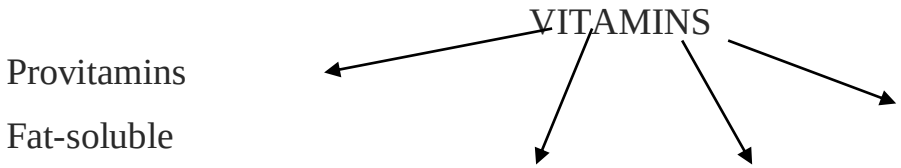
1. Plan and organizational structure of the lecture.

№	The main stages of the lecture	Goals in accreditation levels	Type of lecture, equipment of the lecture	time distribution
1	2	3	4	5
	Preparatory stage			
1.	Defining educational goals.		Combined,	1%
2.	Providing positive motivation.		tables,	2%
			herbariums,	
	The main stage		LRS, drugs	
	Presentation of lecture material.			
3.	plan:			
	1. Definition of "vitamins", "provitamins", "antivitamins".			
	2. Classification of vitamins: letter, solubility, chemical. 3. LRS containing vitamins.	I		90%
		II		2%
	The final stage	III		
	Lecture summary, general			2%

4.	conclusions. Lecturer's answers to possible questions. Tasks for student self-preparation.	II I	List of references	3%

4. Contents of lecture material

- structural and logical scheme



- the text of the lecture is attached

4. Materials of activation of students during the lecture

Question:

1. Definition of "vitamins".
2. Distribution of vitamins in the plant world and resources of the studied raw materials.
3. Terms, methods of collection and storage rules of LRS containing vitamins.
4. Measures for the protection and rational use of wild medicinal plants containing vitamins.
5. Latin and Russian names of LRS, which produce plants and families of all objects of the research topic.
6. Morphological characteristics of plants, their habitats (areas of cultivation), habitats.
7. External signs of the studied types of medicinal raw materials.
8. Possible impurities to nettle and their main differences.
9. The main anatomical diagnostic signs of nettle leaves, cinnamon rose hips, viburnum.
10. Ways of use and medical application of LRS containing vitamins.

Tests:

1. A group of natural substances, diverse in chemical structure, united by its biological significance and the need to nourish the body, which is part of enzymes or coenzymes and acts as a catalyst for chemical transformations occurring in the body:

A. vitamins

B. polysaccharides

C. tannins

D. glycosides

E. hormones

2. Name the medicinal plant, the fruits of which are used in medicine practice as a multivitamin raw material with a predominant content (3-carotene). Fresh berries are processed into vitamin syrup, and also used in the alcoholic beverage industry:

A. mountain ash

B. rose hips

C. sea buckthorn

D. hawthorn

E. žoster

3. From flower baskets of this plant prepare tincture, ointment and recommended for cuts, purulent wounds, ulcers and burns, and the tincture is used for gargling with sore throat. In the middle is prescribed for gastric ulcer and as a choleretic:

A. calendula

B. chamomile

C. St. John's wort

D. nettles

E. herd

4. Liquid extract of the bark of this plant is used for uterine
bleeding in gynecological practice. The fruits are used in vitamin collections:
A. viburnum
B. mountain ash
C. hawthorn
D. sea buckthorn
E. elderberry

5. The leaves of which plant are rich in multivitamin raw materials, which contain a significant amount of vitamin K, vitamin C, carotenoids (3-carotene, xanthophyll, violaxanthin, etc.). Vitamin B2, pantothenic acid, urticin glucoside, tannins, formic acid, chlorophyll and mineral salts:
A. nettles
B. thyme
C. yarrow
D. herd
E. St. John's wort

6. The grass contains a significant amount of vitamin K and ascorbic acid. In addition, they contain amines: choline, acetylcholine, tyramine and histamine, flavonoids diosmin and organic acids (fumaric, citric, malic, tartaric, etc.), as well as traces of alkaloids and essential oil. Up to 40% of potassium is found in the ash. Name this plant:
A. buckthorn
B. dog nettle
C. you argue
D. sage
E. celandine

7. A large group of natural pigments of yellow or orange color, including up to 70 substances. They are found in most plants (except some fungi) and in all animal organisms. The leaves of plants contain these substances are usually insignificant, but in other parts of plants they can accumulate in significant quantities:

A. carotenoids

B. tannins

C. polyphenolic compounds

D. catechins

E. isoflavonoids

8. From the fruits of which plants produce the drug holosas, used for cholecystitis and hepatitis:

A. dog rose

B. sea buckthorn

C. joster

D. hawthorn

E. chokeberry

9. Branched shrub is a long-petiolate and palmate leaves, bearing on the lower surface of the resin glands, which give the plant a pleasant aroma. The flowers are collected by drooping racemes. The fruit is a black fragrant multi-seeded berry. It grows wild in the forests and floodplains of rivers of Ukraine. Cultivated as a berry bush.

