APPROVED

Vice-Rector for Scientific and Pedagogical Work

_____ Eduard BURYACHKIVSKY

September 01, 2025

METHODOLOGICAL RECOMMENDATIONS
FOR LECTURES ON THE ACADEMIC DISCIPLINE

"PHARMACOTHERAPY WITH THE BASIS OF PHARMACOKINETICS"

Level of higher education: second (master's)

Field of knowledge: 22 "Healthcare"

Specialty: 226 "Pharmacy, industrial pharmacy"

Specialization: 226.01 "Pharmacy"

Educational and professional program: Pharmacy, industrial pharmacy

Approved:
By the meeting of the Department of General and Clinical Pharmacology and Pharmacognosy of Odessa National Medical University

Protocol No. 1 dated August 28, 2025

Developers:
1. Rozhkovsky Yaroslav Volodymyrovych, MD, Professor, Head of the Department
2. Strechen Serhiy Borysovych, PhD, Associate Professor of the Department
3. Shemonaeva Kateryna Fedorivna, PhD, Associate Professor of the Department

Reviewers:
1. Belyaeva Oksana Ivanivna, PhD, Associate Professor, Head of the Department of Organization and Economics of Pharmacy with Postgraduate Training of the Odessa National Medical University
2. Knyazkova Iryna Ivanivna, MD, Professor, Head of the Department of Clinical Pharmacology and Internal Medicine of the Kharkiv National Medical University

Recommended for publication by the Subject Cycle Methodological Commission on Pharmaceutical Disciplines of the Odessa National Medical University

Protocol No. 1 dated August 29, 2025

<div align="center">

LECTURE 1. TOPIC

</div>

"PHARMACOTHERAPY: THE CONTENT AND BASIC PRINCIPLES OF THE DISCIPLINE, ITS RELATIONSHIP WITH OTHER MEDICAL AND PHARMACEUTICAL DISCIPLINES. THE PURPOSE AND TASKS OF THE PHARMACIST IN IMPLEMENTING EFFECTIVE AND SAFE PHARMACOTHERAPY. TYPES OF PHARMACOTHERAPY"

Relevance of the topic: PHARMACOTHERAPY - the science of using drugs for the purpose of treatment (diagnosis, prevention and treatment of diseases), the relevance of which lies in teaching future pharmacists the principles of drug therapy of individual nosological groups, which will contribute to improving the professional training of specialists, will play a major role in ensuring the effective and safe use of drugs.

Purpose: to form in the future pharmacy specialist knowledge about the main symptoms and syndromes, diagnostic methods and principles of drug therapy of the most common human diseases.

Basic concepts (list of questions):

Pharmacotherapy - a method of treating patients using the basic principles and provisions of pharmacology, pharmacodynamics, pharmacokinetics of drugs.

Etiotropic pharmacotherapy - a method of using drugs to treat etiological factors of the disease: antimicrobial, antiviral drugs, etc.

Pathogenetic pharmacotherapy - a method of using drugs aimed at the main mechanisms of the formation and progression of diseases: antianginal, antihypertensive drugs, etc.

Symptomatic pharmacotherapy - aimed at treating subjective signs of the disease: antidiarrheal, antitussive drugs, etc.

Replacement pharmacotherapy - aimed at restoring the body's functions by normalizing the level of hormones, enzymes, vitamins.

Preventive pharmacotherapy - a method of preventing diseases using drugs (vaccines, etc.).

Lecture material content (lecture text)

PHARMACOTHERAPY (Greek phármakon — medicine + therapia — treatment) — treatment of a patient with drugs. Modern pharmacotherapy is a rapidly developing direction of clinical medicine that develops a scientifically based system of principles for the use of drugs for the purpose of preventing or treating diseases, influencing the cause or leading links in the pathogenesis of the disease, as well as correcting severe and adverse manifestations of drug side effects.

The use of drugs began with the emergence of medicine and throughout almost its entire history was empirical in nature. The formation of the scientific foundations of pharmacotherapy began only in the 19th century. Modern pharmacotherapy regarding the use of drugs is based on data from pharmacology, clinical pharmacology, pathological physiology, as well as data from clinical disciplines that study the reflection of these processes on the symptoms of the disease,

the dynamics of which can be the final criterion for clinical assessment of the quality and degree of the pharmacotherapeutic effect of drugs. The tactics of drug use are based on knowledge of the mechanism of action of drugs, bioavailability, distribution and elimination.

There are several types of pharmacotherapy.

Etiotropic (causal) pharmacotherapy is aimed at eliminating the causes of the disease. For the purpose of etiotropic pharmacotherapy, chemotherapeutic, anthelmintic drugs and some antidotes are used. Etiotropic treatment of some infectious diseases and suppression of tumor growth with drugs whose therapeutic effect is due to their effect on the pathogen (microbes, parasites) or on the tumor cell is usually called chemotherapy, and the drugs used for this type of therapy are called chemotherapeutic.

The oldest type of pharmacotherapy is symptomatic - aimed at eliminating the symptoms of the disease. This type of treatment is palliative (Latin pallio - to cover, smooth). For this purpose, drugs of symptomatic action are used: analgesics, antispasmodics, hypotensives, antipyretics and others.

Stimulating pharmacotherapy is aimed at increasing the body's defenses (the process of sanogenesis) and stimulating the body's compensatory mechanisms. This is the least developed type of drug therapy. Vaccines, actoprotectors, adaptogens, and some immunostimulants have a stimulating effect.

In certain cases, replacement pharmacotherapy is used to eliminate the deficiency of substances in the body that are not produced in sufficient quantities (vitamins, enzymes, hormones).

Preventive pharmacotherapy is aimed at preventing the development of a particular disease. For this purpose, for example, vaccines are used.

The basic principles of pharmacotherapy include safety, rationality, controllability and individualization. The justification of the safety of the use of any drug is determined by the minimization of pharmacotherapy. The principle of rationality assumes such an optimal ratio of efficacy and safety of pharmacotherapy, due to which the maximum possible therapeutic effect of drugs is ensured with the lowest risk of their undesirable effects. Rational pharmacotherapy in a specific clinical situation allows you to justify the choice of the most adequate drug in a specific dose, dosage form and route of administration. Pharmacotherapy must be controlled. This principle involves the analysis and assessment of both expected and unpredictable results of drug use, which allows you to timely adjust the chosen treatment tactics by changing the dose and method of administration, replacing an ineffective drug, etc. The choice of pharmacotherapy is made in accordance with the established diagnosis, possible complications, as well as the prognosis. Pharmacotherapy is specified by goals, the achievement of which is ensured by the use of drugs, based on knowledge of its pharmacodynamics and pharmacokinetics. Possible contraindications to pharmacotherapy and incompatibility of drugs and treatment methods are also assessed. In the process of determining the volume of pharmacotherapy, indications for complex pharmacotherapy are established, i.e. the use of drugs for different purposes and their combination to achieve one of the goals of pharmacotherapy. The purpose of the combination of drugs can be to enhance the therapeutic effect, reduce the dose of the active substance, and also reduce their undesirable effects. Strengthening the therapeutic effect, as well as reducing the dose, is achieved by a combination of synergists or drugs of additive action, which mutually complement the spectrum of pharmacological action, as well as by combining the main drug with another that enhances or complements its pharmacological effect. The choice of drugs or

their combination is one of the most important elements of pharmacotherapy. It contains a comparison of the features of action, pharmacokinetics, toxicity and other properties of drugs of the same type in purpose with the features of the pathogenesis of the disease and its course in a particular patient (taking into account his general condition, the presence of concomitant diseases), as well as possible drug interactions if necessary, and other data about both the drug and the patient. In an urgent situation, one of the important criteria for choosing a particular drug is the speed of onset of effect. The determination of the drug dose is carried out taking into account the route of its administration into the body. In this case, the differences in dosage can be very significant. The selection of criteria and means of controlling the action of drugs is necessary both for assessing the therapeutic effect and for identifying their undesirable effects. In the process of complex pharmacotherapy, the need to cancel a certain drug or their combinations is established to achieve the goal of F., which is usually associated either with the completion of the pathological process, or with the restoration or compensation of a certain function, the violation of which served as an indication for prescribing the drug. In addition, the justification for the withdrawal of a drug during therapy may be a decrease or disappearance of the therapeutic effect due to the peculiarities of its pharmacological action, the formation of irreversible changes in target organs during the course of the disease, the prevalence at a certain stage of pharmacotherapy of contraindications to the use of the drug based on the dynamics of the pathological process due to the increased risk of dangerous consequences; the detection of toxic or side effects of drugs, which excludes the possibility of replacing the drug (e.g. digitalis intoxication is an absolute contraindication to the use of all cardiac glycosides). In some diseases, as well as congenital and acquired pathological conditions, there is a need for so-called maintenance pharmacotherapy for a long time, sometimes lifelong.

Questions for self-control on the topic:
1. Subject and tasks of pharmacotherapy.
2. Main methods of pharmacotherapy.
3. Types of pharmacotherapy, examples, definitions.
4. Definition and basic principles of pharmacokinetics.
5. Definition and basic principles of pharmacodynamics.
6. The concept of drug dose. Types of doses.
7. The concept of receptors. Types and classification of receptors.
8. Basic parameters of pharmacodynamics.
9. Classification of drug side effects.
10. Methods and methods of preventing the development of drug side effects.

List of sources on the topic:
1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. – Vinnytsia: Nova Kniga, 2010. – 644 p.
2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klischa, V.G. Lizoguba. - Ed. 2. - Vinnytsia: Nova Knyga, 2013. - 644 p.
3. Pharmacotherapy with pharmacokinetics: a textbook for students of higher education. / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;
edited by I.V. Kireyev. - Kharkiv: NFAU: Golden Pages, 2019. - 384 p.

LECTURE 2. TOPIC
"Pharmacokinetics: Definition, Basic Principles, Sections. Importance for Pharmacists and the Implementation of Pharmacotherapy"

Relevance of the topic: Pharmacokinetics studies the processes of biotransformation of pharmacological agents, in particular, drugs in the body of a healthy and sick person. The subject of its research is their absorption, distribution, connection with the biochemical structures of the body, biotransformation and excretion. Based on pharmacokinetics, doses, optimal routes and modes of administration of drugs, as well as the duration of treatment are determined. Knowledge of the pharmacokinetics of drugs is extremely important in clarifying the causes of treatment inefficiency, their poor tolerance by the patient, in metabolic disorders, renal and hepatic insufficiency, in cases of combination therapy and in solving a number of other important clinical problems. Pharmacokinetics is one of the most important sections of pharmacotherapy and operates with clear quantitative criteria.

Purpose: To familiarize the students of high education (HES) with the general theoretical and practical foundations of pharmacokinetics: routes of drug administration: types, clinical significance; drug absorption; bioavailability, definition, clinical significance; concept of bioequivalence; drug transport; distribution of drugs in the body (protein binding, regional blood circulation, volume of distribution; concept of biotransformation; routes of drug elimination from the body; main pharmacokinetic parameters: absorption rate constant, half-absorption period, time to reach maximum concentration, half-life, elimination rate constant, excretion rate constant, definition, significance for pharmacotherapy.

Basic concepts (list of questions):
Absorption rate constant (Ka) - characterizes the rate of drug entry into the body.
Half-life (T1/2) - the time during which the drug concentration in the blood decreases by half.
Elimination rate constant (Kel) - characterizes the rate of drug biotransformation in the body.
The indicator of drug elimination is clearance (ml/min). There are total, renal and hepatic clearance. Total clearance is the sum of renal and hepatic clearances and is defined as the volume of blood plasma that is cleared of a drug per unit of time. Clearance is used to calculate the dose of a drug required to maintain its equilibrium concentration (maintenance dose) in the blood. The equilibrium concentration is established when the amount absorbed and the amount of drug administered are equal to each other.
Total (Clt), renal (Clr) and extrarenal (Cler) clearances - characterize the rate of release of drugs from the body and, accordingly, their excretion in the urine and other ways (primarily with bile).

Lecture content (lecture text)
MAIN INDICATORS OF PHARMACOKINETICS OF DRUGS
Absorption rate constant (Ka), which characterizes the speed of their entry into the body. Elimination rate constant (Kel), which characterizes the speed of their biotransformation in the body. Excretion rate constant (Kex), which characterizes the speed of their excretion from the body (through the lungs, skin, digestive and urinary tract). Half-absorption period (T1/2,a) as the time required for absorption of half of their dose from the site of administration into the blood (T1/2,a=0.693/Ka). Half-distribution period (T1/2,a) as the time for their concentration in the blood to reach 50% of the equilibrium between blood and tissues.
Half-life (T1/2) as the time during which their concentration in the blood decreases by half (T1/2 = 0.693/Kel). The apparent initial concentration (C0), which would be achieved in the blood plasma when they are administered intravenously and instantly distributed in organs and

tissues. The equilibrium concentration (Css), which is established in the blood plasma (serum) when they enter the body at a constant rate (with intermittent administration (reception), the maximum (Cssmax) and minimum (Cssmin) equilibrium concentrations are released at equal intervals of time in equal doses). The volume of distribution (Vd) as the conditional volume of liquid in which it is necessary to dissolve the dose of the active substance (D) that has entered the body to obtain a concentration equal to the initial concentration (C0).

Total (Clt), renal (Clr) and extrarenal (Cler) clearances, characterizing the rate of their release from the body and, accordingly, their excretion with urine and other routes (primarily with bile) (Clt = Clr + Cler). The area under the "concentration-time (AUC)" curve is related to their other pharmacokinetic characteristics (volume of distribution, total clearance), with their linear kinetics in the body, the AUC value is proportional to the dose that has entered the systemic circulation. Absolute bioavailability (f) as the part of the dose that has reached the systemic circulation after extravascular administration (%).

The indicator of the elimination of the drug is the clearance (ml/min). Total, renal and hepatic clearance are distinguished. Total clearance is the sum of renal and hepatic clearances and is defined as the volume of blood plasma that is cleared of the drug per unit of time. Clearance is used to calculate the dose of a drug required to maintain its equilibrium concentration (maintenance dose) in the blood. The equilibrium concentration is established when the amount of what is absorbed and the amount of the drug that is administered are equal to each other.

