T.2.Balanced nutrition. Biological value of nutrition.

The plan

1. **History of vitamins discovery, classification.**
2. **The role of vitamins in human nutrition.**
3. **The states of vitamins' deficiency and surplus; antivitamins. Enrichment of foods with vitamins.**
4. **Sources and norms of vitamins.**
5. **Mineral salts. Classification of mineral salts.**
6. **The role of mineral salts.**
7. **Sources and norms of mineral salts.**

I. History of vitamin discovery, classification..

The word “vitamin” appeared in 1912, when the Polish chemist Cazimir Funk named it a crystalline substance isolated from rice bran, which had nitrogen and an alkaline reaction and which cured the pigeon polenta. Through their molecule, vitamins do not release energy and do not provide plastic material. However, their presence is indispensable for the normal development of energy-generating metabolic processes and morphogenetic anabolic processes. Therefore, vitamins are considered biostimulators and are included in the group of active substances, as are enzymes and hormones.

Classification of vitamins

Fat-soluble vitamins:

- **Vitamin A (retinol)**
- **Vitamin D (calciferol)**
- **Vitamin E (tocopherol)**
- **Vitamin K (phylloquinone)**

Classification of vitamins (continuation)

Water-soluble vitamins

Vitamin B1 (thiamine)

- Vitamin B2 (riboflavin)
- Vitamin PP (niacin, nicotinamide, vitamin B3)
- Vitamin B5 (pantothenic acid)
- Vitamin B6 (pyridoxine)
- Biotin (Vitamin H, Vitamin B7, coferment R)
- Folic acid (Vitamin Bc, Vitamin B9)
- Vitamin B12 (cyanobobamine)
- Vitamin C (ascorbic acid)
- Vitamin P (citrine)

Classification of vitamins (continuation)

- **Substances with vitamin action**

- **Choline (vitamin B4)**
- **Inositol (vitamin B8, cyclohexane)**
- **Paraaminobenzoic acid (vitamin B10, vitamin Bx)**
- **L-carnitine (vitamin B11, vitamin BT)**
- **Orotic acid (vitamin B13),**
- **Pangamic acid (vitamin B15)**
- **Vitamin U (S-methyl-methionine-sulfonium)**
- **Lipoic acid (alpha-lipoic acid, thioctic acid,**
- **Coenzyme Q10**

II. The role of lipo – soluble vitamins in nutrition

Vitamin A

- It influences growth.
- It influences the function of vision.
- It influences the epithelial surfaces.
- It influences the anticancer action.
- It influences the reproduction function, the non-specific resistance, etc.

Vitamina D

1. **It promotes calcium uptake into the upper small intestine by introducing the synthesis of a specific protein, which binds calcium in epithelial cells.**
2. **It facilitates the absorption of phosphorus by stimulating the mechanism of transport of phosphates into epithelial cells.**
3. **It acts on the bone to mobilize calcium into the circulation (the presence of parathyroid hormone is required).**

Vitamin D (continuation)

4. It releases phosphorus into organic compounds (a phenomenon that depends on alkaline phosphatase, which in turn is regulated by vitamin D).

5. Vitamin D contributes to the formation of the calcium-phosphorus complex, a mineral precursor of the bone, intervenes in the storage of calcium phosphate in the bone tissue and in the renal elimination of calcium and phosphate, increasing the reabsorption of phosphorus in the kidney.

