National University of Pharmacy
Department of chemistry of natural compound and nutriciology

LECTURE on NUTRICIOLOGY

INGREDIENTS of
DIETARY SUPPLEMENTS

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Content

- Recommendations to reduce the risks associated with DS
- Lycopene, chemistry and biological effects
- Flavonoids – containing DS
- Snt Joint wort, chemistry and biological effects
- Ginkgo, chemistry and biological effects
- Isoflavonoids – containing DS
- Soya, chemistry and biological effects
- Red clover, chemistry and biological effects
- Cranberry, chemistry and biological effects
- Garlic, chemistry and biological effects
- Milk Thistle, chemistry and biological effects
- Sabal, chemistry and biological effects
- ECHINACEA, chemistry and biological effects
Recommendations to reduce the risks associated with DS

- Encourage the formation of a critical attitude towards dietary supplements;

- Inform patients about the possible negative consequences of the use of dietary supplements, drug interactions;

- Warn patients about the possible presence in their structure of highly active ingredients in DS;

- Inform patients about the presence of contraindications to the use of dietary supplements;

- Ask patients before prescribing medication, if any they have any particular problems if they do not take dietary supplements.
Lycopene - carotenoid pigment that determines the color of the fruit of some plants, such as tomatoes, guava, watermelon. 
- Insoluble in water.
- Molecular formula: $S_{40}N_{56}$. 
Lycopene is found in many red-orange parts of plants, is the main component that determines the red color of tomatoes. 
- Lycopene is an acyclic isomer of beta-carotene.

Lycopene belongs to the carotenoids, but it does not have the A-vitamin activity.
The main function of lycopene in the human body is as an antioxidant.

- Reducing oxidative stress slows progression of atherosclerosis,
- and also protects DNA, which may prevent tumorigenesis.
- Lycopene consumption leads to a significant reduction in markers of oxidative stress in humans.
- Lycopene is the most powerful carotenoid antioxidant present in human blood.
### Ingredients of DS and functional foods

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Sources</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flavonoids</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Anthocyanins</em></td>
<td>Fruits</td>
<td>Neutralization of free radicals, reduction of the risk of malignant neoplasms</td>
</tr>
<tr>
<td><em>Cathechins</em></td>
<td>Tea</td>
<td></td>
</tr>
<tr>
<td><em>Flavanons</em></td>
<td>Citrus spp.</td>
<td></td>
</tr>
<tr>
<td><em>Flavons</em></td>
<td>Fruits, vegetables</td>
<td></td>
</tr>
</tbody>
</table>
St. John's wort herb *Herba Hyperici, Hypericum perforatum, family Clusiaceae*

Flavonoids: hyperoside, rutin, quercetin, antracen-derivatives: hypericin, pseudohypericin, tannins, resin coumarins essential oil, carotenoids, ascorbic acid xanthones

**Indications for use:**
- depression,
- psychovegetative disorders (apathy, depression)
- anxiety,
- irritability, disturbance of emotional state,
- arousal and / or nervous tension, asthenoneurotic syndrome.
• **St.John’s Wort** interacts with many types of drugs.

• In most instances, it speeds up the processes that change the drug into inactive substances, leading to a decrease in drug levels in your body.

• However, St. John’s wort can interact with some drugs, including certain types of **antidepressants**, and can cause **harmful side effects**.
Ginkgo leaves - *Folium Ginkgo, Ginkgo biloba*
*Family* Ginkgoaceae

Flavonoids: mono-di-, and tri-esters, glycosides and coumaric kaempferol and quercetin derivatives, glycosides isoramnetin, myricetin and metilmirecenit, non-glycoside bi-flavonoids, catechins and proanthocyanidins, diterpene lactones ginkgolides A, B, C, J and M are sesquiterpene lactone and bilobalide, alkaloids

![Ginkgo leaves image]

**Chemical Structure:**

- **Ginketin**: $R=\text{CH}_3$
- **Amentoflavon**: $R=\text{H}$
Ginkgo biloba

The active components of Ginkgo biloba produce effects:
- antioxidant,
- vasodilating,
- anti-ischemic,
- anti-oedema
- antiplatelet,
- diuretic and
diuretic and
- neuroprotection,
- and also affect mitochondrial respiration and vascular tone.