Mathematical modeling plays an important role in the study of the pharmacokinetics of drugs. There are many mathematical methods and models, from simple one-dimensional to multidimensional models of varying complexity. The use of mathematical modeling allows us to study the pharmacokinetics of drugs in detail, both in time and space (in organs and tissues), with the derivation of characteristic constants.

MAIN ROUTES OF ADMINISTRATION AND ABSORPTION OF MEDICINES

The speed and completeness of the entry of drugs into the body are of clinical importance. Speed is important in acute conditions. Completeness determines the ratio between the consumed dose of the drug and its concentration in the blood. Speed and completeness depend on the route of administration and absorption of the drug.

Drugs are administered into the body in various ways: through the skin, the digestive tract (oral cavity, rectum), intramuscularly, intravenously, intraarterially, through lymphatic vessels, inhalation, other routes and their combinations. The possibility of delivering the drug by the body to the required location (target organ, tumor, inflammatory focus, etc.), and therefore the effectiveness of treatment, largely depends on the route of administration of the drug. With intravascular (intravenous and intraarterial) administration, there is no talk of absorption of the drug. The natural route for drugs to enter the body is through the mucous membrane of the digestive tract, when it enters the blood through the liver. The absorption of drugs is determined by many physiological factors and their quality. Absorption is significantly influenced by both their properties (solubility in water and fats), and the properties of mucus (for example, pH, content and activity of enzymes, bile acids, local hormones, etc.), food and the motor-evacuation function of the corresponding segment of the digestive canal. In this way, their acidic forms are more easily absorbed in the stomach and alkaline forms in the small and large intestine. For many drugs, the main absorption route is active transport. Some of them undergo significant changes in the liver (presystemic metabolism) and to achieve a sufficient pharmacotherapeutic effect, they should be taken orally, since their doses when taken orally are much higher than with parenteral administration.

Drugs most often enter the human body through the digestive tract (through the mouth or rectum) - the so-called enteral route of administration. This route is natural, convenient (no assistance from medical personnel is required) and relatively safe. Drugs administered through the digestive tract can have both local and systemic effects. Through the mouth (oral) to achieve local effects, poorly absorbed drugs are prescribed, and to achieve systemic effects - drugs that

are well absorbed by the mucous membrane of the stomach and/or intestine. With the oral route of administration of drugs, systemic effects develop over time and are largely determined by the speed and completeness of their absorption, the intake of those that affect the absorption of food and other drugs, the functional state of the liver, systemic circulation and a complex of other factors. This route of administration is not used for drugs that are poorly absorbed by the mucous membrane and/or are destroyed in the stomach, intestines, liver, cause a strong irritating effect on the digestive tract, with vomiting and unconsciousness of the patient.

Inside, drugs can be administered in the form of solutions, powders, tablets, capsules, pills. To prevent irritating effects on the gastric mucosa, the pills are covered with films that are resistant to the action of gastric juice, but disintegrate in the alkaline environment of the intestine.

Tablets with multilayer shells have become widespread, providing a prolonged release of the active substance with a prolonged therapeutic effect. To prevent the retention of drugs in the esophagus, especially in patients with bed rest, they should be washed down with plenty of liquid. With the oral route of administration of drugs, they inevitably pass through the liver. It is possible to bypass the liver with their sublingual (under the tongue), subbuccal (under the cheek) and rectal (into the rectum) administration.

Nitroglycerin, nifedipine, clonidine, and some other drugs are taken sublingually and subbuccally. In this case, it is believed that the drug is not affected by digestive and microbial enzymes, is rapidly absorbed (2-3 times faster than when taken orally) and enters the systemic circulation, bypassing the liver. Presystemic elimination is either absent or very small.

Suppositories, ointments, gels, and liquids are usually administered rectally. This route of administration avoids stomach irritation. It can be used in cases where oral administration of the drug is difficult or impossible (nausea, vomiting, spasm, esophageal obstruction). There are no digestive enzymes in the rectum. In addition, the drug enters the systemic circulation during absorption, bypassing the liver. This method is distinguished by its inconvenience of use, small area of the absorption surface, as well as a short time of contact of the drug with the mucous membrane and its possible irritating effect on it.

The absorption of a drug in the digestive tract may change under the influence of other drugs taken, both due to possible chemical interaction with each other, and due to changes in the acidity of the stomach and intestines, the time of passage of the contents through the digestive tract, etc. The most severe absorption is impaired when the drug binds or becomes insoluble under the influence of another. For example, tetracyclines in interaction with calcium, iron, magnesium ions, etc. form non-absorbable complexes, and the absorption of methacycline and doxycycline is almost completely inhibited by ferrous sulfate. Ion-exchange salts, absorbing, also reduce the absorption of many drugs. Absorption may be impaired due to changes in the peristalsis of the digestive tract under the influence of cholinolytics, anticholinesterase and laxatives.

Antimicrobial drugs can inhibit the synthesis of vitamins by intestinal microorganisms and thereby potentiate the effect of oral anticoagulants.

The parenteral route of administration of drugs includes many methods that bypass the enteral route. It combines injections (intradermal, subcutaneous, intramuscular, intravenous, intraarterial, in the lymphatic system, in the brain cavity, etc.), inhalation, electrophoresis and surface application to the skin and mucous membranes.

Various types of cutaneous (intradermal, subcutaneous) administration of drugs allow them to be deposited with a stable supply to the patient's body over a certain period of time. The volume of the drug administered does not exceed 2 ml. Intramuscular administration, in contrast, provides a relatively rapid supply of the drug to the patient's body (from 10 to 30 min depending on the state of local blood circulation). The volume of the drug administered does not exceed 10 ml. Complications include possible local soreness, as well as abscesses in some cases.

It is not recommended to make injections near nerve trunks and blood vessels. One of the common routes of parenteral administration of drugs is the intravenous route. It provides a rapid

onset of the active substance and accurate dosing with control of this process, the possibility of instantly stopping the latter from entering the bloodstream in the event of adverse reactions, the possibility of introducing substances into the body that are not absorbed from the digestive tract or irritate its mucous membrane. When implementing the route, it is necessary to make sure that the needle is in a vein, since when a drug enters the perivenous space, depending on its properties, various complications may arise, up to tissue necrosis. A number of drugs require very slow administration. We must not forget about the possibility of such complications as venous thrombosis, thrombophlebitis, infection with hepatitis B viruses and human immunodeficiency. In order to avoid venous thrombosis with frequent administration of the drug, catheters are used.

Factors that must be considered when injecting drugs: – high risk of overdose; – damage to the vascular wall, disruption of histohematological barriers, risk of thrombosis and hypervolemia (with intravenous administration); – possibility of cumulation in case of impaired local and systemic circulation; – possibility of infection.

It is not recommended to inject drugs into the veins of the head, as cerebral circulation may be impaired. When drugs are administered to newborns into the umbilical vein, within a few minutes to two days after birth they enter the systemic circulation through the liver, where they undergo presystemic elimination. In addition to complications of intravenous administration, there is also a risk of liver necrosis.

Intravenous administration of drugs should be painfully slow, but preferably drip (infusion). For highly active drugs, as well as in low doses, accurate calculation of the dose and accounting for the "dead" volume of the syringe and infusion system are necessary.

Intraarterial administration allows you to create locally high concentrations of the drug without significant systemic action. A serious complication is arterial thrombosis.

Inhalation is one of the convenient and frequently used methods of administering drugs in order to obtain both local and systemic action. When inhaling a gaseous substance, its cessation leads to a rapid elimination of the action. Do not inhale irritating drugs.

It is necessary to remember about the possible effect of these drugs on people around. Given their rapid entry into the heart, one should remember about the possible cardiotoxic effect. The absorption of some drugs may change with the simultaneous parenteral administration of others. In anesthesiological practice, the combination of local anesthetics and vasoconstrictor drugs allows you to extend the duration of action of drugs.

For direct action on the central nervous system, the drug is injected into the subarachnoid space. Application to the surface of the skin or mucous membranes is used to obtain a local effect, although in some cases, the effect may also occur. Dosage forms that are fixed on the skin with an adhesive substance have become widespread, which ensures their slow and prolonged absorption, ensuring a long-term effect. To ensure the transfer of the drug from the surface of the skin deep into the tissue, electrophoresis is used.

Inhalation, drugs are administered in the form of gaseous substances, liquids and aerosols. In inhalation, the size of solid particles is important. Particles larger than 60 microns settle on the surface of the pharynx and are swallowed by the digestive tract, particles of about 20 microns penetrate the terminal bronchioles, particles of 6 microns - into the respiratory bronchioles, particles of 2 microns and less - into the alveoli. The dose of the drug by inhalation is several times lower than when taken orally. The clinical effect also occurs much earlier.

DISTRIBUTION OF DRUGS IN THE ORGANISM

After drugs enter the bloodstream, they are distributed in the body, the nature of which is determined by their solubility in fats, the ability to bind to blood plasma proteins, the state of local blood circulation, the features of diffusion in the tissue (passive and active transfer), etc. Maximum concentrations are formed in places of active blood supply - the brain, heart, thyroid gland, liver, kidneys. Minimum concentrations are formed in muscles, membranes, skin, adipose tissue.

The distribution of a drug in the body is assessed through the volume of distribution. The latter is understood as the conditional volume of fluid necessary for uniform distribution of the drug in it, which is manifested in the pharmacotherapeutic concentration in the blood plasma.

Usually, the volume of distribution is related to body weight – specific volume of distribution (l/kg). With a specific volume of distribution of up to 0.5 l/kg, it is believed that the drug is located mainly in blood plasma and extracellular fluid, from 0.5 l/kg to 1.0 l/kg – in the entire liquid phase and in poorly vascularized tissues, and more than 1 l/kg – mainly in lipids, muscles and other tissues. As for the possibility of penetration of the drug into the brain through the blood-brain barrier, the following types of transport are known: – special carriers, synthesized by the endothelium for glucose and amino acids; – special receptors for insulin and transferrin; – through a conformational change in the protein with the release of the drug bound to it and its transfer into the cerebrospinal fluid. Between the endothelial cells of the capillaries of the pituitary gland, pineal gland, median eminence, choroid plexus and acea postrema there are "pores" capable of passing molecules weighing up to 30,000 daltons. It should be remembered that in brain diseases the permeability of the blood-brain barrier may increase. Today there are methods of concentrating the drug in target locations thanks to vector (directed) delivery.

BINDING AND ACCUMULATION OF DRUGS IN THE ORGANISM

Most drugs have a physicochemical affinity with blood plasma proteins and tissues, as a result of which their concentrations in the tissues decrease. The part of the drug bound to the protein loses its specific activity. The resulting complex may acquire immune properties with possible adverse reactions, especially in people with impaired immune systems. The proportion of the binding drug with proteins is determined by their concentration in the blood, as well as the binding capacity, which may be impaired in a number of diseases of the liver, kidneys and connective tissue system.

The drug binds to albumin, to a lesser extent - to acid α-glycoproteins, lipoproteins, gamma globulins and formed blood elements (erythrocytes). The concentration of a drug in the blood plasma is understood as the sum of its free and protein-bound fractions. It is especially important to take into account the binding to blood plasma proteins when it exceeds 70-80%. A decrease in the bound fraction of a drug by 10-20% increases the free fraction by 50-100%, which is extremely important for drugs with a small therapeutic range. Not only the proportion of the binding fraction, but also the degree of affinity with protein are important. The binding of a drug to proteins decreases: - in liver and kidney diseases, sepsis, burns, protein starvation (protein synthesis decreases or protein loss increases); - with an increase in the level of bilirubin, residual nitrogen, fatty acids in the blood or simultaneous administration of several drugs (some drugs displace others in protein binding); – in premature, newborns and elderly (ontogenetically determined low protein level) individuals. There are drugs that can enhance or weaken the interaction with proteins of other drugs. Thus, some drugs can bind to blood proteins by 90-98%. All this affects the pharmacokinetics and pharmacodynamics of drugs, ultimately determining their therapeutic efficacy and adverse reactions.

Similar properties are possessed not only by drugs, but also by their metabolites. The same changes with drugs can occur in tissues. The binding and accumulation of a drug, in addition to the content and properties of blood plasma proteins, is determined by its pH, the development of adipose tissue, and other factors. Both excessive and extremely low binding of a drug are of clinical importance.

METABOLISM (BIOTRANSFORMATION) OF MEDICINAL PRODUCTS

The metabolism (biotransformation) of medicinal products is understood as a complex of their transformations in the body, as a result of which polar water-soluble substances are formed - metabolites. In most cases, metabolites are less active and less toxic than the initial compounds. But there are exceptions to the rule, when metabolites are more active than the initial compounds.

The metabolism of medicinal products in the body is determined by genetic factors, gender, age, nutritional characteristics, disease and its severity, environmental factors, as well as the route of entry into the body. When taken orally, the medicinal product is first absorbed by the mucous membrane of the digestive tract, and here it begins to undergo metabolic changes. Some medicinal products are metabolized not only by enzymes of the digestive tract, but also by intestinal bacteria.

Drugs that are taken orally through the liver into the systemic circulation are divided into two types, with high and low hepatic clearance, respectively. The first type is characterized by a high degree of extraction by hepatocytes from the blood, which largely depends on the rate of intrahepatic circulation.

The hepatic clearance of drugs of the second type is determined not by the rate of blood circulation, but by the capacity of the liver enzyme systems and the rate of their binding to liver proteins. The liver has an exceptional place in the metabolism of drugs, so it is always necessary to pay exceptional attention to its functional state. In liver diseases, the metabolism of drugs is always disturbed and usually slows down. In cirrhosis of the liver, their bioavailability increases due to the development of portocaval anastomoses and the entry of part of them into the systemic circulation, bypassing the liver. In such cases, their toxic effect on the brain may increase.

The metabolism of a drug when taken orally before entering the systemic circulation is called the "first-pass effect". The smaller the dose of the drug, the greater part of it is metabolized before entering the systemic circulation and vice versa. From a certain dose that participates in the metabolism of the drug, the enzymatic systems are saturated, and their bioavailability increases.