Vitamina E

1. **It prevents the destructive, non-enzymatic oxidation of essential fatty acids by molecular oxygen.**
2. **It protects from destruction by oxidizing a fat-soluble substance like vitamin A.**
3. **Protects the cell membranes of red blood cells and leukocytes.**
4. **It regulates the normal development of the nervous system.**
5. **It ensures the trophicity of muscle tissue and other tissues.**
6. **Provides liver protection.**
7. **The anticancer role.**

Vitamina K

1. **It provides blood coagulation by catalyzing the liver synthesis of four coagulation factors: prothrombin (II), proconvertin (VII), Christmas (IX), Stuart (X).**
2. **It is required in the carboxylation of glutamic acid, which provides the binding of calcium and phospholipids required for thrombin formation.**
3. **It regulates (together with vitamin D) the level of blood calcium.**

The role of water-soluble vitamins in nutrition

Vitamin B_1

1. It influences carbohydrate metabolism.

2. It influences protein metabolism

Vitamin B_2

1. It influences carbohydrate metabolism.

2. It influences protein metabolism.

3. It influences the function of the sight.

4. It influences the processes of excitation and braking in the CNS.

5. It influences the epithelial surfaces.

The role of water-soluble vitamins in nutrition (continuation)

Vitamin B_6

1. It influences protein metabolism.

2. It influences lipid metabolism.

3. Lipotropic action.

4. Stimulates leukopoiesis.

Vitamin PP.

1. **Anti - pellagra action.**
2. **It influences carbohydrate metabolism by stimulating glycogen accumulation in the liver.**
3. **Vasodilatory action on peripheral blood vessels**

The role of water-soluble vitamins in nutrition (continuation)

Folic acid

1. It participates in the synthesis of nucleic acids and amino acids.

2. Insufficiency of folic acid in the ration of pregnant women leads to the development of malformations, unlike other situations regarding their development

Norm for adults - 400 mcg / 24h

Vitamin B_{12}

1. Anti-anemic action.

2. Lipotropic action.

3. Stimulates the process of synthesis of vitamin A from carotene.

Pantothenic acid

1. It is a constituent of coenzyme A with important functions in acetylation reactions;

2. It participates in the synthesis of many substances: fatty acids, amino acids, cholesterol and so on. ;

3. It participates in the metabolism of proteins, lipids, carbohydrates, cholesterol;

4. It participates in the synthesis of a range of hormones, hemoglobin;

5. It contributes to the assimilation of amino acids and sugars into the intestines;

6. Maintains the function of the adrenal glands.

Norm for adults - 5 mg / 24 hours.

The role of water-soluble vitamins in nutrition (continuation)

Biotin

1. It is a coenzyme of many enzymes, which participate in carboxylation, decarboxylation, deamination.

2. It participates in the synthesis of lipids, glycogen, in the metabolism of amino acids.

- Norm for adults - 50 mcg / 24hours

Vitamin C

1. **Participates in all oxidation and reduction processes.**
2. **Participates in the production and maintenance of collagen that ensures capillary resistance.**
3. **It catalyzes the synthesis of various substances in the body, including hormones such as thyroxine.**
4. **It increases the body's resistance.**

Vitamin C (continuation)

5. Anti-hemorrhagic action.

6. Anti-anemic action.

7. Anti-infectious action.

8. Improves the function of sight.

9. Anticancer effect.

Norm for adults - 90 mg / 24 hours

Substances with vitamin action

1. ***Inositol*** **is involved in metabolism, especially together with choline is involved in lecithin synthesis. Thus manifesting a lipotropic effect.**

For adults it is recommended - 500 mg / 24h

2. ***L-Carnitine*** **plays an important role in energy metabolism, favoring the passage of fatty acids with the larger chain through the inner membrane of the mitochondria for their subsequent oxidation. In this way L-Carnitine decreases the accumulation of lipids in tissues. Deficit leads to disturbance of lipid metabolism, contributing to obesity and myocardial dystrophy**

For adults it is recommended - 300 mg / 24h

3. ***Coenzyme Q10*** **participates in myocardial activity**

For adults it is recommended - 30 mg / 24h

4. ***Lipoic acid*** **has a lipotropic effect, participates in the metabolism of amino acids and fatty acids.**

For adults it is recommended - 30 mg / 24h

5. ***Methylmethioninesulfonium (vitamin U)*** **participates in histamine metabolism, contributing to the normalization of gastric acidity and exhibiting an anti-allergic effect.**