A. black currant

B. elderberry

C. blueberries

D. dope

E. chokeberry

10. Which of the scientists in 1912 proposed the term "vitamins":

A. K. Funk

B. D. Mendeleev

CM Lomonosov

D. L. Pasteur

E. I. Mechnikov

6. Joint material and methodological support of the lecture:

- *equipment: overhead projector, codegrams, slides, tables;*

-*illustrative materials: medicinal plant raw materials, herbariums.*

7. Materials for self-preparation of students:

a) on the topic of the lecture / literature, questions, tasks /;

Question:

1. What is the botanical name of rose hips, from which this name originated?
2. Indicate the diagnostic signs of rosehip powder (micropreparation).
3. What may be impurities to the leaves of nettle; on what grounds are they recognized?
4. Is it easy to establish the authenticity of black currant fruit, on what grounds?
5. Do the fruits of mountain ash change greatly in shape and color in comparison with fresh ones?
6. What is the fruit of sea buckthorn? Which plant is the source of raw materials?
7. Which raw calendula will be more valuable in terms of medicine: with bright orange or yellow flowers?

Task:

1. Write instructions for collecting and drying rowan berries.
2. Make a table of the distinctive features of dioecious nettle and possible impurities.
3. Give a comparative morphological characteristics of official species of dog rose.
4. Specify raw materials that contain fat-soluble vitamins.

5. List the raw materials rich in vitamin C.

b) on the topic of the next lecture: Medicinal plants that contain glycosides

List of main issues:

1. Definition of "glycosides".
2. Distribution of glycosides in the plant world and resources of the studied raw materials.
3. Morphological characteristics of producing plants, their areas (areas of cultivation), habitats.
4. External signs of the studied types of medicinal raw materials.
5. Possible impurities in raw materials and their main differences.
6. Ways of using raw materials and its medical application.

8. Literature used by the lecturer to prepare the lecture.

Basic literature

4. 1. Фармакогнозія: підручник (I—III р. а.) / І.А. Бобкова, Л.В. Варлахова. – 3-є видання Всеукраїнське спеціалізоване видавництво «Медицина» 2018, 504с.

2. Фармакогнозія: базовий підручн. для студ. вищ. фармац. навч. закл.(фармац. ф-тів) IV рівня акредитації / В.С. Кисличенко, І.О. Журавель, С.М. Марчишин та ін.; за ред. В.С. Кисличенко. – Харків: НФаУ: Золоті сторінки, 2015. - 736 с.

3. Навчальний посібник з дисципліни «Фармакогнозія» / Я. В. Рожковський, Б. В. Приступа, І. А. Бойко, Н. В. Герасимюк, В. В. Черногорюк -: Методична розробка кафедри фармакогнозії ОНМедУ. – Одеса: ОНМедУ, 2019 – 51 с.

4. Державна Фармакопея України: в 3 т. / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1500 с.

Additional literature:

1 Державна Фармакопея України: в 3 т. / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 3. – 732 с.

2. Практикум з ідентифікації лікарської рослинної сировини: навч. посіб. / [В. М. Ковальов, С. М. Марчишин, О. П. Хворост та ін.] ; за ред. В. М. Ковальова, С. М. Марчишин. – Тернопіль: ТДМУ, 2014. – 250 с.

The lecture was composed by _____ MD, Professor Rozhkovsky Ya.V.

LECTURE TEXT

VITAMINS

Vitamins (from the Latin "life") are low-molecular organic compounds of various chemical structures, necessary in very small quantities for the normal functioning of organisms.

The priority of the discovery of V. belongs to the Russian scientist NI Lunin (1880). The name "vitamins" (amines of life) was proposed by the Polish scientist K. Funk (1912 - discovered vitamin B1 -thiamine in yeast).