There are non-synthetic (oxidation, reduction, hydrolysis) and synthetic types and/or stages of metabolic reactions. The non-synthetic type (stage I) is divided into reactions catalyzed by microsomal (endoplasmic reticulum) enzymes and non-microsomal enzymes. The synthetic (stage II) type of reactions is based on the conjugation of drugs with endogenous substrates (glucuronic acid, sulfates, glycine, glutathione, methyl groups and water) through hydroxyl, carboxyl, amine and epoxy functional groups. After the reaction is complete, the drug molecule becomes more polar and is more easily excreted from the body. Microsomal metabolism is primarily carried out by fat-soluble drugs that easily penetrate the membranes of endoplasmic reticulum cells, where they bind to one of the cytochromes of the P446-P455 system, the primary components of the oxidative enzyme system, which is.

The rate of metabolism is determined by the concentration of cytochromes, the ratio of their forms, the affinity for the substrate, the concentration of cytochrome c reductase and the rate of recovery of the drug-cytochrome P450 complex. It is also affected by the competition of endogenous and exogenous substrates. Further oxidation occurs under the influence of oxidase and reductase with the participation of NADP and molecular oxygen. Oxidases catalyze the deamination of primary and secondary amines, the hydroxylation of side chains and aromatic rings of heterocyclic compounds, as well as the formation of sulfoxides and dealkylation.

Microsomal enzymes also control the conjugation of drugs with glucuronic acid. In this way, estrogen, glucocorticoids, progesterone, narcotic analgesics, salicylates, barbiturates, antibiotics, etc. are excreted from the body. The activity of microsomal enzymes can be activated and suppressed by various substances. The activity of cytochromes decreases under the influence of xycaine, sovcaine, bencaine, inderal, visken, eraldin, etc. and increases under the influence of barbiturates, phenylbutazone, caffeine, ethanol, nicotine, butadione, neuroleptics, amidopyrine, chlorcyclizine, dimedrol, meprobamate, tricyclic antidepressants, benzonal, quinine, cordiamine, etc.

A small number of drugs are subject to non-microsomal metabolism, such as acetylsalicylic acid and sulfonamides. With a non-synthetic type of metabolism, active reactive substances can be formed from some xenobiotics, including epoxides and nitrogen-containing oxides. The latter, with a deficiency of epoxide hydrases and glutathione peroxidases, interact with structural and enzymatic proteins and damage them. Damage gives them the properties of

autoantigens and as a result autoimmune reactions are triggered with possible carcinogenesis, mutagenesis, teratogenesis, etc. As for the synthetic type of metabolism with the direction of anabolism of reactions and the formation of conjugates with residues of various acids or other compounds, sulfation is formed by the time of birth, methylation - after a month of life, glucuronidation - after two months, connection with cysteine and glutathione - after three months, and with glycine - after six months. In this case, the insufficiency of one of the pathways for the formation of paired compounds can be partially compensated by others.

METABOLISM OF DRUGS IN DRUG INTERACTIONS

The ability of some drugs to disrupt the metabolism of others is important to consider in clinical practice. There are two sides to the coin. If drug interactions are not taken into account, the planned pharmacotherapeutic effect may not be achieved. But the weakening of the pharmacodynamics of one drug by another can be used to benefit. Thus, disulfiram blocks the destruction of acetaldehyde, the accumulation of which in the blood of a person suffering from alcoholism causes unpleasant sensations, which is why it is used in its treatment. Inhibition of the metabolism of one drug by another is also possible when the same enzymes are involved in the metabolism of both. The clinical significance of this type of competitive relationship has not yet been fully established.

EXHAUST OF MEDICINES FROM THE ORGANISM

Medicines are excreted from the body naturally – through the digestive, urinary, respiratory systems, skin, mammary, lacrimal glands. In the digestive system, the drug and its metabolites are secreted by the digestive glands, which also include the entire mucous membrane of the digestive canal, and are then excreted with feces. Under the influence of digestive enzymes and intestinal microflora, they undergo further transformations with reabsorption and entry into the systemic circulation through the liver – the so-called enterohepatic circulation. In these processes, the properties of the drug itself and its metabolites, as well as the organs and systems that provide them, and primarily the liver, are important. That is why when deciding to use a drug in a patient, important attention is paid to the functional state of his liver.

In the urinary system, drugs are excreted in the urine by glomerular filtration and tubular secretion. The part of the drug that is in a free state is filtered. The drug can be secreted from the capillaries and peritubular fluid into the lumen of the tubules. This process can be blocked with a delay in the blood of the drug and its metabolites. When passing through the tubules, part of the drug is reabsorbed and returns to the blood. These processes are disrupted in renal failure, which must be taken into account both in the appointment of drugs that are excreted through the urinary system and in determining the prescribed doses. Weak acids are excreted faster when the urine is alkaline.

In the respiratory system, drugs are excreted both with alveolar air and by the mechanism of mucociliary clearance after secretion by the glandular epithelium of the tracheobronchial tree. The skin is one of the important routes of excretion for many drugs and their metabolites by various mechanisms, partially compensating for other routes in case of their disorders.

Excretion with breast milk must be considered in relation to the danger to the child if the drug is prescribed to the mother. Since there is no data on the safety of many drugs for newborns, pharmacotherapy in nursing women should be extremely careful.

BIOAVAILABILITY AND BIOEQUIVALENCE OF DRUGS

The bioavailability of a drug is determined by the route of administration. With intravascular administration, it all enters the circulatory system. With other routes of administration, only a part of it enters it. Accordingly, the clinical effect depends on how much of the drug has entered the circulatory system. The part of the drug that enters the circulatory system when it is introduced into the body is called bioavailability. It is obvious that with intravenous administration it is equal to 100%, with other administrations it is always below 100%.

The bioavailability of a medicinal product is a function of many variables, not only the route of administration. In addition to the route of administration, it is influenced by the

individual characteristics of the organism; the state of the systems that ultimately ensure its delivery to the site of the expected action; as well as its own characteristics, regarding the dosage form, its composition, production technology, etc.

Excipients that are part of the medicinal product are indifferent and do not have a pharmacological effect, but can affect its bioavailability. The nature and composition of its coating are of equal importance. In this regard, the concepts of absolute and relative availability of a medicinal product are introduced.

Absolute bioavailability is a value that characterizes the part of the absorbed drug during extravascular administration in relation to its amount after intravenous administration of the drug, and relative is a value that determines the relative degree of absorption of the drug substance from the study drug in relation to the absorption of the reference drug. The relative bioavailability of a drug is of practical importance, since drugs from different manufacturers containing the same drug substance differ significantly in their effectiveness, frequency and severity of side effects. To compare drugs from different manufacturers, the concept of bioequivalence (similar bioavailability) has been introduced.

Bioequivalence is a value that characterizes the ratio of the effectiveness of different drugs containing the same substance in the same phase. Drugs are called bioequivalent if and only if they provide the same concentration of the active substance in the blood and tissues of the body. In assessing bioequivalent drugs, they are guided by the maxima of their concentrations in the blood, the times of reaching the maximum concentration and the area under the curves of changes in concentration in the blood.

Questions for self-control on the topic:
1. Subject and tasks of pharmacokinetics.
2. Basic pharmacokinetic parameters.
3. Transport of drugs through biological membranes. Types of transport.
4. Absorption of drugs with oral, sublingual, rectal and other routes of administration.
5. Kinetic processes of distribution and binding of drugs to proteins. Calculation of the volume of distribution and bioavailability of drugs.
6. Main pathways of biotransformation of drugs.
7. Factors affecting drug metabolism.
8. Mechanisms of drug excretion. The concept of renal clearance.
9. The concept of drug dose. Types of doses.
10. Methods and techniques for preventing the development of side effects of drugs.

List of sources on the topic:
1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Vinnytsia: Nova Kniga, 2010. - 644 p.
2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Ed.2. - Vinnytsia: Nova Kniga, 2013. - 644 p.
3. Pharmacotherapy with pharmacokinetics: a textbook for students of higher educational institutions / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;
edited by I.V. Kireyev. – Kharkiv: NFAU: Golden Pages, 2019. – 384 p.
4. Medical prescription with general pharmacology: a textbook for students of higher educational institutions of the Ministry of Health of Ukraine / V.Y. Kresiun, V.V. Godovan. – 2nd ed., revised and supplemented – Odesa: ONMedU, 2017. – 280 p.
5. Luk'yanchuk V.D., Kravets D.S. Introduction to general pharmacokinetics: a textbook. – Luhansk: OJSC "Luhansk Regional Printing House", 2004. – 108 p.

LECTURE 3. TOPIC
"Principles of pharmacotherapy of cardiovascular diseases"

Relevance of the topic:

Cardiovascular diseases are one of the main causes of mortality worldwide, and Ukraine is no exception. Research results show that the mortality rate from cardiovascular diseases among non-communicable diseases in our country is 63%. And this is one of the highest rates in the world. The most common diseases of the cardiovascular system are arterial hypertension, ischemic heart disease and stroke, which are the main factors in the loss of health of Ukrainians. It is possible to reduce the rate of spread of cardiovascular diseases in Ukraine, but for this it is necessary to minimize the main risk factors that lead to premature mortality. We will talk about them further.

Purpose: to familiarize the HES with the main symptoms and syndromes characteristic of the main diseases of the cardiovascular system, with the most significant diagnostic methods (laboratory and instrumental) used in cardiological practice, with the basic principles and types of pharmacotherapy of the most common diseases of the cardiovascular system.

Basic concepts (list of questions):

Arterial hypertension is a persistently elevated systolic (above 140 mm Hg) and/or diastolic blood pressure (above 90 mm Hg) in individuals who are not taking antihypertensive drugs.
Ischemic heart disease is a pathological condition characterized by an absolute or relative disruption of the blood supply to the myocardium due to damage to the coronary arteries of the heart.
Circulatory insufficiency, or heart failure, is the inability of the heart to provide blood circulation that meets the metabolic needs of the body.
Cardiac arrhythmias are a group of heart disorders associated with a disorder of the rhythm, sequence, and strength of heart muscle contractions.

Lecture content (lecture text)

Cardiovascular diseases are the most common in Ukraine and in the world. Future generations will probably call our century the era of cardiovascular diseases. These diseases are the leading cause of mortality and disability among the population. It is important to understand the causes, symptoms and methods of prevention and treatment of these diseases in order to maintain the health of the heart and blood vessels.

Causes of cardiovascular diseases

Inactivity - a sedentary lifestyle leads to insufficient stress on the heart muscle. Lack of regular physical exercise can contribute to the development of cardiovascular diseases, as the heart becomes weaker and less efficient in pumping blood.

Improper nutrition - a diet rich in fatty, fried foods and low in nutrients leads to the accumulation of fatty deposits in the vessels, known as atherosclerotic plaques. This can cause narrowing of the arteries and impaired blood flow.

Nervous and emotional overload - stress and nervous overstrain increase adrenaline levels and blood pressure, which creates additional strain on the heart and blood vessels. Chronic stress can contribute to the development of hypertension and other cardiovascular diseases.

Other risk factors include:

• Diabetes

• Being overweight or obese

• Excessive alcohol consumption and smoking

Main symptoms of cardiovascular disease

Symptoms of cardiovascular disease can vary depending on the specific disease, but most often patients complain of:

• Pain or discomfort behind the sternum: Sometimes the pain spreads to the left arm, neck or lower jaw.

• Fast or irregular heartbeat

• Shortness of breath at rest

• Swelling in the lower extremities

• Blood pressure fluctuations, headache, dizziness

Characteristics of the main diseases of the cardiovascular system

Ischemic heart disease (IHD) - is characterized by impaired blood supply to the heart muscle due to damage to the heart vessels. IHD is mainly caused by atherosclerosis, which causes narrowing of the lumen of the vessels due to the formation of atherosclerotic plaques. This leads to insufficient blood supply to the heart muscle, which can cause a heart attack - the death of sections of the heart muscle.

Arterial hypertension - is a disease whose main symptom is increased blood pressure. Hypertension is based on a violation of the functioning of the central nervous system and other body systems. This disease can lead to serious complications, such as stroke, heart attack and kidney failure.

Congestive heart failure - is characterized by weakening of the heart muscle, as a result of which it is unable to pump blood normally. Common symptoms include shortness of breath, inability to

withstand even minor physical exertion, and swelling of the legs. Congestive heart failure can be the result of damage caused by a heart attack or cardiomyopathy.

An arrhythmia is an abnormal heart rhythm. It can be chronic and harmless, but in some cases it contributes to the development of congestive heart failure and can also be a contributing factor to sudden cardiac arrest.

Cardiomyopathy develops when the heart muscle loses its ability to pump blood normally. This disease can be caused by atherosclerosis of the coronary arteries, although the exact cause is often unclear. Symptoms include shortness of breath, swelling in the legs, fatigue, and irregular heartbeat.

Methods for diagnosing cardiovascular disease
Various methods are used to accurately diagnose cardiovascular disease:
An electrocardiogram (ECG) is one of the main diagnostic methods that allows you to evaluate the electrical activity of the heart and detect rhythm disturbances, ischemia, and heart attacks.
Echocardiography uses ultrasound waves to produce real-time images of the heart. This allows for assessment of the structure of the heart, valve function, and the contractile ability of the heart muscle.

Holter monitoring - This method allows for recording of the ECG for 24-48 hours, which makes it possible to detect temporary arrhythmias and other abnormalities that are not always visible on a standard ECG.

Stress test - Performed during physical exertion (for example, on a treadmill or bicycle ergometer), which allows for assessment of the heart's response to stress and to detect ischemia.

Angiography - An X-ray examination of the blood vessels that allows visualization of the arteries and the detection of narrowing or blockage. This procedure is often used to diagnose coronary artery disease.