For adults it is recommended - 200 mg / 24h

6. ***Orotic acid*** **participates in the synthesis of nucleic acids, phospholipids and bilirubin.**

For adults it is recommended - 300 mg / 24h

7. ***Paraaminobenzoic acid*** **participates in protein metabolism and hematopoiesis.**

For adults it is recommended - 100 mg / 24h

8. ***Choline*** **is part of lecithin, playing a certain role in the metabolism of phospholipids in the liver, it is a source of methyl groups, it acts as a lipotropic factor.**

For adults it is recommended - 500 mg / 24h

III. The states of vitamins' deficiency and surplus; antivitamins

Hypovitaminosis **- diseases due to the relative difficulty of a vitamin or group of vitamins in the diet.**

Avitaminosis **- diseases due to the lack of one or more vitamins in the diet, which occur especially at the end of winter, when the food in the temperate zone is poorer in fresh fruits, vegetables or vegetables.**

Causes that can contribute to vitamin deficiency

1. Insufficient or incomplete nutrition (deficient nutrition), with deficiencies in the primary intake of vitamins or as a result of the destruction of vitamins in foods (to heat processing and to the long storage of food);

2. The action of the antivitamin factors that are included in the food products;

3. The presence of substances in food, that influence the assimilation of vitamins;

4. An intense catabolism of vitamins caused by the alteration of the microbial flora, which is an important source of vitamins for the needs of the body;

Causes that can contribute to vitamin deficiency (continuation)

5. Absorption disorders caused by damage to the motor and secretory functions of the intestine;

6. In cases of gastrointestinal diseases - the uptake of vitamins in the gastrointestinal tract in the pathologies of the stomach, intestines, hepatobiliary system;

7. The impossibility of converting provitamins into vitamins;

8. The administration of certain drugs (abusive administration of antibiotics and sulphanilamides, which cause dysbacteriosis with consequences of hypovitaminosis K, group B etc.), non-irrational chemotherapy;

Causes that can contribute to vitamin deficiency (continuation)

9. Certain special or pathological conditions: children and the elderly, alcoholics and chronic smokers, pregnant women during pregnancy and lactation, strict diet lovers and vegetarians, people who have suffered an acute infectious disease or suffer from chronic diseases, some climatic conditions; intense physical work; intense neuropsychological work, stress states;

10. congenital defects of the transport mechanism and of the fermentative processes, of absorption of vitamins; consumption of vitamins that enter the body with food by the pathogenic intestinal flora and intestinal parasites;

11. action of antivitamins in the environment.

General symptoms of hypo- and avitaminosis:

- sleepiness;
- chronic fatigue;
- acne;
- decreased visual acuity;
- hair loss;
- nail problems;
- bleeding gums
- frequent colds;

General symptoms of hypo- and avitaminosis (continuation):

- irritability;
- decreased attention, memory and intelligence.
- exacerbation of chronic diseases;
- increasing the action of toxic substances, stress and other harmful factors;
- decreased immunity and resistance of the body to infections;
- decrease in quality of life and work capacity;
- accelerating the aging process.

ANTIVITAMINS

- **An *antivitamin* is simply *"a substance that makes a vitamin ineffective."* A *vitamin antagonist* is essentially the same thing as an antivitamin. It is a substance that lessens or negates the chemical action of a vitamin in the body.**

Vitamin A antivitamins and antagonists

- Different drugs, including aspirin, phenobarbitol, arsenicals and dicumarol (a drug used medically to retard blood clotting), destroy vitamin A in the body.
- Vitamin A is also depleted when nitrosamines are formed in the stomach from nitrites with secondary amines and when the mucous membranes of our respiratory passages are exposed to air pollutants (carbon monoxide, ozone, sulphur dioxide, nitrogen dioxide, lead, hydrocarbons, etc.)
- In addition, mineral oil used as a laxative absorbs vitamin A and carotene (a naturally-occurring substance in foods which is used by the body to make vitamin A), thereby destroying it