The human body does not synthesize vitamins (they are synthesized mainly by plants and partly microorganisms) or synthesizes them in small quantities and must receive them with food in the finished form or in the form of provitamins.

Provitamins - these are compounds that are not vitamins, but serve as precursors of their formation in the body. For example: carotenoids - precursors of vitamin A, sterols - under the influence of UV radiation are converted in the body into vitamins of group D.

Nowadays, about 30 vitamins are known, of which about 20 we get with food. Vitamins have a high biological activity and are needed by the body in very small doses - from a few micrograms to tens of milligrams per day. Diseases associated with a lack or absence of vitamins in the body, K. Funk called hypo- and beriberi. Upon receipt of excessive doses of vitamins develops a pathological condition - hypervitaminosis, especially dangerous for growth vitamins A and D.

Along with vitamins, food contains biologically active substances, the deficiency of which does not lead to disease. These substances are called vitamin-like. These include bioflavonoids (vitamin P), choline, inositol, lipoic, orotic, pangamic and n-aminobenzoic acids.

Antivitamins are compounds that are close to vitamins in chemical structure, but lack their biological properties. Once in the body, A. is included instead of vitamins in metabolic reactions and disrupts their course. This leads to vitamin deficiency even when the corresponding vitamin comes with food or is formed in the body in sufficient quantities. Some drugs are also A .: sulfanilamide drugs - n-

aminobenzoic to-you; antitumor drugs aminopterin and methotrexate - folic acid (vitamin B9)

CLASSIFICATION

There are three classifications of vitamins.

1. Letter(proposed by one of the first). At the same time, V. received names corresponding to their biological or pharmacological role in the body. For example: vitamin D (calciferol, antirachitic) regulates the ratio of Ca and phosphorus in the bones, lack of this vitamin in the diet of children leads to rickets. Vitamin E (tocopherol, reproductive vitamin) supports reproductive function (from the Greek. "Tokos" -birth of children, and "ferro" - carrier).

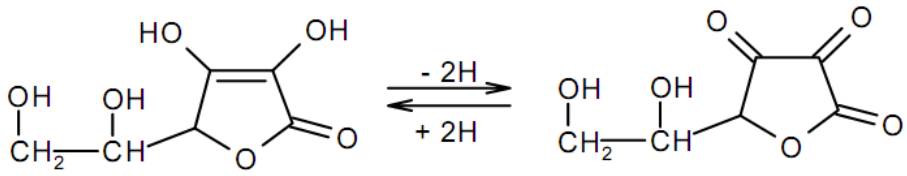
2. On solubility. Is the division into fat- and water-soluble vitamins. Fat-soluble: A, D, E, K, F. Water-soluble: groups B, as well as PP, C, H, U.

3. Chemically (most important, basic for the pharmacist), according to which vitamins are divided into aliphatic acyclic, aromatic and heterocyclic.

Aliphatic vitamins

Ascorbic acid (vitamin C, anti-zinc)

Represents a group of compounds derived from L-gulon to-you. The most important of them are L-ascorbic acid and dehydroascorbic acid, which easily pass into each other.



L-Аскорбінова кислота (γ-лактон 2,3-дегідрогулонової кислоти)

Дегідроаскорбінова кислота (γ-лактон 2,3-дикетогулонової кислоти)

L-ascorbic acid is synthesized by all chlorophyll-containing plants, but is not synthesized and does not accumulate in the human body. This explains the rapid onset of hypo- and vitamin deficiency.

Physico-chemical properties of AK:crystalline substance, well soluble in water and alcohol, insoluble in organic solvents; unstable compound, easily oxidized. Oxygen, air and light accelerate this process.

Authentication of AK:used chromatographic method. Developer: 0.04% solution of 2,6-dichlorophenolindophenolate sodium - white spots appear on a blue background.

Quantitative definition of AK: use the method of titration - the same reagent to the appearance of a pink color.

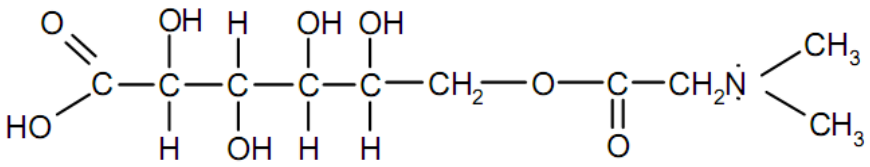
Functions in the body:A.K. Participates in redox reactions, carbohydrate metabolism, blood clotting, tissue regeneration, formation of steroid hormones and normalization of capillary permeability, improves appetite, increases the vitality of the body. With hypovitaminosis there is a rapid fatigue, cardiac dysfunction, a tendency to bleeding, reduced resistance to infections.