Treatment of cardiovascular disease depends on the specific diagnosis and may include drug therapy, lifestyle changes, and surgery.
Drug therapy
• Antihypertensive drugs: Used to lower blood pressure.
• Anticoagulants: Reduce the risk of blood clots.
• Beta-blockers: Reduce heart rate and reduce strain on the heart.
• Statins: Reduce blood cholesterol levels.
Lifestyle changes
• Healthy eating: Eat a diet low in fat and high in fruits, vegetables, and whole grains.
• Physical activity: Get regular exercise, such as walking, running, or swimming.
• Quitting smoking and limiting alcohol: Reduce the risk of developing heart disease.
Surgery
• Angioplasty and stenting: Procedures to widen narrowed arteries.
• Coronary artery bypass grafting: Surgery to create a bypass for blood around a blocked artery.
Prevention of cardiovascular disease
Prevention of cardiovascular disease includes identifying and controlling risk factors such as hypertension, high cholesterol, obesity, diabetes and smoking.
Key preventive measures:
• Regular physical activity: at least 30 minutes of physical activity per day.
• Balanced diet: limiting saturated fat, salt and sugar intake.
• Weight control: maintaining a healthy weight.

• Monitoring blood pressure and cholesterol levels: regular medical check-ups.
• Quitting smoking: reducing the risk of developing cardiovascular disease.

Questions for self-control on the topic:

1. Main symptoms and syndromes of diseases of the cardiovascular system.
2. General methods of laboratory and instrumental diagnostics in cardiology.
3. Etiopathogenetic features, clinical manifestations and treatment of rheumatic fever.
4. Etiopathogenetic features, clinical manifestations and pharmacotherapy of myocarditis.
5. Etiopathogenetic features, clinical manifestations and treatment of pericarditis.
6. Etiology, pathogenesis, clinical manifestations, treatment of ischemic heart disease.
7. Etiology, pathogenesis, clinical manifestations, treatment of arterial hypertension.
8. Etiology, pathogenesis, clinical manifestations, treatment of heart failure (acute and chronic).
9. Etiology, pathogenesis, clinical manifestations, pharmacotherapy of arrhythmias.
10. Pharmacological characteristics of antianginal drugs (nitrates, calcium antagonists, beta-blockers, sydnonimines).
11. Pharmacological characteristics of antihypertensive drugs (beta-blockers, calcium antagonists, diuretics, ACE inhibitors, angiotensin 2 receptor antagonists).

List of sources on the topic:

1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Vinnytsia: Nova Kniga, 2010. - 644 p.
2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Ed.2. – Vinnytsia: Nova Knyga, 2013. – 644 p.
3. Pharmacotherapy with pharmacokinetics: a teaching aid for students of higher education. / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;
edited by I.V. Kireyev. – Kharkiv: NFAU: Golden Pages, 2019. – 384 p.
4. Modern classifications and standards for the treatment of diseases of internal organs. Emergency conditions in therapy. Analyses: normative indicators, interpretation of changes / Edited by prof. Yu.M. Mostovoy. – 25th ed., changes and additions – Kyiv: Center of State Clinical Laboratory, 2018. – 792 p.

LECTURE 4. TOPIC
"Principles of pharmacotherapy of respiratory diseases"

Relevance of the topic: Among all diseases, respiratory diseases are registered most often. The rapid deterioration of the environmental situation, the increase in the level of injuries, accompanied by injuries to the chest and chest cavity organs, the increase in the number of oncological diseases of the respiratory organs, stress, occupational hazards contribute to the steady growth and rejuvenation of lung diseases. These factors make respiratory health problems one of the most relevant in modern society.

Purpose: to familiarize the HES with the main symptoms and syndromes characteristic of the main diseases of the respiratory system, with the most important diagnostic methods (laboratory and instrumental) used in pulmonological practice, with the basic principles and types of pharmacotherapy of the most common diseases of the respiratory system.

Basic concepts (list of questions):
Pneumonia is an acute infectious disease of predominantly bacterial etiology, which is characterized by focal lesions of the respiratory parts of the lungs and the presence of intra-alveolar exudation.
Bronchial asthma is a chronic inflammation of the respiratory tract, in which inflammatory cells and cellular elements of the tracheobronchial tree play an important role, causing a concomitant increase in bronchial hyperreactivity, which leads to repeated episodes of attacks of suffocation or wheezing, shortness of breath, a feeling of tightness in the chest, especially at night or in the morning.
Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory disease characterized by an irreversible or almost irreversible decrease in airway airflow.
Tuberculosis is a chronic infectious disease characterized by the development of specific changes in various organs and tissues, primarily in the lungs.

Lecture content (lecture text)

Among all diseases, respiratory diseases are registered most often. The rapid deterioration of the environmental situation, the increase in the level of injuries, accompanied by injuries to the chest and chest organs, the increase in the number of oncological diseases of the respiratory

system, stress, occupational hazards contribute to the steady growth and rejuvenation of lung diseases. These factors make respiratory health problems one of the most relevant in modern society.

Causes of respiratory diseases

1. Infectious factors

Infectious agents, such as viruses, bacteria and fungi, are the main causes of the development of inflammatory diseases of the respiratory system, such as bronchitis and pneumonia. Influenza viruses, coronaviruses, rhinoviruses and other respiratory pathogens can cause both mild forms of the disease and serious complications that can lead to hospitalization and even death.

2. Allergic factors

Allergens such as pollen, food, household chemicals, and others can cause allergic reactions in the body, which often manifest as bronchial asthma. In people with a genetic predisposition to allergies, contact with an allergen can lead to the development of chronic inflammatory processes in the respiratory tract.

3. Autoimmune mechanisms

Autoimmune diseases occur when the body's immune system begins to attack its own cells, considering them foreign. These diseases can affect various organs, including the lungs. For example, sarcoidosis or idiopathic pulmonary fibrosis may be associated with autoimmune processes.

4. Hereditary factors

Some respiratory diseases are genetic in nature. Hereditary factors can determine the predisposition to the development of bronchial asthma, cystic fibrosis, and other respiratory diseases. Understanding the genetic component of diseases helps doctors plan diagnosis and treatment more accurately.

5. Environmental and social factors

Air pollution, climate change and other environmental problems seriously affect the health of the respiratory system. Large cities with high levels of air pollution, workplaces with an increased content of harmful substances in the air (dust, chemicals) are places of increased risk of developing lung diseases.

The impact of a modern lifestyle on the respiratory system

The modern lifestyle also makes a significant contribution to the increase in respiratory diseases. Smoking, alcohol abuse, chronic stress, lack of sleep and malnutrition negatively affect the immune system, which increases the vulnerability of the respiratory system to infections and other harmful effects.

1. Working environment

For many people, the working environment becomes a place of increased risk for the development of respiratory diseases. Offices with poor ventilation, air conditioners that promote

the spread of microorganisms, copiers and printers that emit harmful substances - all this can contribute to the development of allergic diseases, bronchitis and bronchial asthma.

2. Lifestyle

People are often exposed to negative environmental factors by spending long periods of time indoors, such as in offices or at work. Insufficient physical activity, insufficient exposure to fresh air, and lack of sunlight can weaken the immune system, making the body more vulnerable to infections.

3. Smoking

Smoking remains one of the main causes of chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD) and lung cancer. Quitting smoking is the most important step in preventing these diseases.

Respiratory Diseases: Symptoms and Diagnosis

Respiratory diseases can have various manifestations, from a mild cough to severe shortness of breath and chest pain. Most often, patients seek medical attention with the following symptoms:

• Cough: May be dry or with phlegm, constant or intermittent.

• Shortness of breath: A feeling of shortness of breath that may occur during exercise or at rest.

• Chest pain: May indicate inflammation or damage to the lungs, pleura, or bronchi.

• Fever: Often accompanies infectious diseases such as pneumonia or bronchitis.

• Wheezing and wheezing: This may be a sign of bronchial asthma or COPD.

Diagnosis of Respiratory Diseases

Various methods are used to accurately diagnose respiratory diseases, including:

• Auscultation: Listening to the lungs with a stethoscope to detect wheezing, noises, and other changes in respiratory sounds.

• Chest X-ray: Detects inflammation, tumors, and other changes in the lungs and bronchi.

• Spirometry: A lung function test that measures the volume of air exhaled and the rate of exhalation. Used to diagnose asthma, COPD, and other obstructive diseases.

• CT (computed tomography): A more detailed imaging method that allows you to see the structure of the lungs in high resolution.

• Laboratory tests: Bacteriological analysis of sputum, determination of blood gas levels, and immunological tests.

Characteristics of the main respiratory diseases

Bronchitis

Bronchitis is an inflammatory disease characterized by damage to the bronchi. The main symptom of bronchitis is a cough that may be accompanied by sputum production. Bronchitis can be acute or chronic.

• Acute bronchitis: Usually caused by a viral infection and may be accompanied by general weakness, fever, and cough.

• Chronic bronchitis: Diagnosed if a cough with sputum production is observed for at least three months a year for two years or more. It is often the result of long-term exposure to harmful factors, such as smoking.

Pneumonia

Pneumonia is an acute infectious-inflammatory disease that affects the lung tissue. The inflammatory process involves the alveoli, which fill with fluid or pus, making breathing difficult. Pneumonia can have various causes, including viruses, bacteria, and fungi. The disease can be severe, especially in people with weakened immune systems, children, and the elderly.

• Viral pneumonia: Often caused by influenza viruses or respiratory viruses. Tends to progress rapidly, especially in children and the elderly.

• Bacterial pneumonia: Most often caused by bacteria such as Streptococcus pneumoniae. Treatable with antibiotics, but can have serious complications if not detected early.

Bronchial asthma

Bronchial asthma is a chronic inflammatory disease of the airways with an allergic component. During an asthma attack, the bronchial tubes narrow, causing difficulty breathing, coughing, wheezing, and wheezing.

• Triggers: Attacks can be triggered by various allergens, exercise, stress, or infections.

• Treatment: Includes the use of inhaled bronchodilators, corticosteroids, and control of factors that trigger attacks.

Chronic Obstructive Pulmonary Disease (COPD)

COPD is a chronic disease characterized by persistent airflow limitation in the airways. COPD is usually caused by long-term smoking or exposure to environmental pollutants such as dust or chemicals.

• Symptoms: Persistent cough with phlegm, shortness of breath on exertion, frequent respiratory infections.

• Treatment: Includes bronchodilators, corticosteroids, oxygen therapy, and smoking cessation.

The impact of COVID-19 on the respiratory system
The COVID-19 pandemic has brought significant changes to the way we think about respiratory health. The SARS-CoV-2 virus, which causes COVID-19, infects the respiratory tract and lungs, often leading to severe pneumonia, acute respiratory distress syndrome (ARDS), and other complications.
Mechanism of lung damage

COVID-19 causes inflammation of the alveoli, which disrupts gas exchange and causes severe hypoxia. The virus also promotes the formation of microthrombi in the pulmonary vessels, which complicates treatment and increases the risk of death.

COVID-19 Symptoms

The main symptoms of COVID-19 related to respiratory tract infection include:
• Cough (dry or productive)
• Shortness of breath and difficulty breathing
• Chest pain
• High fever

Long-term effects of COVID-19

Some patients, even after recovery, have persistent respiratory problems, such as chronic shortness of breath, pulmonary fibrosis, and decreased physical endurance. These symptoms can significantly reduce quality of life and require long-term treatment and rehabilitation.

Prevention and treatment

COVID-19 prevention includes vaccination, wearing masks, social distancing, and regular hand disinfection. Treatment of severe cases includes the use of oxygen therapy, antiviral drugs, corticosteroids, and supportive care.

Prevention of respiratory diseases

Preventing respiratory diseases is an important component of maintaining health. Key preventive measures include:
• Quitting smoking: Smoking is the main cause of many respiratory diseases, including lung cancer and COPD.
• Healthy lifestyle: Regular exercise, proper nutrition, and adequate sleep support the immune system and reduce the risk of disease.
• Vaccination: Vaccines against influenza, pneumococcal, and COVID-19 help prevent serious infections that can lead to respiratory complications.
• Allergen control: Taking steps to reduce exposure to allergens can help prevent the development of bronchial asthma and allergic diseases.
• Regular medical examinations: An annual examination by a general practitioner or pulmonologist helps to identify respiratory problems in time and take the necessary measures.

Self-control questions on the topic:

1. Etiology, pathogenesis, clinical features, pharmacotherapy of acute respiratory diseases (influenza, parainfluenza, adenovirus infection, rhinovirus infection).
2. Comparative characteristics of bronchodilator drugs according to pharmacokinetic and pharmacodynamic parameters.
3. Principles of drug selection and routes of administration in a specific clinical situation (antibacterial, antiviral, mucolytic, expectorant, anti-inflammatory, desensitizing).
4. Etiology, pathogenesis, clinical features, principles of pharmacotherapy of pulmonary tuberculosis and other organs and systems of the body.
5. Mechanism of therapeutic action of glucocorticosteroids in bronchoobstructive syndrome.
6. Etiology, pathogenesis, clinical features, pharmacotherapy of rhinitis.
7. Etiology, pathogenesis, clinical features, pharmacotherapy of otitis.
8. Etiology, pathogenesis, principles of pharmacotherapy of nasal bleeding.
9. Etiology, pathogenesis, clinical features, pharmacotherapy of angina.
10. Etiology, pathogenesis, clinical features, pharmacotherapy of pharyngitis, laryngitis, bronchitis.
11. Etiology, pathogenesis, clinical features, pharmacotherapy of bronchial asthma.
12. Etiology, pathogenesis, clinical features, diagnostics, principles of pharmacotherapy of pneumonia.

List of sources on the topic:

1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Vinnytsia: Nova Kniga, 2010. - 644 p.

2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Ed.2. – Vinnytsia: Nova Knyga, 2013. – 644 p.

3. Pharmacotherapy with pharmacokinetics: a teaching aid for students of higher education. / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;

edited by I.V. Kireyev. – Kharkiv: NFAU: Golden Pages, 2019. – 384 p.

4. Modern classifications and standards for the treatment of diseases of internal organs. Emergency conditions in therapy. Analyses: normative indicators, interpretation of changes / Edited by prof. Yu.M. Mostovoy. – 25th ed., changes and additions – Kyiv: Center of State Clinical Laboratory, 2018. – 792 p.