Vitamin K antivitamins and antagonists

- However, antibiotic therapy (the taking of any antibiotics such as penicillin, streptomycin, tetracyclin, Chloromycin, Terramycin, etc.) suppresses bacterial growth and, consequently, the synthesis of vitamin K.
- Other vitamin K antivitamins include the drugs dicumarol and hydrocoumarol, which are used by medical people to relieve thrombosis (abnormal formation of blood clots in the blood vessels). Because the chemical structure of these antivitamins is similar to that of vitamin K, they act as anticoagulants by interfering with the synthesis of pro-thrombin and the other natural clotting factors.

Vitamin C antivitamins and antagonists

- **It is well known that cigarette smokers have lower vitamin C levels than nonsmokers. Even a single cigarette can deplete as much as thirty-five milligrams of vitamin C from the body. (By the way calcium and phosphorus are also depleted in cigarette smokers.)**
- **Because vitamin C reacts with any alien substance in the bloodstream, all drugs and pollutants can be considered to be vitamin C antagonists. Some of the foremost vitamin C antivitamins include antibiotics, ammonium chloride, stribesterol, thiouracil, atropine, barbituates and antihistamines. Alcoholic beverages are also vitamin C antagonists, different kinds of stresses.**

B Vitamin antivitamins and antagonists

- **Since the body needs B1 vitamin to metabolize sugars, this vitamin is depleted when refined sugar or flour is consumed because refined sugar and flour, are devoid of it .**
- **Alcoholic beverages are antagonists of thiamin.**
- **Coffee is a B vitamin(especially, thiamin, biotin, inositol) antivitamin—because it contains caffeine and chlorogenic acid.**
- **Raw fish and raw shellfish, including oysters, are also B-complex (especially, thiamin) antagonists.**
- **Cortisone is an antagonist of vitamin B6 (pyridoxine).**

IV. Enrichment of the foods with vitamins

- **For enrichment of food products with , as a rule, are used those vitamins, which are not synthesized, are not stored in the human body or are quite unstable even in well-known sources, are considered in the first place. Of these, thiamine, which forms the smallest reserves in the body, is foregrounded. Vitamin C and riboflavin can be added to this group, and partially with other B vitamins. Vitamin C can also be milked (usually 10 mg%), sugar (100 mg%), juices and soft drinks (various). concentrations). Given the particularities of niacin metabolism, it is recommended to enrich some foods and with this vitamin even in spite of the relatively wide spread of a. Vitamin A can be stored in the human body for a fairly long period. At the same time, because the content of this vitamin in food is quite low, it is recommended to artificially vitaminate some food fats. Currently, vitamin D, partly vitamin E, is used for artificial vitaminization of dietary fats.**

- ***Enrichment of the dishes with vitamins*** **can be carried out in the organized groups (pre-school and school institutions, medical institutions, sanatoriums, rest houses, partially in the student and working canteens). In these cases, as a rule, the ascorbic acid is used, which is added in pieces immediately before the meal, and certain recommendations are followed. Some vitamins cannot be used for artificial vitaminization of foods due to their adverse influence on organoleptic properties**

V. Sources and norms of vitamins

Group	Age	Vitamins									
		C, mg	A, µg retinol echiv.	E, mg tocoferol echiv.	D, µg	B_1, mg	B_2, mg	B_6, mg	Niacin, mg niacin. echiv.	Folic, acid, µg	B_{12}, µg
Men											
I	18-29	70	1000	10	2,5	1,2	1,5	2	16	200	3
II	18-59	70	1000	10	2,5	1,4	1,7	2	18	200	3
III	18-59	80	1000	10	2,5	1,6	2,0	2	22	200	3
IV	18-59	80	1000	10	2,5	1,9	2,2	2	26	200	3
V	18-59	100	1000	10	2,5	2,1	2,4	2	28	200	3
The old population											
Men	60-74 75+	80 80	1000 1000	15 15	2,5 2,5	1,4 1,2	1,6 1,4	2,2 2,2	18 15	200 200	3 3
Women	60-74 75+	80 80	800 800	12 12	2,5 2,5	1,3 1,1	1,5 1,3	2 2	16 13	200 200	3 3