Sources:rose hips, rowan, currants, ripe walnuts, juicy fruits, berries, vegetables (potatoes, cabbage), pine needles, and others. In the process of food processing A.k. can be destroyed due to oxidation by traces of iron and copper, and especially oxidative enzymes - so it is better to steam food or immerse in boiling water.

Age requirement in A.k. - 70-100 mg.

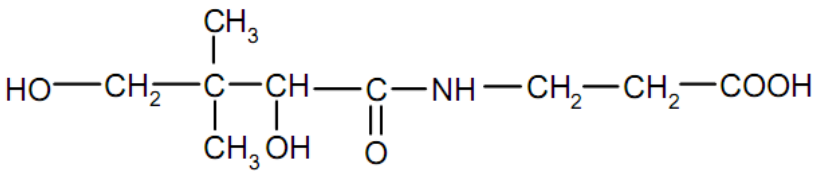
Pangamic acid (vitamin B15)

This is an ester of D-gluconic and dimethylaminoacetic acids (dimethyl glycine):



Пангамова кислота

Contained in rice bran, plant seeds, yeast, liver, etc.



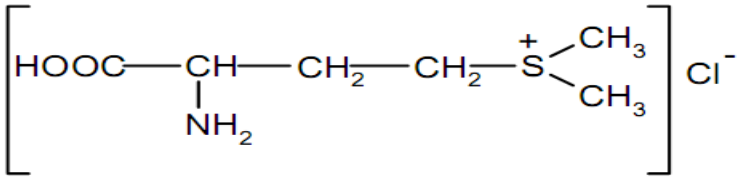
Пантотенова кислота

Pantothenic acid (vitamin B3 antirheumatic)

Contained in peas, rice, fats, liver, egg white, yeast, etc. It is produced in the human body by Escherichia coli.

Methylmethionine sulfonium chloride (vitamin U, antiulcer)

First found in cabbage juice, but found in many vegetables. The name is derived from Latin. "Ulcus" - an ulcer.

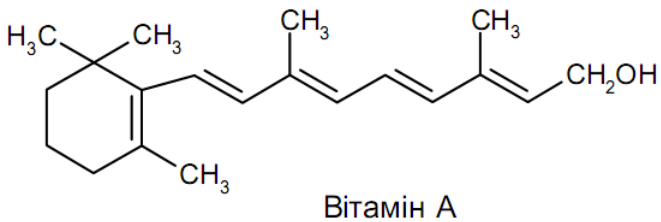


Метилметіонінсульфонія хлорид

<u>Alicyclic vitamins</u>

Retinol (vitamin A, antiserophthalmic).

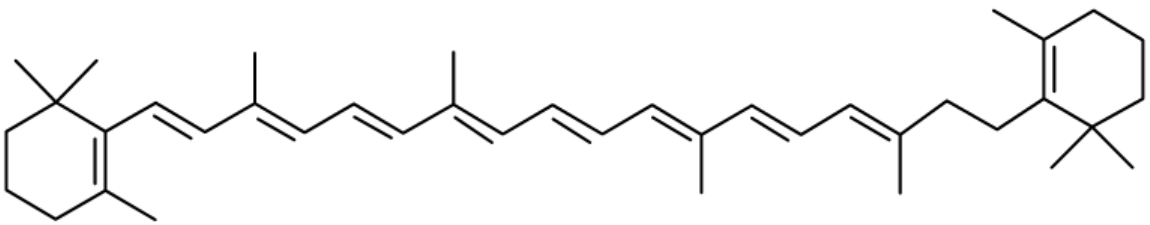
This group includes compounds consisting of 20 C atoms.



Вітамін А

The main source of vitamin A is fish oil. In plants, retinol is unknown, but many plants contain carotenes - provitamins of vitamin A.

Carotene - one of the main groups of carotenoids (also - xanthophyll), by nature are tetraterpenes (C40 H64). Contained in chromoplasts, chloroplasts, in drops of fatty oil. Carotene in plants can be in the form of isomers α, β, γ. The most valuable - β-isomer, which in the intestinal wall under the influence of the enzyme carotenase is broken down into two symmetrical halves - two molecules of vitamin A (of the other two isomers - only one molecule of vitamin A).