LECTURE 5. TOPIC
"Principles of pharmacotherapy of digestive diseases"

Relevance of the topic: The number of people suffering from diseases of the gastrointestinal tract and hepatobiliary system is increasing every year all over the world, and therefore, they need specialized gastroenterological care. Today, the trend of increasing prevalence of diseases of the digestive system is a rather urgent problem not only in Ukraine, but also throughout the world. Diseases of the digestive system rank third among all diseases. The problem concerns not only practical areas of health care, but also theoretical medicine.

Purpose: to familiarize the HES with the main symptoms and syndromes characteristic of the main diseases of the digestive system, with the most significant diagnostic methods (laboratory and instrumental) used in gastroenterological and hepatological practice, with the basic principles and types of pharmacotherapy of the most common diseases of the gastrointestinal tract and hepatobiliary system.

Basic concepts (list of questions):

Gastroesophageal reflux disease (GERD) is a chronic recurrent disease caused by retrograde (reverse) reflux of acidic gastric juice into the esophagus and/or extraesophageally.

Chronic gastritis is a chronic inflammatory process of the gastric mucosa, which occurs with changes in cell regeneration processes, progressive atrophy of the glandular epithelium, and impaired secretory, motor, and incretin function of the stomach.

Peptic ulcer disease is a disease in which a peptic ulcer in the stomach or duodenum is formed as a result of a violation of the regulatory nervous and hormonal mechanisms and disorders of gastric digestion.

Hepatitis is a general name for acute and chronic diffuse inflammatory liver diseases of various etiologies.

Chronic acalculous cholecystitis is a chronic inflammatory disease of the gallbladder, which is combined with functional disorders (dyskinesia and dyscholia).

Lecture content (lecture text)

Diseases of the gastrointestinal tract (GIT) are well known to most people since school days and are often caused by an unhealthy diet.

To maintain all life processes, a person needs energy, which can be obtained from food. The GIT tract is where primary processing, digestion of food and the disposal of its residues take place. The digestive process is extremely complex, many organs participate in it, which produce the necessary enzymes and hormones. And the actions of all organs are controlled by the brain, endocrine and immune systems. The supply of other organs and systems with necessary nutrients depends on the correctness and efficiency of digestive processes. Each stage is important and necessary, so any violation can affect the condition of the body as a whole.

WHAT CONTRIBUTES TO THE OCCURENCE OF DISEASES OF THE DIGESTIVE ORGANS?

Frequent consumption of fast food, carbonated drinks, fried, fatty, smoked food, semi-finished products, as well as insufficient consumption of cereals, vegetables, fruits, sea fish, lean meats, nuts, poor chewing lead to the occurrence of such diseases as gastroesophageal reflux disease, gastritis, gastroduodenitis, cholecystitis, steatohepatitis, pancreatitis, enterocolitis. Stress, smoking, alcohol consumption, poor environmental conditions play a large role in the progression of these diseases.

The main signs and symptoms of digestive diseases are: abdominal pain, which may occur before or after eating, night pain, clearly localized or diffuse, may spread to the back or below the right shoulder blade; nausea and vomiting with food, bile, blood; diarrhea or constipation, black feces; bitterness in the mouth, dryness; heartburn; belching with sour, rotten or air; bloating or rumbling in the abdomen; chronic weight loss.

LET'S CONSIDER THE MOST COMMON DISEASES OF THE DIGESTIVE SYSTEM

Esophagitis - occurs when the mucous membrane of the esophagus becomes inflamed. This can be caused by alcohol consumption, too rough, poorly chewed food, burns. Such diseases of the gastrointestinal tract as esophagitis are manifested by quite severe pain, discomfort. There may be a burning sensation, vomiting, sometimes even with blood.

Chronic gastritis is the most common disease of the gastrointestinal tract. Previously, it was believed that gastritis is a disease of students and people with a frantic rhythm of life who eat irregularly and incorrectly. Today, it is absolutely certain that the vast majority of gastritis is caused by the bacterium Helicobacter pylori. Helicobacter infection is one of the most common in the world. Chronic gastritis is an inflammation of the gastric mucosa. In fact, this is a disease that can have very serious consequences. Initially, the absorption of various nutrients is impaired, for example, vitamin B12. A deficiency of this vitamin leads to the development of anemia. If gastritis is not treated, an atrophic form may develop, which is considered a precancerous condition.

Chronic duodenitis and chronic colitis are inflammation of the mucous membranes of the duodenum and colon, respectively.

Cholecystitis or acute cholecystitis is inflammation of the gallbladder. The gallbladder is a small pear-shaped organ located under the liver. It stores bile produced in the liver and sends it to the duodenum at the right time. Bile helps in the digestion of fats. Cholecystitis is a serious disease that requires immediate treatment, sometimes even surgical.

Chronic pancreatitis is inflammation of the pancreas, which, if left untreated, leads to irreversible damage to the organ. The pancreas is located behind the stomach and produces chemicals called enzymes that are needed to digest food. It also produces the hormones insulin and glucagon. When the pancreas becomes inflamed, it becomes damaged and can no longer produce enough of these enzymes, and the body can no longer digest food. Damage to the parts of the pancreas that produce insulin can lead to diabetes. There are many factors that can contribute to the development of chronic pancreatitis. The most important of these are heredity and alcoholism. Seeking medical attention early can help you avoid serious complications.

Peptic ulcers most often develop in the lining of the stomach or in a part of the small

intestine called the duodenum. There is no specific cause of peptic ulcers. However, it is clear that peptic ulcer disease is the result of an imbalance between the lining of the duodenum or stomach and the digestive juices that aggressively attack it. The leading role in the occurrence of the disease is played by the microorganism Helicobacter pylori. You should not expect that the ulcer will heal on its own. If left untreated, ulcers can lead to serious health problems, including bleeding, perforation (a hole through the stomach wall).

Questions for self-control on the topic:
1. General information about the etiology, pathogenesis of diseases of the gastrointestinal tract: esophagitis, gastritis, enterocolitis.
2. Main clinical and diagnostic characteristics of diseases of the gastrointestinal tract.
3. Etiopathogenesis, clinical features, diagnosis of peptic ulcer disease.
4. Complications of peptic ulcer disease, methods of diagnosis and treatment.
5. Intestinal dysbacteriosis: etiology, pathogenesis, clinical features, principles of pharmacotherapy.
6. Justification of the appointment of antimicrobial therapy for peptic ulcer disease and chronic gastritis.
7. Main subjective signs of diseases of the gastrointestinal tract, in which symptomatic treatment is possible.
8. General information about the etiology, pathogenesis of diseases of the hepatobiliary system: hepatitis, cholecystitis, pancreatitis.
9. Etiopathogenesis, clinical features, diagnosis of acute and chronic hepatitis.
10. Acute and chronic cholecystitis: etiology, pathogenesis, clinical manifestations, principles of pharmacotherapy.
11. Justification of the appointment of pathogenetic therapy for acute and chronic pancreatitis.
12. The main subjective signs of diseases of the hepatobiliary system, in which symptomatic treatment is possible.

List of sources on the topic:
1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Vinnytsia: Nova Kniga, 2010. - 644 p.
2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Ed.2. – Vinnytsia: Nova Knyga, 2013. – 644 p.
3. Pharmacotherapy with pharmacokinetics: a teaching aid for students of higher education. / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;
edited by I.V. Kireyev. – Kharkiv: NFAU: Golden Pages, 2019. – 384 p.
4. Modern classifications and standards for the treatment of diseases of internal organs. Emergency conditions in therapy. Analyses: normative indicators, interpretation of changes / Edited by prof. Yu.M. Mostovoy. – 25th ed., changes and additions – Kyiv: Center of State Clinical Laboratory, 2018. – 792 p.

LECTURE 6. TOPIC
"PHARMACOTHERAPY OF METABOLIC DISEASES AND METABOLISM"

Relevance of the topic: Metabolic diseases (metabolic disorders) are a group of diseases caused by a decrease or lack of activity (insufficiency) of a particular enzyme, which leads to a failure of biochemical reactions in the body and the development of a pathological process. Most metabolic disorders are the result of a congenital deficiency of a certain enzyme caused by a genetic block. The cause of the diseases can be hereditary disorders, diseases of the endocrine organs, or other disorders in the functioning of organs important for metabolism (for example, the liver). The overall frequency of hereditary metabolic diseases is very high - every 500th newborn child has some kind of metabolic pathology. Thanks to modern medical advances, it is possible to diagnose a metabolic disease very early, in particular in the neonatal period, and, in most cases, to carry out effective treatment.

Purpose: to familiarize the student with the main symptoms and syndromes characteristic of the main metabolic diseases, with the most important diagnostic methods (laboratory and instrumental) used in metabolic practice, with the basic principles and types of pharmacotherapy of the most common metabolic disorders.

Basic concepts (list of questions):

Metabolism is a set of biochemical reactions that occur in living organisms. the process of organic compounds entering the body for the purpose of their further breakdown; accompanied by the release and accumulation of energy.

Metabolism is a continuous and self-regulated cycle of substances that occurs in the process of the existence of living organisms and is accompanied by their constant self-renewal. These reactions include the assimilation of nutrients and oxygen that come from the environment, up to the formation of end products (CO_2, water, urea, etc.), which are excreted.

Living organisms are able to absorb and convert energy from the environment (energy metabolism), which is then spent on building and maintaining their structural organization (plastic metabolism). Metabolism includes three stages: the entry of substances into the body, their intratissue metabolism, and the excretion of end products from the body. The entry of substances into the body occurs as a result of respiration (oxygen) and nutrition. In the gastrointestinal tract, food is digested (broken down into simple substances). During digestion, polymers (proteins, polysaccharides, and other complex organic substances) are hydrolyzed to monomers, which are absorbed into the blood and included in intermediate metabolism. The latter (intracellular metabolism) has two directions: catabolism and anabolism. Catabolism is the process of breaking down organic molecules into end products. The main end products of the transformation of organic substances in animals and humans are CO_2, H_2O, and urea. The processes of catabolism include metabolites that are formed both during digestion and during the breakdown of structural and functional components of cells. Catabolism reactions are accompanied by the release of energy (exergonic reactions). Anabolism combines biosynthetic processes in which simple building blocks are combined into complex macromolecules necessary for the body. Anabolic reactions use the energy released during catabolism (endergonic reactions). Metabolism combines anabolic and catabolic processes and provides vital processes in the cells of the body. Each type of organism is characterized by its own, genetically determined type of metabolism. The intensity and direction of metabolic reactions are ensured by the complex regulation of synthesis and cleavage processes, the activity of enzyme systems, and the perfection of regulatory mechanisms.

Atherosclerosis is a chronic disease that affects mainly large arterial vessels; it is mostly observed in the elderly. Arteriosclerosis is a general term that describes the hardening (and loss of elasticity) of medium-sized or large arteries; arteriolosclerosis is any hardening (and loss of elasticity) of arterioles (small arteries). Atherosclerosis is the hardening of an artery, particularly due to atheromatous plaque. The term "atherogenic" is used to refer to substances or processes that cause the formation of atheroma. Atherosclerosis is characterized by the thickening of the arterial wall due to the growth of connective tissue due to the deposition of yellow fatty matter on the inner surface of the artery walls, the formation of "atherosclerotic plaques". Blood flow is reduced and blood pressure increases, which can lead to myocardial infarction, stroke, and certain other diseases in middle and old age.

Obesity is a disease in which excess accumulated fat in the body adversely affects health, leading to a decrease in life expectancy and/or an increase in health problems.

Gout is a systemic pathology characterized by elevated levels of uric acid in the blood and the deposition of uric acid crystals in soft tissues, and the inflammatory processes that occur thereafter.

Lecture content (lecture text)

Metabolic disorders or metabolic disorders are, in fact, not exactly a disease. Rather, they are a complex of symptoms, a syndrome that develops for various reasons and leads to changes in the functions of the body's cells. This problem is complex and, unfortunately, widespread. Metabolic disorders occur in children and adults. They themselves arise as a result of certain diseases, and at the same time further worsen the state of health. There are more than 20 varieties, among which the most common is metabolic syndrome. Often, patients with metabolic disorders do not suspect their problem. They knock on the doors of doctors and clinics, spending time and money searching for the causes of poor health.

Causes

Metabolic processes in the body do not stop for a minute. Nutrients from food are absorbed by cells, where they are transformed into energy necessary for life. When a metabolic

disorder occurs, the body either lacks energy resources, or those that are available are not spent properly.

The causes of metabolic disorders can be:

• unhealthy diet with excess or deficiency of calories, nutrients;

• various diseases of the thyroid gland;

• genetic disorders;

• hormonal disorders;

• psycho-emotional overwork, stress;

• sleep disorders;

• immune disorders;

• sedentary lifestyle and work;

• congenital enzyme pathologies;

• diseases of internal organs - liver, kidneys, gonads.

Sometimes the pathology is inherited, children are born with a deficiency of one or another enzyme, without which chemical processes in the whole body do not proceed correctly. The consequences are often critical, an examination of a young child will help to identify the problem in time and respond to it. Adults get sick more often, since they have more risk factors. The difficulty is that it is not so easy to notice the pathology at the initial stage.

Symptoms

It all depends on which link of chemical reactions is affected. In some cases, the main symptom of metabolic disorders is obesity, in others - weight loss. The fact that the symptoms of the underlying disease are superimposed on the picture of metabolic disorders adds to the complexity.

Typical symptoms of metabolic disorders:

• fatigue, physical and intellectual;

• weight gain, obesity without apparent reasons;

• change in body shape;

• severe weight loss, exhaustion;

• excessive appetite or vice versa - indifference to food;

• increased sweating;

• swelling of the legs, arms;

• thirst, sometimes unbearable;

• frequent fractures of skeletal bones;

• hair loss or vice versa - excessive hair growth;

• male and female infertility;

• skin rash, peeling.

• The cardiovascular system often suffers: there is a burning sensation behind the sternum, shortness of breath during physical exertion, and chest pain.