Group	Age	Vitamins									
		C, mg	A, µg retinol echiv.	E, mg tocoferol echiv.	D, µg	B_1, mg	B_2, mg	B_6, mg	Niacină, mg niacin. echiv.	Acid folic, µg	B_{12}, µg
Women											
I	18-29	70	800	8	2,5	1,1	1,3	1,8	14	200	3
II	18-59	70	800	8	2,5	1,1	1,3	1,8	14	200	3
III	18-59	80	1000	8	2,5	1,3	1,5	1,8	17	200	3
IV	18-59	80	1000	8	2,5	1,5	1,8	1,8	20	200	3
Pregnant		20	200	2	10	0,4	0,3	0,3	2	200	1
Breastfeeding mothers (1-6 months)		40	400	4	10	0,6	0,5	0,5	5	100	1
Breastfeeding mothers (7-12 months)		40	400	4	10	0,6	0,5	0,5	5	100	1

V. Mineral salts.
Classification of mineral salts.

- **Mineral salts are the part of foods. They are biologically active substances, which ensure the normal function of all the cells and tissues of the body. Mineral salts account for 5% of body mass, of which more than half are deposited in the bone system (skeleton).Mineral salts - refers to indispensable elements of nutrition, ensuring the existence and development of the body.**

In 1873 Forster demonstrated that feeding the dogs with meat, from which the mineral salts were extracted, leads to a faster death of animals than those in a hunger regime.

Studies in the field of mineral salts by scientists have brought A.P. Dobroslavin, F.F. Erisman, V.I.Vernadskii, A.P.Vinogradov and others.

Mineral salts are present in the human body in different quantities, which allows us to classify them into three groups:

- **Macroelements - Ca, P, Mg, Na, K, S, Cl - 0.01% of body mass;**
- **Microelements - Fe, Mn, Zn, I, F, Cu, Cr, Mo, Se - 0.001% of body mass;**
- **Ultramicroelements - Hg, Ba, U - 0.000001% of body mass**

Mineral salts can be classified according to the pH change character :

a) Alkaline mineral salts (cations): K, Ca, Na, Mg;

b) Mineral salts with acidic character (anions): P, S, Cl;

c) Biomicroelements: Fe, Cu, Co, I, F, Zn, St, Ni, Mn.

VI. The biological role of mineral salts

General biological role of mineral salts:

1. They are plastic material, because they enter the composition of each cell (Ca, P, Mg, F, Na, K).

2. Maintain the acid-basic balance (K, Ca, Na, Mg - alkalinity; P, S, Cl - acidity).

3. Maintain the isotonic and isoionicity of the body fluids, influence the colloidal systems of the body, participate in the water metabolism (Na, K).

4. Influence the hematopoiesis (Fe, Zn, Co, partially, Cu, Mn).

5. Enter the composition or activate the activity of different enzymes, vitamins (Fe, Mn, Cu);

6. Enter the composition of some hormones (I, Zn, Cu Co, Mn);

VI. The biological role of mineral salts (continuation)

General biological role of mineral salts(continuation):

7. Influence the secretion of the digestive tract, especially, the stomach;

8. Influence the activity of the CNS. Mg, for example, speeds up the inhibition process, contributing to the reduction of nervous excitation.