Indications for use:
- Discirculatory encephalopathy of various etiologies, and to develop as a result of craniocerebral injury and stroke,
- Memory impairment,
- Decrease in the ability to learn,
- Irrational fear,
- Violations of sleep and wakefulness
- Dementia, including in patients with Alzheimer's disease,
- Asthenic conditions of various etiologies, including neurotic, psychogenic and developed against the backdrop of a traumatic brain injury,
- Diseases associated with impaired microcirculation and peripheral blood, including arteriopathies and Raynaud's lower limbs,
- Therapy for neurosensory disorders, including tinnitus
Seeds and herb contain flavonoids included: quercitin, campferol and their glycosides - isoquercetrin, astragalin, rutin, campferol-3-O-rutinoside, quercetin-3-O-soforozide; ISOFLAVONOIDS: genistein, formononetin, daidzein and their glycosides - daidzin, genistin, ononin; kumestans, saponins, coumarins; phenolcarboxylic acids (chlorogenic, neochlorogenic, p-coumaric, ferulic);
Isoflavones act similarly to female estrogens:
- devoid of the side effects inherent in synthetic;
- do not stimulate the process of tissue hyperplasia (growth);
- do not lead to the development of estrogen-dependent tumors;
- reduce tides during menopause;
- reduce blood pressure;
- reduce the excitability of the nervous system;
- eliminate osteoporosis of bones;
- normalize lipid metabolism, reducing cholesterol.

Isoflavones have antiandrogenic activity:
- blocking the enzyme 5 alpha reductase;
- reduce the concentration of the hormone dehydrotestosterone;
- reduce the production of sebum;
- have anti-seborrheic effect;
- eliminate acne;
- prevent atrophy of hair follicles and hair loss.

SOYBEAN — Glýcine máxima (L.) Merr. , G. híspida (Moench) Maxim. aбо G. soja Sieb. et Zucc. family Fabaceae
Indications for use of "Soy isoflavone":
- climax;
- menstrual disorders;
- premenstrual syndrome;
- precancerous diseases of the female genital area;
- prevention of breast cancer;
- varicose veins of the lower extremities;
- acne;
- seborrhea;
- hair loss in men;
- osteoporosis of bones;
- hypertension;
- atherosclerosis and its complications, coronary heart disease, etc.;
- high cholesterol;
- allergy;
- liver and kidney diseases;
- diseases of the endocrine organs;
- prevention and auxiliary treatment of malignant tumors.
soybean — Glýcine máxima (L.) Merr., G. híspida (Moench) Maxim. або G. soja Sieb. et Zucc. family Fabaceae
Menoflavone is a dietary supplement that supports women before, during and after menopause. Clinically proven DS containing isoflavones derived from red clover, which is one of the world's richest natural sources of four important isoflavonoids: genistein, daidzein, biokhanin and formononetin.
Of the acids in the berries, citric acid is predominant, and also benzoic, quinine, ursolic, chlorogenic, malic, oleanolic, γ-oxy-α-ketomass, α-ketoglutaric. Of the polysaccharide group the greatest practical importance are contained in a considerable amount in the berries of cranberry pectin. Cranberry fruits are rich in vitamin C, in this equating to oranges, lemons, grapefruit, garden strawberries. Other vitamins contain B1, B2, B5, B6, PP. Cranberries are a valuable source of vitamin K1 (phyloquinone), not inferior to cabbage and strawberries. Other substances in the composition of the fruit can be traced to betaine and bioflavonoids: anthocyanins, leukoanthocyanins, catechins, flavonols and phenolic acids, as well as macro- and trace elements: a significant amount of potassium, less phosphorus and calcium.

There is relatively much iron, there is also manganese, molybdenum, and copper. These include iodine, magnesium, barium, boron, cobalt, nickel, tin, lead, silver, titanium, chromium, zinc, aluminum and more.
CRANBERRY (Vaccinium macrocarpon) - evergreen creeping shrub of the family Vaccinaceae.

- Functional action:
  - Has diuretic and antimicrobial properties. It acidifies urine and prevents bacteria from entering the urethra into the bladder.
  - Increases secretion of gastric and pancreatic juice.
  - Reduces blood sugar.
  - Improves vision.
  - Helps with diarrhea, vomiting.
GARDEN GARLIC (Allium sativum). Popular medicinal and vegetable culture in many peoples of the world. - herbaceous bulbous plant of the onion family (Alliaceae).