β-Каротин

Physico-chemical properties of carotene and detection methods:

Carotene is a fat-soluble pigment, isolated from raw materials using organic solvents (chloroform). For identification using the chromatographic method (TLC), which detects a reagent -10% solution of phosphoromolybdic acid in ethanol, applied when heated to 60-800. K. appear blue spots on a yellow-green background.

Quantitative definition carried out by colorimetric method.

Sources K .:*Carrots and pumpkin are industrial raw materials for obtaining carotenoids in pure form.* Other plant sources (black currant, red pepper) are raw materials for total drugs.

In the finished form, vitamin A enters the human body only during the oxidation of animal fats. Vitamin deficiency is accompanied by dryness and pallor of the skin, brittle nails, hair, degenerative changes in the mucous membranes, increased fatigue, damage to the visual organs. Age requirement: 1-2.7 mg.

Application: eye diseases (xerophthalmia, retinitis pigmentosa, etc.), skin lesions and diseases (frostbite, burns, wounds, ichthyosis, eczema, etc.).

Calciferol (vitamin B, antirachitic).

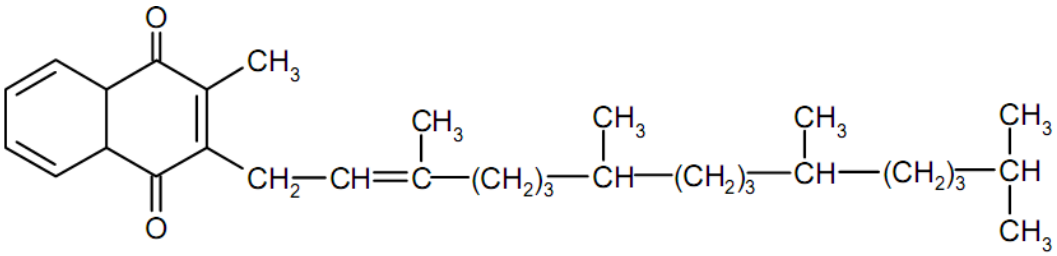
A concept that combines several substances (vitamin D2-ergocalciferol, D3-cholecalciferol) with similar chemical and biological properties of phytosterols. Precursors of vitamins of this group are (yeast ergosterol - in the body is converted into ergocalciferol). Natural vitamins D2 and D3 accumulate in significant amounts in the liver and adipose tissue of cod and marine animals.

Aromatic vitamins

These include vitamins of group K - derivatives of 2-methyl-1,4-naphthoquinone, have antihemorrhagic activity. Higher plants contain only vitamin K1.

Phylloquinone (vitamin K1. Antihemorrhagic)

In its structure it contains a naphthoquinone nucleus with an attached residue of high molecular weight aliphatic diterpene alcohol phytol, which is also part of chlorophyll.



Вітамін K_1

Functions in the body:participates in the formation of prothrombin, promotes blood clotting. At hypo- and avitaminosis parenchymatous and capillary bleedings develop.

Sources:nettles, corn stigmas, viburnum, buckthorn, alfalfa, spinach, and others. Age requirement: 0.2-0.3 mg.

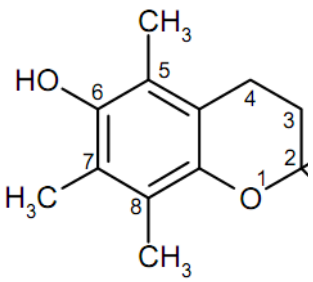
Application:at bleedings of various etiology, at the increased fragility of vessels, atony of intestines. The use of vitamin K in hemophilia and Werlhof's disease is ineffective.

Vitamins of the heterocyclic series

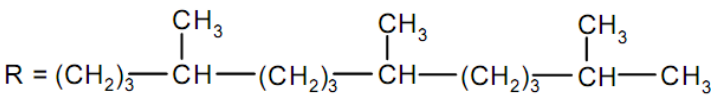
Tocopherols (vitamin E, vitamin reproduction)

There is a tocol molecule in the structure. There are 7 isomers that differ in the number of methyl groups. The most active isomer is α-tocopherol.