9. Influence the blood coagulation (Ca).

10. Contribute to the elimination of various toxic substances from the body.

11. Influence the muscle activity.

The role of Ca in the human nutrition (continuation)

1. **Calcium plays an important role in the growth and development process, as a *plastic material.* About 99% of calcium is found in bones and teeth, and 1% in blood, muscles, etc. Together with phosphorus, they form the basis of bone tissue.**
2. **Activates some enzymes: trypsin, lipase, alkaline phosphatase, adenosine-triphosphatase, cholinesterase, etc.**
3. **Ca participates in blood coagulation and maintain the normal activity of nervous system.**
4. **Ca activates Castle's intrinsic factor and facilitates the absorption of vitamin B12 in the ileum.**

The role of Ca in the human nutrition

5. Ca participates in the coagulation of blood by the formation of platelet thromboplastin and the conversion of fibrinogen into fibrinogen.

6. Ca has sympathomimetic effects in potassium antagonism that act parasympathomimetically.

7. Ca together with magnesium diminishes neuromuscular excitability.

8. Ca participates in the mechanism of muscle contraction and in regulating the permeability of membranes.

Deficiency of calcium **disrupts bone tissue development, growth and development processes become slower, and rickets can occur in children up to 5 years old. In the elderly, calcium deficiency can contribute to the development of osteoporosis.**

The main sources of Calcium **- milk and dairy products (cheese, cow cheese), egg yolk, vegetables, fruits and so on.**

RDA of calcium(RM)**: children - from 240 to 1200 mg, adults - 800 mg, pregnant women and mothers breastfeeding - 1000 mg.**

The role and sources of phosphorus:

1. P*lastic role:* **phosphorus is a part of bones, teeth, nerves and muscle tissues and is contained in complex proteins and so on, in the form of hydroxyapatite and phosphates; it is a constituent of nucleic acids (DNA, RNA), that participate in protein synthesis, cell multiplication and transmission of hereditary characters.**
2. **Phosphorus participates actively in energy metabolism (adenosine tri- and diphosphates, guanosine tri- and diphosphates).**

- ***The main sources of phosphorus*: fish (250 mg), meat (180 mg), beans (480 mg), peas (330 mg), oats and pearl barley (320 - 350 mg), bread (200 mg) , milk (95 mg), cheese (500-600 mg) and so on.**

The role and sources of magnesium

1. Magnesium in the body of the adult is in the amount of 20 - 35 grams, of which more than half participate in the mineralization of the skeleton in the form of magnesium phosphate and magnesium carbonate.
2. Mg participates in neuromuscular excitability.
3. Mg catalyzes numerous metabolic reactions;

The role and sources of magnesium (continuation)

4. Mg participates in the intermediate metabolism of carbohydrates, lipids and proteins;

5. Mg prevents platelet aggregation.

Sources of magnesium:

watermelone, croups; peas; beans; nuts; dried fruits; green vegetables (salad, spinach, green onions, nettles); meat; black bread.

The role of sodium

1. Sodium is present in extracellular fluids; the total quantity of sodium in an adult body of 70 kg is about 100 g.
2. Na maintains the acid-basic balance of the human body.
3. Sodium largely regulates the movement of liquids in the human body.
4. Na intervenes in neuromuscular excitability.

The role of sodium (continuation)

- **In foods sodium is present in the form of salts and firstly in the form of sodium chloride. *Sodium sources:* table salt; the bread; milk and dairy products.**
- **The *sodium requirement* of an adult is on average 2g per day (1.1 - 3.1 g), but a balance can be maintained with smaller amounts.**
- **WHO recommends for an adult 5 g of table salt daily.**

The role of sodium (continuation)

- **Excessive sodium intake leads to increased water retention in the body, thus high blood pressure is the most common disease in populations with excessive sodium intake.**

Salt consumption must be reduced in:

1. **Heart diseases.**
2. **High blood pressure.**
3. **Kidney diseases that develops with aqueous stasis.**
4. **Cirrhosis with ascites.**
5. **Hepatitis.**
6. **Treatment with cortical adrenal hormones.**

The role of potassium

1. Potassium is a cation of intracellular fluids.
2. Potassium regulates the acid-basic balance.
3. Potassium favors protein synthesis.
4. Potassium promotes renal elimination of sodium and stimulates diuresis;
5. Potassium stimulates the heart rate.