Common diseases with metabolic disorders

In the first place in frequency is diabetes mellitus, a disorder of carbohydrate metabolism. In the first type of disease, the pancreatic tissue synthesizes very little insulin, the person loses weight. In the second, the body's cells lose sensitivity to insulin, obesity develops. The body's vital activity is actively regulated by the thyroid gland, which is why goiter, hyperthyroidism and hypothyroidism always lead to metabolic disorders. The third most frequent threat is problems with fat and cholesterol metabolism. As a result of hypercholesterolemia, full-fledged ischemic heart disease develops, associated with atherosclerosis. Often, metabolic disorders in women occur against the background of polycystic ovary syndrome, PCOS. They are manifested by weight gain, diabetes, disorders of reproductive function: the cycle is disrupted, up to amenorrhea.

Diagnosis

Based on complaints and symptoms, an experienced doctor can only assume that the person's disease is related to metabolism. The only way to establish the correct diagnosis is a thorough instrumental and laboratory examination.
To diagnose metabolic disorders, the following are performed:
• detailed survey of complaints, dietary habits and lifestyle;
• medical examination, in children - assessment of physical development parameters;
• clinical, biochemical blood test;
• lipid profile, cholesterol fractions;
• determination of thyroid hormone levels, gonadal glands;
• blood glucose;
• ultrasound of the thyroid gland, internal organs, reproductive system in women;
• electrocardiography, including Holter ECG;
• CT, MRI if necessary.

Treatment of metabolic disorders

There is no universal recipe. Each case should be considered individually, taking into account the cause that led to metabolic disorders. The goal of therapy is to minimize harm to health, relieve the patient of pathological symptoms and normalize metabolism.
In order to treat various metabolic disorders, the following can be used:
• lifestyle changes;
• dietary changes;
• anti-inflammatory drugs;
• treatment of the underlying disease;
• symptomatic therapy.

For example, in the case of diabetes, blood sugar-lowering drugs and insulin are used. Hypothyroidism is treated with thyroid hormones, hyperthyroidism with a complex set of drugs. Problems with fat metabolism are a reason to prescribe statins.

Questions for self-control on the topic:

1. General information about the etiology, pathogenesis of metabolic diseases: atherosclerosis, obesity, gout.

2. Main clinical and diagnostic characteristics of metabolic diseases.

3. Etiopathogenesis, clinical features, diagnosis of atherosclerosis.

4. Complications of atherosclerosis, methods of diagnosis and treatment.

5. Obesity: etiology, pathogenesis, clinical features, principles of pharmacotherapy.

6. Main subjective signs of metabolic disorders, in which symptomatic treatment is possible.

7. General information about the etiology, pathogenesis of gout.

8. Justification for the appointment of pathogenetic therapy of metabolic disorders.

List of sources on the topic:

1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Vinnytsia: Nova Kniga, 2010. - 644 p.

2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Ed. 2. - Vinnytsia: Nova Kniga, 2013. - 644 p.

3. Pharmacotherapy with pharmacokinetics: a textbook for students of higher education. / I.V. Kireev, O.O. Ryabova, N.V. Zhabotynska and others;

edited by I.V. Kireev. – Kharkiv: NFAU: Golden Pages, 2019. – 384 p.

4. Modern classifications and standards of treatment of diseases of internal organs. Emergency conditions in therapy. Analyses: normative indicators, interpretation of changes / Edited by prof. Yu.M.Mostovoy. – 25th ed., changes and additions. – Kyiv: Center of State Clinical Hospitals, 2018. – 792 p.

LECTURE 7. TOPIC
"Pharmacotherapy of diseases of the nervous system"

Relevance of the topic: Prevalence, morbidity, mortality, disability-adjusted life years, sum of years lost and years of life with disability by age and gender. It has been established that diseases of the nervous system are the main cause of disability (11.6% of the total number of diseases) and the second cause of mortality in the population (16.5% of the total number of diseases). Thus, today stroke is recognized as an epidemic of the modern world, it is a major medical and social problem. In 2016, 13.7 million cases of this disease were registered in the world (in 2020 - 17.3 million), its prevalence increased by 8.1% compared to 1990 (in Ukraine this indicator is higher than the average for Europe). As a result of stroke in 2016 5.5 million people died (2.6 million women and 2.9 million men), of whom 2.7 million had ischemic stroke, and 2.8 million had hemorrhagic stroke. Therefore, the relevance is beyond doubt from both a medical and socio-economic perspective.

Purpose: to familiarize the general public with the main symptoms and syndromes characteristic of the main diseases of the central and peripheral nervous system, with the most important diagnostic methods (laboratory and instrumental) used in neurology, with the basic principles and types of pharmacotherapy of the most common diseases of the nervous system.

Basic concepts (list of questions):

The central nervous system (CNS) is a system of organs of humans and animals, built from nerve cells, which coordinates the functioning and interconnection of all other organs and

organ systems of the body. The central nervous system can be of the nodal and tubular types. In general, the CNS is divided into the following seven parts: the cerebral hemispheres (left and right), diencephalon, midbrain, cerebellum, medulla oblongata, and spinal cord; the first six parts are collectively called the brain. Through all of these structures runs a system of cavities filled with cerebrospinal fluid, or CSF, called the cerebral ventricles. These ventricles originate from a continuous lumen that forms during embryonic development when the primary neural plate closes into the neural tube. The medulla oblongata, pons, and midbrain are collectively called the brainstem and surround the 4th cerebral ventricle (medulla oblongata and pons) and the cerebral aqueduct (midbrain). The diencephalon and hemispheres are collectively called the forebrain and contain the third and lateral (left and right) ventricles, respectively. The 4th ventricle of the brain is connected to the spinal canal filled with the same fluid, which runs the entire length of the spinal cord.

The peripheral nervous system (PNS) is a part of the nervous system, represented by nerves that connect the central nervous system with sensory organs, receptors and effectors (muscles and glands) and unite them in interaction. The peripheral nervous system consists of all other nerves and neurons that do not lie within the CNS. The vast majority of nerves (which are actually axons of neurons) belong to the PNS. The peripheral nervous system in humans includes 31 pairs of spinal nerves and 12 pairs of cranial nerves that go from the spinal cord and brain to the periphery. The peripheral nervous system is divided into the somatic nervous system and the autonomic nervous system. In turn, the autonomic nervous system is divided into the sympathetic and parasympathetic nervous system. The sympathetic nervous system and the parasympathetic nervous system are interconnected and are "antagonists" in terms of their mechanism of action: the first stimulates the work of organs, the other inhibits them.

Stroke is an acute cerebrovascular accident (SCCA), which causes damage to brain tissue and disorders of its functions. Strokes include cerebral infarction (ischemic stroke), cerebral hemorrhage (hemorrhagic stroke), and subarachnoid hemorrhage (SAH), which have etiopathogenetic and clinical differences. Stroke is the second most common cause of death worldwide and the main cause of long-term disability.

Meningitis is inflammation of the meninges, which cover the brain and spinal cord. Inflammation can be caused by viruses, bacteria, or other microorganisms. Meningitis is life-threatening, so this disease is an emergency. Bacterial purulent meningitis leads to death in approximately 1/6 of patients, severe complications occur in 1/5 of patients.

Encephalitis is inflammation of the brain (the suffix "it" indicates the inflammatory nature of the disease). The term "encephalopathy" indicates the absence of inflammation, and the lesion process is caused mainly by vascular disorders. It is often a clinical syndrome of many diseases.

Radiculitis is not an independent disease, but a syndrome that develops against the background of pathological processes in the spinal column and is characterized by damage to the roots of the spinal nerves.

Lecture content (lecture text)

CAUSES AND SYMPTOMS OF DISEASES OF THE NERVOUS SYSTEM.

Diseases of the nervous system represent a wide and diverse field of pathologies of various etiology and symptoms. This is explained by the fact that the nervous system is extremely branched, and each of its subsystems is unique. Most often, disorders of the nervous system have a detrimental effect on the functions of other internal organs and systems.

TYPES OF DISEASES OF THE NERVOUS SYSTEM.

All diseases of the nervous system can be divided into vascular, infectious, chronic progressive, hereditary and traumatic pathologies.

VASCULAR diseases - are extremely common and dangerous. They often lead to disability or even death of the patient. This group includes acute cerebral circulation disorders (strokes) and chronically ongoing cerebrovascular insufficiency, which causes changes in the brain. Such diseases can develop as a result of hypertension or atherosclerosis. Vascular diseases of the nervous system are manifested by headaches, nausea and vomiting, decreased sensitivity and impaired motor activity. Infectious diseases of the nervous system develop as a result of the pathogenic influence of various viruses, bacteria, fungi and parasites. The brain suffers mainly, and the peripheral nervous system and spinal cord are affected less often. Common diseases of this group are encephalitis, malaria, measles, etc.

INFECTIOUS - symptoms of neuroinfections are fever, impaired consciousness, severe headache, nausea and vomiting. This group includes sclerosis, myasthenia gravis and other diseases. The course of the disease is usually long, and the lesion is systemic in nature. Signs of the disease increase gradually, the viability of certain body systems decreases.

HERITAGEOUS - are divided into chromosomal (cellular) and genomic. The most common chromosomal disease of the nervous system is Down syndrome, and genomic pathologies most often affect the neuromuscular system. The characteristic signs of such disorders are dementia, infantility, disorders of the endocrine system and the musculoskeletal system. Traumatic injuries of the nervous system occur as a result of trauma, impact or compression of the brain or spinal cord. These include concussion. Accompanying symptoms are headache, impaired consciousness, nausea and vomiting, memory loss, decreased sensitivity, etc.

CAUSES OF DISEASES OF THE NERVOUS SYSTEM.
It was mentioned above that various infectious agents are very often included among the causes of diseases of the nervous system:
— bacteria (pneumococcus, meningococcus, staphylococcus, pale treponema and streptococcus);
— various fungi and parasites;
— viruses transmitted by airborne droplets (arboviruses).
Also, diseases of the nervous system can be transmitted placentally during pregnancy (cytomegalovirus, rubella) and the peripheral nervous system. For example, the rabies virus, herpes, acute poliomyelitis and meningoencephalitis are spread in this way.
Among the common causes of diseases of the nervous system are also brain injuries, brain tumors or their metastases, vascular disorders (thrombosis, ruptures or inflammation), heredity or chronic progressive diseases (Alzheimer's disease, chorea, Parkinson's disease, etc.).
The nervous system is also affected by malnutrition, lack of vitamins, heart, kidney and endocrine diseases. Pathological processes can develop under the influence of various chemicals: opiates, barbiturates, antidepressants, ethyl alcohol, poisons of animal and plant origin. Poisoning with antibiotics, antitumor drugs and heavy metals (mercury, arsenic, lead, bismuth, manganese, thallium, etc.) is also possible.
SYMPTOMS OF NERVOUS SYSTEM DISEASES.
Symptoms of nervous system diseases manifest themselves in different ways, very often in the form of motor disorders. Characteristic is the development of paresis (decreased muscle strength) or paralysis in the patient, inability to move quickly, tremor, involuntary rapid movements. Coordination and speech disorders, involuntary contractions of various muscle groups, tics, shuddering are possible. Tactile sensitivity can also be impaired. Other important symptoms of nervous system diseases are headache (migraine), pain in the back and neck, arms and legs. Pathological changes also affect other types of sensitivity: smell, taste, vision. Nervous system diseases are manifested by epileptic seizures, hysterics, sleep and consciousness

disorders, mental activity, behavior and psyche.

TREATMENT OF NERVOUS SYSTEM DISEASES.

Treatment of nervous system diseases depends on their type and symptoms, is prescribed by a doctor and sometimes requires intensive therapy in a hospital. To avoid nervous system diseases, you should diagnose and treat infections in a timely manner, lead a healthy lifestyle, giving up alcohol and drugs, eat well, avoid stress and overwork.

Questions for self-control on the topic:
1. Anatomical and physiological aspects of the nervous system.
2. Functions of the CNS.
3. Functions of the peripheral nervous system.
4. General information about the etiology, pathogenesis of vascular diseases of the CNS.
5. Main clinical and diagnostic characteristics of CNS diseases.
6. Main clinical and diagnostic characteristics of peripheral nervous system diseases.
7. Etiopathogenesis, clinical features, diagnostics of inflammatory diseases of the nervous system.
8. Cerebral complications of atherosclerosis, methods of diagnosis and treatment.
9. Meningitis: etiology, pathogenesis, clinical features, principles of pharmacotherapy.
10. Main subjective signs of diseases of the nervous system, in which symptomatic treatment is possible.
11. General information about the etiology, pathogenesis of encephalitis.
12. Justification for the appointment of etio-pathogenetic therapy of diseases of the nervous system.

List of sources on the topic:

1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Vinnytsia: Nova Kniga, 2010. - 644 p.
2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Ed. 2. - Vinnytsia: Nova Kniga, 2013. - 644 p.
3. Pharmacotherapy with pharmacokinetics: a textbook for students of higher education. / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;
edited by I.V. Kireyev. – Kharkiv: NFAU: Golden Pages, 2019. – 384 p.

LECTURE 8. TOPIC
"Pharmacotherapy of oral diseases"

Relevance of the topic: Oral diseases remain a pressing problem, as they affect overall health, quality of life and can be a source of serious complications. About 3.5 billion people worldwide suffer from oral diseases, such as caries, periodontitis and others. The importance of prevention and timely treatment of these diseases cannot be overestimated.

Purpose: to familiarize the students with the main symptoms and syndromes characteristic of the main oral diseases, with the most important diagnostic methods (laboratory and instrumental) used in dentistry, with the basic principles and types of pharmacotherapy of the most common oral diseases.

Basic concepts (list of questions):

Functions of the oral cavity - the oral cavity performs several important functions, in particular, mechanical and chemical processing of food, taste assessment, formation of a food lump, as well as participation in speech and breathing.

• Mechanical processing of food: The teeth grind the food, and the tongue helps mix it with saliva and form a food lump for further swallowing.

• Chemical processing of food: Enzymes in saliva, such as amylase, begin to break down carbohydrates, converting them into simpler sugars.

• Taste evaluation: Taste receptors on the tongue detect the taste of food, which helps the body evaluate its safety and attractiveness.