Tocopherols contained in vegetable oils (corn, soybean, sunflower, cotton, peanut, sea buckthorn, rose hip oil, etc.), as well as in the green parts of plants (especially in young sprouts of cereals).



α-Токоферол

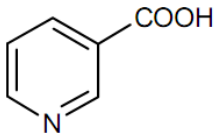


Bioflavonoids (vit. Gr. R, capillary-strengthening, vit. Permeability)

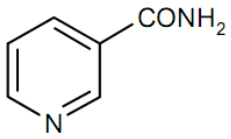
Include a large group of natural substances: flavones, flavonols, flavannes. Catechins, flavonones, anthocyanins, and others. We consider in detail in a subject "flavonoids".

Nicotinic acid (vitamin PP, nicotinamide, niacin, antipelargic)

Contained in vegetables, fruits, buckwheat, green nuts, as well as in yeast, organs (liver) of animals and others.



Нікотинова кислота



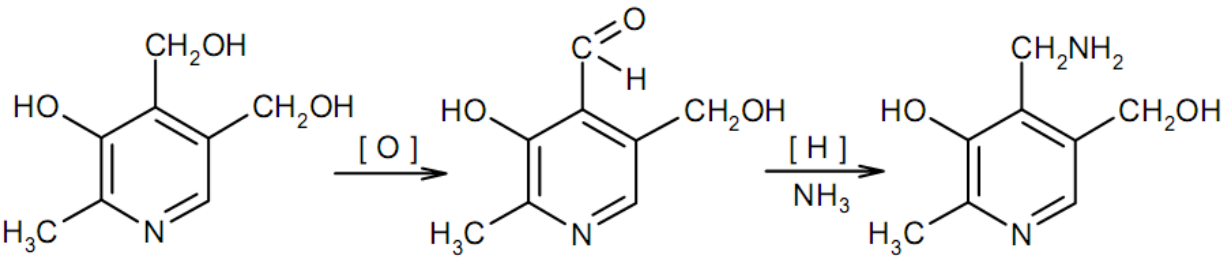
Нікотинамід

Nicotinic acid and its amide are groups of coenzymes dehydrase 1 and codehydrase 11, which are carriers of hydrogen and participate in redox processes in the body.

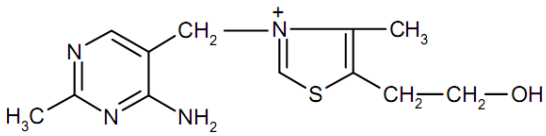
Pyridoxine (vitamin B6, antidermatitis)

It is a derivative of 2-methyl-3-hydroxypyridine. Contained in rice husks, wheat germ and corn germ, peas, soybeans, oatmeal, yeast, liver, meat, fish and others.

In nature it is represented by three forms, mutually passing into each other:



Піридоксол Піридоксаль Піридоксамін

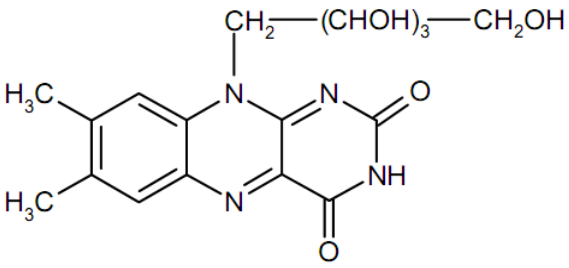


Тіамін

Thiamine (vitamin B1, antineuritic)

Contains interconnected two heterocycles:

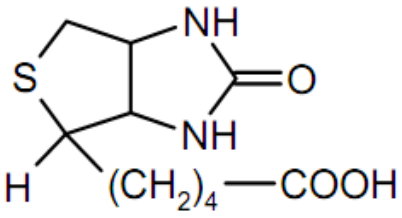
Contained in yeast, plant pollen, embryos and shells of cereals (wheat, corn, oats, buckwheat), as well as in nuts, grapes, beans, onions, carrots, egg yolks, etc.).



Рибофлавін

Riboflavin (vitamin B2, growth vitamin)

It has a high specificity, consisting of two heterocycles, a chemical structure, even a small change which causes a loss of vitamin activity or the formation of antagonists.