Potassium sources: **vegetables (potatoes, tomatoes), fresh and dried fruits, nuts, fish, meat, black bread.**

The daily requirement of K **for an adult is 3.5 – 4,7 g .**

Mineral salts and hydric metabolism.

- ***Claude Bernar*** **was the first to appreciate and draw attention to the body's compartments in terms of internal environment. He suggested that the extracellular fluid provided an internal environment, a medium in which all cells are bathed. Bernard considered, that the extracellular compartment consisted of a solution of about 0,9% sodium chloride and the predominant cation in intracellular fluid was potassium.**
- ***Homer Smith*** **noted the crucial role of the kidneys inn the regulation of the constituents and the volume of both the extracellular and intracellular compartments**

Mineral salts and hydric metabolism (continuation)

- **The total body water(TBW) in the 70 kg human is about 40 L.**
- **Two - thirds of this water resides inside cells(intracellular fluid compartment or ICF) and one - third exists outside cells(extracellular fluid compartment or ECF) A minor portion of the TBW exists in intestines, the anterior chamber of the eyes, and the subarachnoid space and is termed trans cellular compartment. This compartment makes up < 1 L of the TBW**

Mineral salts and hydric metabolism (continuation)

- **The most important solutions of the ECF are the electrolytes sodium(135 -145 mmol/L) and chloride (98 – 108 mmol/L).The concentration of potassium in the ECF is much less(3,5 - 4,5 mmol/L). In the ICF potassium is the predominant cation, whereas the concentration of sodium and chloride are negligible. The water content of cells varies with cell types. For example, muscle cell have a much higher water content than do fat cells.**

Mineral salts and hydric metabolism (continuation)

- **Sodium, chloride and potassium are important constituents of the diet. They are virtually completely absorbed in the upper small intestine and they are eliminated in the urine. If sweating is not excessive and if diarrhea is not present, >98% of the ingested sodium chloride appear in the urine. More than 85% of potassium appears in the urine as well.**
- **Renal diseases may decrease the capacity of kidneys to eliminate sodium, chloride and water.**

Diet DASH

- **DASH is an acronym that stands for "Dietary Approaches to Stop Hypertension." It encourages people *to reduce their sodium intake while increasing their intake of nutrients like calcium, potassium and magnesium*, that help reduce blood pressure. A person following the DASH diet may see their systolic blood pressure, which is the upper number in a blood pressure reading, go down by 8 to 14 points within a few weeks.**
- **There are two versions of the DASH diet: the standard model that permits people to consume up to 2,300 milligrams of salt per day and a low-sodium version that restricts dieters to no more than 1,500 milligrams of sodium a day.**

The role of iron

1. **Participates in hematopoiesis, stimulates reticulocyte formation in the bone marrow, enters the hemoglobin structure (up to 65%);**
2. **Iron is involved in the formation of myoglobin in muscles and different enzymes.**
3. **Insufficient iron salts cause iron deficiency anemia.**

The richest foods in iron **(mg/100g) are: meat, liver (14.0 mg), kidney (10.0 mg), egg yolk (6.0 mg), olives (20.0 mg), peas and beans (5 -6 mg), parsley (6.0 mg) and so on.**

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The role of iron (continuation)

- ***The daily physiological norms of iron for adults are :*** **10 mg for men and 18 mg for women; for pregnant women – 38 mg and for breastfeeding mothers – 33 mg.**

  "The National Program of the Republic of Moldova to reduce the diseases caused by the deficiency of iron and folic acid":

1. **Mandatory fortification of wheat flour with iron and folic acid;**
2. **Supplementation of the diet of pregnant women with folic acid during first three months of pregnancy;**
3. **Iron supplementation of the diet of all pregnant women.**
4. **Promotion the consumption of foods rich in iron and folic acid.**