• Formation of a food lump: Saliva moistens the food and helps it stick together into a homogeneous mass, ready for swallowing.

• Participation in speech: The lips, tongue, and teeth play an important role in the formation of speech sounds, ensuring articulation.

• Participation in breathing: The oral cavity passes air when the nose cannot cope with breathing, for example, during physical exertion or talking.

• Protective function: Saliva contains lysozyme, which has antimicrobial effects, and the oral mucosa protects against mechanical damage.

Inflammatory diseases of the oral cavity are a wide range of conditions that affect the gums, oral mucosa, tongue, and other tissues. The most common are stomatitis, gingivitis, periodontitis, and fungal and viral infections. Symptoms may include pain, redness, swelling, bleeding gums, ulcers, and bad breath. Treatment depends on the specific disease and may include local and general therapy, as well as professional hygiene.

Main diseases of the oral cavity:

• Stomatitis: Inflammation of the oral mucosa, which can be caused by various factors, such as infections, injuries, allergies, or autoimmune diseases. Symptoms include pain, redness, swelling, ulcers, and burning.

• Gingivitis: Inflammation of the gums, often caused by poor oral hygiene and plaque buildup. Characterized by redness, swelling, and bleeding of the gums.

• Periodontitis: A more serious disease that affects the tissues that support the teeth (periodontal disease). It develops as a result of progression of gingivitis. It can lead to loosening and loss of teeth.

• Candidiasis (thrush): A fungal infection caused by the fungus Candida albicans. Characterized by a white coating on the tongue and mucous membranes of the mouth, a burning sensation.

• Herpes: A viral infection that manifests itself in the formation of painful blisters on the lips and around the mouth, as well as in the oral cavity.

• Aphthae: Painful ulcers on the mucous membranes of the mouth, which can be caused by various factors, such as trauma, infection, allergies.

Causes of inflammatory diseases of the oral cavity:

• Poor oral hygiene: Incorrect or insufficient brushing of the teeth leads to the accumulation of bacteria and the formation of plaque, which is the main cause of gingivitis and periodontitis.

• Infections: Bacterial, viral or fungal infections can cause stomatitis, herpes, candidiasis.

• Trauma: Damage to the mucous membrane of the mouth, for example, with improperly installed dentures or sharp edges of the teeth, can lead to stomatitis or aphthae.

• Allergies: Allergic reactions to certain foods, medications or toothpastes can cause inflammation of the mucous membrane of the mouth.

• Diseases of internal organs: Some diseases, such as diabetes, can increase the risk of developing inflammatory diseases of the oral cavity.

• Smoking: Smoking tobacco negatively affects the condition of the oral cavity, increasing the risk of developing gingivitis, periodontitis and other diseases.

• Hormonal changes: Changes in hormonal levels, such as during pregnancy or menopause, can affect the condition of the gums.

Oral trauma is damage to the tissues of the oral cavity caused by various traumatic agents, such as mechanical, physical and chemical factors. These injuries may include scratches, cuts, burns, tooth dislocations, jaw fractures and other injuries to the mucous membrane and soft tissues.

Types of oral trauma:

• Mechanical injuries: occur as a result of force on the tissues of the oral cavity, for example, as a result of a blow, fall, injury, as well as when brushing teeth, eating or wearing dentures.

• Physical injuries: can be caused by thermal agents (high or low temperature), electric current (burns) or ionizing radiation.

• Chemical injuries: occur as a result of contact of the mucous membrane with acids, alkalis and other chemicals.

Causes of traumatic injuries of the oral cavity:

• Accidents: falls, blows, injuries.

• Improper use of objects: for example, using dental floss or dentures for purposes other than their intended purpose.

• Sports injuries: engaging in contact sports without protective equipment.

• Household injuries: injuries sustained at home.

• Occupational injuries: injuries sustained at work.

• Medical procedures: injuries sustained during dental procedures or surgical interventions.

Dystrophic diseases of the oral cavity are a group of diseases characterized by impaired nutrition (trophy) of the tissues of the oral cavity, which leads to their pathological changes.

The main dystrophic diseases of the oral cavity:

• Candidiasis (thrush) of the oral cavity: A fungal infection caused by fungi of the genus Candida.

• Stomatitis: An inflammatory disease of the oral mucosa, which can be dystrophic, especially in chronic cases.

• Glossalgia (burning mouth syndrome): A burning, stinging, or painful sensation in the mouth without visible lesions.

• Leukoplakia: Keratogenesis of the oral mucosa, which may be a precancerous condition.

• Lichen planus: An inflammatory disease affecting the skin and mucous membranes, including the oral cavity.

• Atrophic glossitis: Dystrophic changes of the tongue, characterized by a decrease in volume and atrophy of the papillae.

• Keratoses: Compaction and thickening of the horny layer of the mucous membrane.

Causes of dystrophic diseases of the oral cavity:

• Infections: Bacterial, viral, fungal (e.g., candidiasis).

• Mechanical damage: Injuries, burns, constant irritation.

• Chemical irritants: Exposure to alcohol, smoking, certain foods.

• Systemic diseases: Diabetes, anemia, gastrointestinal diseases.

• Vitamin and microelement deficiency: Lack of B vitamins, iron, zinc, and others.

• Allergic reactions: To foods, medications, dental materials.

• Hormonal changes: During pregnancy, menopause, endocrine disorders.

• Psychogenic factors: Stress, depression.

Caries is a tooth lesion associated with the destruction of its enamel (upper layer), and then dentin (inner layer).

Periodontitis is an inflammation of the tissues around the root of the tooth that hold it in

the jaw bone. It can be caused by an infection that enters the periodontal tissues from the root canal of the tooth or from the periodontal pocket.

Periodontitis is a chronic inflammatory disease of periodontal tissues caused by bacteria, which ultimately leads to tooth loss. The periodontium is a whole complex of tissues that surrounds the tooth and includes: alveolar processes with dental alveoli, gums, tooth, and the ligamentous apparatus that connects the tooth to the alveolus (periodontium).

Lecture content (lecture text)

Pharmacotherapy of oral diseases includes the use of various drugs to treat infections, inflammations, ulcers and other pathologies of the oral mucosa and gums. Treatment may include antiseptic, anti-inflammatory, antibacterial, antifungal and analgesic drugs, as well as wound healing agents.

Main areas of pharmacotherapy of oral diseases:
• Antiseptics: Chlorhexidine, propolis, herbal solutions (e.g. eucalyptus, sage).
• Anti-inflammatory drugs: Local (e.g. gels, ointments) and systemic (if necessary).
• Antibiotics: Prescribed for bacterial infections (e.g. penicillin, amoxicillin, clindamycin, tetracyclines).
• Antifungal drugs: For candidiasis (e.g. nystatin, clotrimazole).
• Painkillers: Local anesthetics (e.g. lidocaine).
• Wound healing preparations: Gels, ointments containing panthenol, allantoin.
• Vitamins and minerals: To maintain the general condition of the body and mucous membranes.

Examples of diseases and their treatment:
• Gingivitis, periodontitis: Antiseptics are used for rinsing the mouth (Chlorhexidine, herbal solutions), antibiotics locally or systemically, drugs to improve microcirculation and tissue regeneration.
• Stomatitis: Depending on the cause (viral, bacterial, fungal, allergic), appropriate antiseptics, antiviral, antibacterial, antifungal agents, as well as drugs to reduce pain and accelerate healing are prescribed.
• Ulcers and erosions: Antiseptics, healing drugs (e.g. based on sea buckthorn oil, vitamin A), and painkillers are used.
• Candidiasis: Antifungal drugs are prescribed.

It is important to remember:
• Self-medication can be dangerous. At the first symptoms of oral diseases, you should consult a dentist.
• The doctor will determine the cause of the disease and prescribe appropriate treatment.
• It is necessary to follow the rules of oral hygiene: brush your teeth twice a day, use dental floss, and rinse your mouth with antiseptic solutions.
• A balanced diet and restriction of sweet foods contribute to the prevention of oral diseases.

Questions for self-control on the topic:
1. Anatomical and physiological aspects of the oral cavity.
2. Functions of the oral cavity.
3. General information about the etiology, pathogenesis of inflammatory diseases of the oral cavity.
4. Main clinical and diagnostic characteristics of dental diseases.
5. Etiopathogenesis, clinic, diagnosis of caries.
6. Periodontitis: etiology, pathogenesis, clinical features, principles of pharmacotherapy.
7. Main subjective signs of oral diseases, in which symptomatic treatment is possible.
8. General information about the etiology, pathogenesis of periodontitis.
9. Justification of the appointment of etio-pathogenetic therapy of dental diseases.

10. Possible complications of drug therapy in the oral cavity, prevention and treatment.

List of sources on the topic:

1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. – Vinnytsia: Nova Kniga, 2010. – 644 p.
2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klischa, V.G. Lizoguba. - Ed. 2. - Vinnytsia: Nova Knyga, 2013. - 644 p.
3. Pharmacotherapy with pharmacokinetics: a textbook for students of higher education. / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;
edited by I.V. Kireyev. - Kharkiv: NFAU: Golden Pages, 2019. - 384 p.

LECTURE 9. TOPIC
"Pharmacotherapy of ophthalmological diseases"

Relevance of the topic: Eye diseases are a pressing problem that requires attention from both medical and social aspects. According to WHO, about 253 million people in the world suffer from vision impairment, and 36 million of them are blind. In Ukraine, according to the Center for Public Health, about 1.5 million cases of eye diseases have been registered, in particular, more than 300 thousand among children. The relevance of the problem is exacerbated by the fact that many cases of vision impairment can be prevented or cured, but often doctors are consulted at later stages, when treatment becomes more difficult.

Purpose: to familiarize the general public with the main symptoms and syndromes characteristic of the main eye diseases, with the most significant diagnostic methods (laboratory and instrumental) used in ophthalmology, with the basic principles and types of pharmacotherapy of the most common eye diseases.

Basic concepts (list of questions):

Functions of the eye analyzer – The eye analyzer, or visual sensory system, performs several important functions, including: perception of light, processing of visual images, orientation in space, obtaining information about the surrounding world, and participation in learning and creative activities.

The eye analyzer consists of three main parts:
• Peripheral part: The eyeball, which includes the cornea, lens, retina, and other structures that perceive light stimuli and convert them into nerve impulses.
• Conductive part: The optic nerve, which transmits nerve impulses from the retina to the brain.
• Central part: The visual cortex of the brain, where the final analysis and synthesis of visual information occurs, allowing us to perceive what we see.

Basic functions of the eye analyzer:
1. 1. Perception of light: The eye is able to perceive electromagnetic waves in the visible range of the spectrum, which allows us to see.
2. 2. Color perception: The retina contains photoreceptors that distinguish different colors of light.
3. 3. Formation of visual images: The cornea, lens, and retina focus light on the retina and form an image.
4. 4. Orientation in space: Visual information helps determine the position of the body in space and navigate among objects.
5. 5. Obtaining information about the surrounding world: Through vision, a person receives up to 90% of information about the environment, which allows him to learn and participate in various activities.
6. 6. Participation in creative activities: The visual analyzer plays an important role in the formation of ideas about the world and in creative processes.

Inflammatory eye diseases – Inflammatory eye diseases, also known as ophthalmic infections, cover a wide range of pathologies that affect different parts of the eye, such as the conjunctiva, cornea, eyelids, choroid, lacrimal organs, and others. These diseases can be caused by bacteria, viruses, fungi, allergies, trauma, or systemic diseases. It is important to recognize the symptoms in time and consult a doctor for diagnosis and treatment, as some inflammatory processes can lead to serious complications, including vision loss.

The most common inflammatory eye diseases are:
• Conjunctivitis: Inflammation of the conjunctiva (the mucous membrane of the eye), which can be bacterial, viral, or allergic.
• Keratitis: Inflammation of the cornea of the eye, which can be caused by infection, trauma, or other factors.
• Blepharitis: Inflammation of the eyelid margin, which can be caused by bacteria, mites, or other causes.
• Iridocyclitis (uveitis): Inflammation of the choroid of the eye, which can lead to serious complications.
• Dacryocystitis: Inflammation of the lacrimal sac, often caused by blockage of the tear ducts.
• Stye: Purulent inflammation of the hair follicle of the eyelash or meibomian gland at the edge of the eyelid.

Traumatic eye injuries – Traumatic eye injuries cover a wide range of injuries to the organ of vision caused by external factors and can range from minor corneal scratches to serious injuries that result in vision loss.

Types of traumatic eye injuries:
• Mechanical injuries: Contusion: Injury from a blunt impact that can cause hemorrhage, damage

to the retina, iris, and other structures of the eye. Penetrating injuries: Injuries in which a foreign object penetrates the eye, damaging the membranes and tissues of the eye. Corneal and sclera injuries: Scratches, cuts, or other damage to the cornea and sclera.

Thermal injuries: Eye burns: Eye damage caused by exposure to high temperatures, such as steam burns, hot objects, or chemicals.

Chemical injuries: Chemical eye burns: Eye damage due to contact with acids, alkalis or other aggressive chemicals.

Radiation injuries: Eye damage due to ultraviolet radiation: Corneal and conjunctival burns due to prolonged exposure to ultraviolet radiation.

Biological injuries: Infectious lesions: Inflammation of the cornea or conjunctiva caused by bacteria, viruses or fungi.

Dystrophic eye diseases – Dystrophic eye diseases are a group of pathologies characterized by degeneration and damage to eye tissues, in particular the retina and cornea, which leads to impaired vision. They can be both hereditary and acquired, and often progress over time, causing various visual impairments.

Retinal dystrophy:
• Causes: Nutritional disorders of the retinal tissues, genetic factors, age-related changes, concomitant diseases such as diabetes and hypertension.
• Symptoms: Visual impairment, spots or blurring before the eyes, distortion of objects, tunnel vision (narrowing of the field of vision), night blindness.
• Consequences: Progressive visual impairment, up to complete loss of vision, retinal detachment.
• Treatment: Conservative (drugs to strengthen blood vessels, vitamins, vasodilators) and surgical.