The plant is appreciated for the presence in its chemical composition of **thioethers** (organic sulfides, or **sulfur-containing compounds**), which give it a *pungent taste and a specific pungent odor*. Bulbs contain glycoside **aliin** and other biologically active sulfur-containing substances (S-methyl, S-ethyl, S-butyl, S-alkylcysteine sulfoxides, S-methylcysteine, etc.), essential oil (0.4%), phytosterols, vitamins (C - 10 mg /%, B1 - 0.08 mg /%, B2 - 0.08 mg /%, B6 - 0.60 mg /%, nicotinic acid - 1.2 mg /%), organic acids, carbohydrates, polysaccharide inulin, fatty oil (traces), macro- and trace elements (potassium, calcium, sodium, magnesium, phosphorus, iron, zinc, iodine, copper).

**In countries where garlic is systematically consumed, the incidence of cancer is relatively low.**
GARDEN GARLIC - Allium sativum, Alliaceae

- Functional actions:
  - **Reduces cholesterol** and triglycerides in the blood.
  - Improves **fluid properties of the blood**, preventing the formation of clots and blockage of blood vessels, prevents the development of atherosclerosis. - Normalizes blood pressure.
  - **Has antiviral, antibacterial and antifungal action.**
  - **Promotes immunity.**
    - Components of garlic significantly increase the activity of phagocytes, T-lymphocytes, macrophages and killer cells.
    - Has antioxidant effect.
    - Garlic has antiviral, antifungal properties, is a natural antibiotic.
    - Promotes the release of the respiratory tract, cleansing the bronchi from mucus, has antispasmodic effect.

- **Indications for use**
  - Cardiovascular diseases.
  - Increased blood pressure.
  - Increased cholesterol.
A variety of herbs, including concentrated garlic extracts, can thin the blood in a manner similar to aspirin, which may be a problem during or after surgery.
Milk Thistle – Silybum marianum (L.) Gaerth., Family- Asteraceae

**Chemical composition:** fruits contain flavolignans, the total of which is called *silymarin* (2,8 3,8%), contained in the mixture - silybin, silidianin, silihristin, silidianin, tocopherol (0.038%), sterols (0.63%) - campesterol, stigmasterol, sitosterol, mucus, biogenic amines. Taxifolin or 2,3-dihydroflavonol is related compound in the synthesis of lignans and silimarins specific compounds for thistle seeds. In fruit, in addition, contains a fatty oil (25-33%); protein (13-17%); cellulose (20-26%);
Use: The sum flavolignans (legalon, Karsil, Silibor, Silimar et al.) produce **antihepatotoxic action**. These substances **stabilize the membrane** of liver cells, affect lipid metabolism, improve cell metabolism, thereby increasing the mitotic activity of the cells, stimulated the production of proteins needed to restore normal liver function. They exhibit antioxidant and radioprotective properties, enhance detoxifying and exocrine functions of the liver, has antispasmodic and anti-inflammatory effect.

**Chemical Composition:** fruits and seeds contain carbohydrates, invert sugar (28.8%), mannitol, high molecular weight polysaccharide which hydrolysis to form galactose, arabinose and uronic acids; fatty oil (26.7%) - oleic acid, caprylic acid, capric, lauric, myristic, palmitic and stearic acids and their esters; steroids: β-sitosterol, stigmasterol and daukosterol, flavonoids, resins, tannins, essential oil (1.5%). Fruits and seeds are rich in triacylglycerols.
Application: saw palmetto preparations used to treat benign prostatic hyperplasia (adenoma) first stage and in the early stages of treatment, the second stage. Sabal extract causes a decrease in protein synthesis, anti-inflammatory, anti-androgenic, anabolic, immunostimulant and antispasmodic action. In homeopathy medicines saw palmetto fruit used in combination with drugs goldenrod and echinacea, as well as in combination with drugs pumpkin seeds and roots of nettles.
**ECHINACEA** angustifolia DC (Brauneria angustifolia); E. purpurea (L.) Moench, E. pallida (Nutt.)Britt. (Brauneria pallida Nutt.)