The role of copper

1. **Copper participates in hematopoiesis.**
2. **Copper participates in the process of tissue respiration.**
3. **Copper enters into the structure of some enzymes.**
4. **Cu promotes the absorption of iron from the intestines, its mobilization from tissue deposits, facilitates the use of iron in the body and is indispensable in the formation of blood hemoglobin.**

The main sources of copper **are: viscera, meat, fish, vegetables, fruits (nuts), black bread.**

The physiological recommendations of copper **are from 0.7 to 2.0 mg / day.**

The role of cobalt

1. **Cobalt participate in hematopoiesis, activates the formation of red blood cells and hemoglobin.**
2. **Cobalt enters the structure of vitamin B12.**
3. **Cobalt together with magnesium activates the activity of phosphatase.**
4. **Cobalt inhibits the respiratory processes of the tumor cells, retaining their development.**

Cobalt sources can serve **water (river, lake, sea), marine products, grapes, cabernet wine, donuts, sweet red peppers, tomatoes, liver, egg yolk and so on**

The requirement of cobalt **is not established, but 0.1 - 0.2 mg per day is recommended.**

The role of iodine

- **1. Iodine participates in the formation of the hormone thyroxin, plays an important role in conducting of the growth and development processes.**

  2. The insufficiency of iodine in the daily diet causes endemic goiter.

  The main sources of iodine **are: sea fish (fish lard), river fish, cod liver, leafy greens, milk and eggs, nuts and so on.**

The role of fluorine

1. **Fluorine participates in the process of teeth development.**
2. **Fluorine participates in formation of dentin and teeth email.**
3. **Fluorine influences phosphorus - calcium metabolism.**

Fluorine sources: **water, saltwater fish, shells, crustaceans, sea bass (beans, peas, lentils, sea fish, teas, corn and so on).**

- ***Physiological requirements of fluorine*** **for adults are estimated at 3-4 mg per day.**

The role of zinc

1. **Zinc is component part of the insulin hormone**
2. **Zinc is component part of different enzymes(for example, alkaline phosphatase, polymerases, pancreatic carboxypeptidase);**
3. **Zinc participates in carbohydrate metabolism.**
4. **Zinc is necessary for the normal functioning of the pituitary, stomach and prostate glands.**
5. **Zinc is very important in sexual growth and maturation.**

The main sources of zinc are liver of different animals and dried legumes.

- **_The daily requirement of zinc_ for adults is 15 mg, pregnant women – 0,18 mg; breastfeeding mothers – 0,20 mg.**

Necessary in mineral elements for men, mg

Group (CFA)	Mineral elements, mg					
	Calcium	Phospho-rus	Magnezium	Iron	Zinc	Iodine
I(1,4)	800	1200	400	10	15	0,15
II (1,6)	800	1200	400	10	15	0,15
III (1,9)	800	1200	400	10	15	0,15
IV (2,2)	800	1200	400	10	15	0,15
V (2,5)	800	1200	400	10	15	0,15
Elder persons (60 years old and more)						
Men	1000	1200	400	10	15	0,15

Necessary in mineral elements for women, mg

Group(CFA)	Elemente minerale, mg					
	Calcium	Phosphorus	Magnezium	Iron	Zinc	Iodine
I(1,4)	800	1200	400	10	15	0,15
II (1,6)	800	1200	400	10	15	0,15
III (1,9)	800	1200	400	10	15	0,15
IV (2,2)	800	1200	400	10	15	0,15
Supplementation of physiological norms						
Pregnant	300	450	50	20	5	0,03
Mothers breastfeeding babies 1-6 months	400	600	50	15	10	0,05
Mothers breastfeeding babies 7-12 months	400	600	50	15	10	0,05
Elder persons (60 years old and more)						
Femei	1000	1200	400	10	15	0,15