Біотин

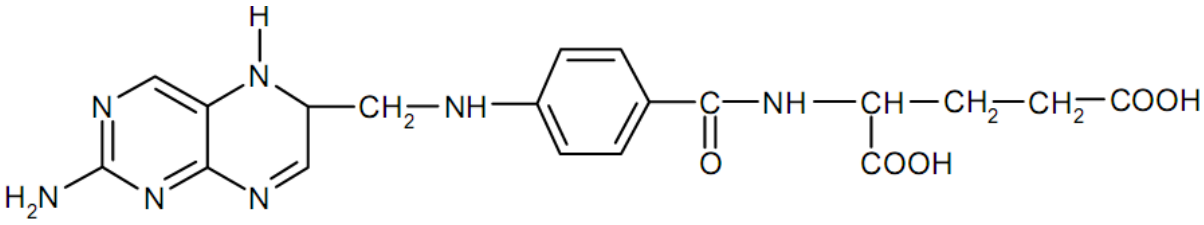
It is found in large quantities in plant pollen, wheat germ, oats, corn, rice husks, alfalfa, green peas, beans, spinach, tomatoes, hazelnuts, yeast, animal products.

Biotin (vitamin H, antiseborrheic)

The molecule consists of thiophene and imidazole cycles, and the side chain is represented by valeric acid.

Only (+) is active - biotin. It is found in rice bran, soybeans, beans, peanuts, onions, raisins, etc., but most of all in the liver and kidneys, and from plant sources - in rye grains and cauliflower.

Folic acid (vitamin Sun, B9, folacin, antianemic)



Фолієва кислота

Contained in green parts of plants, fresh vegetables, cereals, beans, onions, black currants, corn and others. It enters the body with food and is synthesized by the intestinal microflora.

Cobalamin (vitamin B12, antianemic)

This is a group of root derivatives: oxycobalamin, methylcobalamin, cyanocobalamin, and others. Synthesized by microorganisms - bacteria, microscopic fungi and algae. In the body, its synthesis is carried out by the microflora of the digestive tract and replenished with food of animal origin. In plants it is practically absent.

Biological action of vitamins:

The specific function of water-soluble vitamins (except ascorbic acid) is the formation of coenzymes and prosthetic groups of enzymes. Enzymes, which include vitamins, are involved in many important metabolic processes, energy metabolism, biosynthesis and conversion of amino acids, the formation of many physiologically important compounds. Some fat-soluble vitamins also perform coenzyme functions: vit. D-metabolism of calcium and phosphorus. Wit. K - in carboxylation reactions, vit. E - a natural antioxidant, etc.

LRS and LR, containing vitamins

Carotenoids and tocopherols

Marigold flowers–*FloresCalendulae (Calendul aofficinalis, Asteraceae)*

Hs:*carotenoids*, triterpene saponins, flavonoids, polysaccharides, org. .k-ti, resins, etc.

Preparations: infusion, tincture, ointment, caleflon (tab.), rotokan (liquid extract, mixture), alor (linim.), balm phytonutrient diabetes, fees: elekasol, hepatophytiin.

Action: antiseptic, anti-inflammatory, reparative.

Rose hips -*Fructus Rosae (Rosa cinnamomea, R. canina, Rosaceae)*

H.S.:*carotenoids (up to 10 mg%), tocopherols, ascorbic acid (from*0.2-1.0 to 4-5%); flavonoids, polysaccharides, org. to-you, fatty oil, pectin.

Preparations: infusion, syrup, oil, carotenoid (oil extract), Lipochromin-800 (caps.), Holosas (extract), mixture Cod anti-asthmatic, Vitastim (tincture combined), Balm Phyton SD, Bronchicum, echinacea (syrup, comb.), vitamin . fees №1, 2, collection Hepatophyte, etc.

Action: multivitamin, antioxidant, immunostimulating, choleretic, reparative, anti-inflammatory, hypoglycemic.

Sea buckthorn -*Fructus Hippophaes (Hippophae rhamnoides, Elaeagnaceae)*

H.S.:*carotenoids (0.3-20 mg%), vitamin B1 B2 B6 B12, E, K, C (up to 270 mg%),*fatty oil, serotonin, steroids, flavonoids, org. to-you, phenolic acids, pectin, mono and disaccharides, trace elements Zn, Mn, Cu.

Preparations: sea buckthorn oil, sea buckthorn suppositories, Olazol, Hyposol (aerosols comb.), Oblekol (plaster), Armon, Talita (creams).

Action: reparative, anti-inflammatory, bactericidal.