**Family** Asteraceae

**Chemical composition:** herbal drug contains caffeic acid derivatives, which are represented by esters of caffeic acid with sugars, tartaric acid and quinic: echinacoside content of which is 0.3-1.3% in roots and 0.1-1.0% in the leaves and flowers of Echinacea species, found 6-O-cofeilechinacoside, verbaskoside, desramnosilverbaskoside. Conjugates also identified caffeic acid, quinic acid, such as tsinarin (or 1,5-dicoefilchinic acid) caftaric and eichoric acid.

Among the flavonoids found apigenin glycosides, luteolin, kaempferol, quercetin, isorhamnetin, quertsetagetin. Flavonoid content in leaves is based on quercetin 0.38 - 0.48%. Rutin is present in all three types of echinacea.
Application: Echinacea preparations produce antiseptic, antiviral effect, expand the peripheral vessels. Traditionally, they are used in the treatment of boils, septicemia (blood poisoning), pyorrhea (pus), tonsillitis, and especially for the treatment of boils, carbuncles and abscesses. Echinacea preparations have immunostimulatory, antibacterial and antiviral properties.
• CHEMICAL COMPOSITION OF ROOTS:

• ginseng saponins have steroid aglycone (panaxtriol and panaxdiol) and spiroketal group of seven carbon atoms, they are similar in structure to the damaran type. Saponins - panaxosides (in Chinese medicine are called ginsenosides) A, B, C, D, E, F, G contain from 3 to 6 sugar residues. In the hydrolysis products saponin glycosides found oleanolic acid, protopanaxdiol, panaxdiol, panaxtriol. In the foreign literature major players ginseng saponins called ginsenosides Rgi, Re, Rd, Rbi, Rbi, and Rbo.

• Therapeutic activity of ginseng root and give high molecular polysaccharides (glycans) - panaxans who set hypoglycemic activity. It is now established that the roots of the ginseng contain a mixture of triterpene glycosides. Furthermore saponins in the root identified pectin, starch, sucrose, vitamins C, B group, D, sterols and lipolytic agents.
Application: ginseng effective
- with **physical and mental fatigue**, 
- reduced efficiency especially after a long illness, 
- Diabetis 
- chronic gastritis hypo-and- antacid case, 
- increase the overall **resistance** to diseases and adverse environmental effects. 

**Contraindications:** hypertension, ginseng contraindicated in acute cases of disease, especially when gemmoragiyah during acute coronary thrombosis. 

- Not recommended drugs with **mobile nervous system**, manic disorders and schizophrenia. 
- After 40 years should be reduced dosages of ginseng. 
- It is not recommended very prolonged use of ginseng, as it often leads to inflammation of the nerves, often the sciatic nerve, which results in muscle spasms affected areas.
Cimicifuga racemosa L.,
Family Ranunculaceae

The chemical composition of the roots and rhizomes of: phenolic compounds:
- Tannins,
- Alkaloids,
- Triterpene glycosides (2%: aktein, tsimitsifugoside)
- Isoflavone – formononetin,
- Gum
- Aromatic acids (salicylic and isoferulic)
- Saponins,
- Essential oil
- 15-20% cimicifugin (a mixture of resins and bitters)
- Organic acid
- Phytoestrogens
- Phytosterol
- Tannins,
- Sucrose
- Starch
- Vitamins: carotene
- Macro- and trace elements iron, calcium, magnesium, selenium
Cimicifuga racemosa

Modern science has recognized the estrogenic effect of the herbal drug and DS: BAC cimicifiga able to normalize the balance of estrogen by stimulating their production; DS have a mild sedative, relaxing and antispasmodic effect; significantly reduces the severity of "tide", suppressing the production of luteinizing hormone (LH); effective for inflammation of the genital organs; relieves depression associated with menopause.

In the female body luteinizing hormone stimulates the secretion of estrogen by the ovaries, and in the male - cells that produce testosterone.
Black cohosh hormonal action due to the presence of formononetin, has weak estrogenic activity.

**Indications for use:**
in the menstrual cycle disoders; migraine, hysteria and nervous tension; at menopause and tides;
in rheumatoid arthritis:
to improve metabolism;
to lower cholesterol;
to lower blood pressure;
sinusitis;
asthma;
rheumatism.