Rowan berries - *Fructus Sorbi (Sorbus aucuparia, Rosaceae)*

X.s .:*carotenoids (3-20 mg%), vitamin: C (up to 200 mg%), B2, K, E, folic acid*, flavonoids, org. to-you, monosaccharides, oak., pectin districts, triterpene saponins (ursol to-that), essential oil, fatty oil, etc.

Preparations: infusion, syrup, multivitamin collection, multivitamin collection №2.

Action: multivitamin, choleretic.

Vitamin K.

Nettle leaves -*Folia Urticae (Urtica dioica, Urticaceae)*

H.S.:*vitamin K1 (200 mg%), C (270 mg%), B2, B3, carotenoids (50 mg%),*chlorophylls A and B, flavonoids, org. to-you, oak. districts, three terpene sapon., trace elements (copper, silicon, iron, manganese).

Preparations: infusion, liquid extract, Alohol, balm Phyton SD, Vitastim (tincture and com.), Cardiophyte (tincture comb.), Traskova potion, Hepatophyte (collection), multivitamin collection, laxative collection №1, gastric collection №3, etc.

Action: multivitamin, biostimulating, hemostatic, choleretic, adaptogenic, antioxidant.

Columns with corn stigmas -*Stylicum stigmatis Maydis, (Zeamays, Poaceae)*

Hs:*vitamins K1, groups B. E, C, carotenoids, pantothenic acid,* saponins, bitter glycosides, flavonoids, trace elements (potassium, zinc, selenium), fatty oil, essential oil, resins, gums, mucus, and others.

Preparations: infusion, decoction, liquid extract, Insadol (table.), Polyfitol-1 (tincture comb.), Hepatophyte collection.

Action: hemostatic, choleretic, antispasmodic.

Grasshopper grass -*HerbaBursae pastoris (Capsule bursa-pastoris, Brassicaceae)*

Hs:*vitamins K, C,* oxycinnamic acids, coumarins, flavonoids, amino acids, trace elements (potassium, calcium, copper, iron, etc. zinc, molybdenum, selenium).

Preparations: infusion, liquid extract, Prostalad (tincture comb.), Prostapol (liquid extract comb.)

Action: styptic.

Bark, fruits of viburnum - *Cortex, Fructus Viburni (Viburnum opulus, Caprifoliaceae)*

H.S.:*vit. C, K1, P, group B; opulusiridoids A, B, C and their acetylated derivatives;*

Bark: phenolic acids, triterpenoids, isovaleric to-that, oak. districts, essential oil, resins, phytosterols, etc .;

Fruits: phenolic acids, flavonoids, pectin, triterpenoids, and others.

Preparations: infusion, decoction, liquid extract, Bronchovitol (tincture comb.).

Action: diaphoretic, hemostatic, anti-inflammatory, diuretic.

Ascorbic acid

Fruits, hemostatic leaves, anti-inflammatory, homeland of black - *Ribinigri (Ribesnigrum, Grossulariaceae)*

H.S.:*comb. vit. : C (пл. До570, p.-up to 250 mg%), gr. B, K, E, carotenoids,*polysaccharides, flavonoids (anthocyanins), pectin districts, org. to-you, essential oil, oak. districts, coumarins (in the letter), and others.

Preparations: infusion, syrup, Glucoribine (extract of L. in granules, tablets, ointment), Riflan (tincture of L.), Echinasal (syrup comb.), collection of vitamin №1.

Action:fields., desensitization., antiallerg., reparative., contraceptive. (colitis).

Fruits, leaves of strawberry - *Fructus, FoliaFragariae (Fragariavesca, Rosaceae)*

Hs:*leaves-vitamin C (120-200 mg%),*carotenoids, coumarins, flavonoids, ef. m., oak. solutions, phosphorus salts; fruits: vitamin C (50 mg%), org. to-you, carotenoids, mono-disaccharides (up to 15%), pectin districts, anthocyanins, ef. m., iron salts, oak. districts and others.

Preparations: infusion.

Action: multivitamin, diuretic.

Rhizomes with primrose roots -*Rhiz. cumracidibusPrimulae (Primulaveris, Primulaceae)*

Hs:*vit. C, three terpene sanonins,* policies., flavonoids, EM, carotene.

Preparations: broth, infusion, Bronhikum (comb.), Sinupret (pills, drops comb.)

Action: diaphoretic, hemostatic., anti-inflammatory., diuretic.