Corneal dystrophy:
• Causes: Genetic factors, injuries, inflammatory processes, age-related changes.
• Symptoms: Corneal clouding, visual impairment, photophobia.
• Consequences: Decreased corneal transparency, vision loss.
• Treatment: Depends on the type and stage of the disease, may include surgical intervention (corneal transplantation).

Glaucoma is a group of ophthalmological diseases in which the outflow of aqueous humor from the eye is disrupted and the optic nerve atrophy occurs. This fluid fills the anterior chamber of the eyeball and performs the functions of nourishing the lens and cornea of the eye, and also removes toxic metabolic products. Increased intraocular pressure is the main sign of glaucoma in the early stages.

Cataract is an eye disease characterized by partial or complete clouding of the lens, which is located between the iris and the vitreous body. The lens of the eye contains a protein compound - crystallin with a certain chemical and organic composition, which determines the degree of transparency of our biological lens. With age, crystallin loses its properties, starting to cloud from the periphery to the center. As a result, only a small part of the light rays enters the eye, so vision decreases, and a person sees objects blurred. Causes of cataract development can also include diabetes, eye injuries, prolonged exposure to ultraviolet radiation, smoking, and taking certain medications.

Lecture content (lecture text)
Pharmacotherapy of diseases of the eye analyzer involves the use of various drugs to treat eye pathologies, including infectious, inflammatory, degenerative and other diseases. The goal of treatment is to improve visual acuity, reduce inflammation, prevent disease progression and preserve visual function.

The main groups of drugs used in ophthalmology:
• Antimicrobial drugs: antibiotics (for example, in the form of drops, ointments) for the treatment of bacterial infections of the cornea, conjunctiva, eyelids; antiviral drugs for the treatment of herpetic keratitis; antifungal drugs for the treatment of fungal eye lesions.
• Anti-inflammatory drugs: nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroids (in the form of drops, ointments, injections) to reduce inflammation in keratitis, uveitis, conjunctivitis.
• Glaucoma medications: eye drops that lower intraocular pressure (carbonic anhydrase inhibitors, beta-blockers, prostaglandin analogues, alpha-adrenostimulators).
• Cataract medications: drops that slow the development of cataracts (e.g., taurine, quinoxidine drops).
• Age-related macular degeneration medications: antioxidants, vitamins, lutein, drugs that inhibit blood vessel growth (anti-VEGF therapy).
• Artificial tears: to moisturize the surface of the eye in dry eye syndrome.
• Retinal dystrophy medications: vitamins, antioxidants, vasodilators.
• Uveitis medications: corticosteroids, immunosuppressants.
• Corneal diseases medications: keratoplastic agents, antibiotics, anti-inflammatory drugs.
• Local anesthetics: for pain relief during examination and minor surgical interventions.

Questions for self-control on the topic:
1. Anatomical and physiological aspects of the eye analyzer.
2. Functions of the eye.
3. General information on the etiology, pathogenesis of inflammatory eye diseases.
4. Main clinical and diagnostic characteristics of ophthalmological diseases.
5. Main subjective signs of eye diseases, in which symptomatic treatment is possible.
6. Justification for the appointment of etio-pathogenetic therapy of ophthalmological diseases.
7. Possible complications of drug therapy in the eye area, prevention and treatment.

List of sources on the topic:

1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. – Vinnytsia: Nova Kniga, 2010. – 644 p.
2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klischa, V.G. Lizoguba. - Ed.2. – Vinnytsia: Nova Kniga, 2013. – 644 p.
3. Pharmacotherapy with pharmacokinetics: a textbook for students of higher education. / I.V. Kireyev, O.O. Ryabova, N.V. Zhabotynska and others;
edited by I.V. Kireyev. – Kharkiv: NFAU: Zoloti storyny, 2019. – 384 p.

LECTURE 10. TOPIC
"Pharmacotherapy of infectious diseases"

Relevance of the topic: The formation of ideas about infectious diseases goes back to the distant past, but scientifically sound facts that allow formulating a scientific discipline were obtained only at the turn of the 19th-20th centuries. This time is often called the "golden age of bacteriology", since in a very short historical period (only a few decades) discoveries were made that formed the theoretical basis of all subsequent research until the middle of the 20th century.
Despite the successes in the field of clinical medicine, the problem of infectious diseases continues to remain quite complex in all countries of the world without exception. Practically throughout the 20th century, clinical medicine was mainly engaged in the study of infectious diseases that occur in typical, clinically manifest forms. At the present stage, new aspects of the

problems have been identified, one of which is the establishment of the role of infectious pathogens in the development of chronic inflammatory diseases in humans, due to which the specific weight of infectious diseases in the overall structure of human pathology can reach 60-70%.

Purpose: The HES should know the general principles of antimicrobial therapy; the algorithm for choosing an antibacterial drug for a specific patient. Have an understanding of the etiology and pathogenesis of infectious diseases, common complications of antimicrobial therapy, methods of detection, prevention and treatment.

Basic concepts (list of questions):
Infection – Infection (English: Infection, Latin: Infectio – penetration into the body of pathogenic microorganisms; infection, contamination / contamination – a state when a foreign agent enters the body – a pathogen (bacterium, parasitic fungus, protozoan, helminth, virus or prion), which multiplies and can have a pathogenic effect.

The infectious process is a complex of mutual adaptive reactions in response to the establishment and reproduction of a pathogenic microorganism in a macroorganism, aimed at restoring disturbed homeostasis and biological equilibrium with the environment.

Antibiotics – organic substances that are synthesized by microorganisms in nature to protect against the intervention of other types of microorganisms and have the ability to inhibit the development or kill them. As a rule, antibiotics are isolated from living bacteria or fungi. There is also a large number of semi-synthetic antibiotics, which differ in modifications functional groups of natural antibiotics. Such modified compounds are often more effective or more resistant to neutralization, which occurs as a result of acquired resistance by microorganisms.

Sulfanilamides - the first chemotherapeutic antibacterial agents of a broad spectrum of action - are derivatives of sulfanilic acid amide.

Fluoroquinolones - a group of synthetic chemotherapeutic agents. They are derivatives of 4-quinolone, which contain an unsubstituted or substituted piperazine ring in position 7 of the quinoline nucleus, and a fluorine atom in position 6. According to the number of fluorine atoms in the molecule, fluoroquinolones are divided into monofluoroquinolones, difluoroquinolones and trifluoroquinolones. Today, more than 30 drugs have been obtained. The creation of drugs with two and three fluorine atoms in the molecule has affected not only the antimicrobial activity, but also their pharmacokinetics. The most studied and widely used in the clinic are monofluorinated compounds. By the time of creation, the drugs of this group are divided into 4 generations. The drugs of the I generation include norfloxacin, ofloxacin, ciprofloxacin, pefloxacin, lomefloxacin. The drugs of the II generation include levofloxacin, sparfloxacin. The drugs of the III–IV generations: moxifloxacin, gemifloxacin, gatifloxacin.

Nitrofurans are synthetic antibacterial drugs, antiprotozoal and antifungal drugs. The drugs have a wide spectrum of action, but the use of nitrofurans is limited due to the peculiarities of metabolism. The drugs of the group include nitrofural, nitrofurantoin, nifuratel, nifuroxazide, furazidin and furazolidone.

Nitroimidazoles are highly active synthetic antimicrobial drugs of a broad spectrum, which include metronidazole, tinidazole, ornidazole, secnidazole, nimorazole.

Lecture content (lecture text):
Infection (from Latin infectio – contamination, contamination) is a broad general biological concept that characterizes the penetration of a pathogenic pathogen into another more highly organized organism and their subsequent antagonistic relationship.

An infectious process is a time-limited complex interaction of biological systems of a micro- and macroorganism, occurring under certain environmental conditions, manifesting itself

at the submolecular, subcellular, cellular, tissue, organ and organism levels and naturally ending either with the death of the macroorganism or its complete liberation from the pathogen.

An infectious disease is a specific form of manifestation of an infectious process, reflecting the degree of its development and having characteristic nosological signs.

The infectious process is one of the most complex biological processes in nature, and infectious diseases are formidable, destructive factors for humanity, causing it enormous economic damage. The causative agents of infectious diseases can be bacteria, viruses, rickettsia, chlamydia, mycoplasma, protozoa, fungi, helminths.

Throughout his life, a person comes into contact with a huge world of microorganisms, but only a negligible part of this world (approximately 1/30,000) is capable of causing an infectious process. This ability is largely determined by the pathogenicity of the pathogen.

Pathogenicity is a specific feature of a microorganism, genetically fixed and characterizing the ability to cause disease. According to this feature, microorganisms are divided into pathogenic, conditionally pathogenic and non-pathogenic. The main factors determining pathogenicity are virulence, toxigenicity and invasiveness.

Virulence is the degree, measure of pathogenicity, individually inherent to a particular strain of a pathogenic pathogen.

Toxigenicity is the ability to produce and release various toxins (exo- and endotoxins).

Invasiveness is the ability of a microorganism to penetrate into tissues and organs and spread in them.

Factors and methods of aggression of infectious disease pathogens are diverse. Among them are the induction of stress, hemorrhagic reactions, allergic and immunopathological reactions, direct toxic effects on cells and tissues, immunodepression, tumor development, etc. Often, secondary changes exceed the damage caused directly by pathogens. This is due to the predominant effect of exo- and endotoxins produced by the pathogen, and antigenemia. At the same time, pathogens have properties that prevent the action of protective factors of the macroorganism on them.

Infectious diseases are a group of diseases caused by pathogenic bacteria, viruses, rickettsiae, protozoa, fungi. A common feature of most infectious diseases is the ability to be transmitted from a sick organism to a healthy one and, if favorable conditions are present, to acquire mass, epidemic spread

Principles and methods of diagnosis of infectious diseases. Laboratory, microscopic, bacteriological, virological, serological methods and allergic skin tests are used to diagnose infectious diseases. Allergic skin tests are used to diagnose tularemia (with tularin), anthrax (with anthraxin), toxoplasmosis (with toxoplasmin), ornithosis (with ornithoin), dysentery (with dysentery), as well as listeriosis, Q fever, mosquito-borne encephalitis, trichinosis, trypanosomiasis, filariasis, schistosomiasis (with specific allergens). Biological methods are based on the infection of laboratory animals by introducing material taken from patients (blood, urine, bubo punctate, the content of rash elements—vesicles, pustules, etc.). The goal is to isolate the causative agent of an infectious disease (brucellosis, plague, tularemia, anthrax, etc.) from infected animals, conduct a neutralization reaction (botulism, tetanus), detect the specific reaction of the animal to the causative agent or its toxin (breast cancer, rickettsiosis, foot-and-mouth disease, etc.).

To detect specific sensitization of the organism, cell tests for in vitro allergic diagnostics are used: leukocytosis reactions, inhibition of leukocyte migration, immune rosette formation, blast transformation of leukocytes, etc.

For the purpose of diagnosing individual infectious diseases, biochemical, histological, histochemical, radionuclide, instrumental and other research methods are also used.

DISTINCTIVE SIGNS OF INFECTIOUS DISEASES presence of a specific pathogen contagiousness (infectiousness) cyclicity of the course development of immunity to re-infection

-incubation (from the moment the pathogen enters the body until the first signs of the disease appear) -initial - main clinical manifestations - recovery Cyclicity of the course - the presence of periods in the development of the disease.

CLASSIFICATION OF INFECTIOUS DISEASES ACCORDING TO L.V. GROMASHEVSKY intestinal infections respiratory tract infections bloodstream infections infections of the outer coverings

PRINCIPLES OF TREATMENT OF PATIENTS WITH INFECTIOUS DISEASES The main principles of complex treatment of infectious patients include: impact on the pathogen and its toxins - etiotropic treatment, impact on the immunological reactivity of the body - specific and nonspecific immunotherapy; impact on certain links of the infectious process, restoration and correction of homeostasis - pathogenetic treatment; elimination or reduction of the main manifestations of the disease - symptomatic treatment.

In this case, the general provisions of complex treatment are observed, which include individualization, planning, sequence (polyclinic - inpatient - dispensary) of treatment, taking into account the features of the course, severity and period of the disease, the patient's age, concomitant diseases, etc.

ETIOTROPIC TREATMENT This treatment is aimed at destroying, neutralizing and removing the pathogen and its waste products from the body. This is one of the main types of treatment for most infectious diseases, although it must be used together with other methods that can affect the course of the disease.

Basic principles of antibiotic therapy.

1. The ideal requirement for rational, targeted effective treatment is the isolation, identification of the pathogen and determination of its sensitivity to an antibiotic adequately selected for this patient. In many infectious diseases caused by one type of pathogen (typhoid fever, leptospirosis, erysipelas, scarlet fever, anthrax, typhus, plague, etc.), the most effective drug can be determined already when establishing a clinical diagnosis.

2. Selection of the most active and least toxic drug 3. Timeliness and a certain duration of antibiotic administration to achieve and consolidate the therapeutic effect.

4. Determination of the dose, method and frequency of administration of the drug (observance of certain intervals). This is necessary to create a stable therapeutic concentration of the drug in the blood, other fluids and tissues of the body, which should exceed the minimum antibacterial concentration (MAC) for this pathogen by 2-4 times.

5. Combining antibiotics with each other and with other drugs to enhance (potentiate) the antibacterial effect.

6. Taking into account the possibility of side effects of antibiotics during treatment

GROUPS OF DRUGS Penicillins are antibiotics that belong to the first-line ones. Broad-spectrum antibiotics are often used.

In addition to penicillins, cephalosporins, chloramphenicol, beta-lactamase inhibitors (sulbactam, tazobactam), tetracyclines, aminoglycosides, macrolides, rifamycins are widely used.

Nitrofuran derivatives. This group of chemotherapeutic agents includes furazolidone, furagin, furazolin, furatsilin, furadonin. They are distinguished by a wide spectrum of action - on gram-positive bacteria, pathogens of ornithosis, trachoma, protozoa. The action of nitrofuran drugs is to inhibit cellular respiration, which leads to a stop in the growth and reproduction of the microorganism.

Oxyquinoline derivatives have significant antibacterial, antiparasitic, antifungal activity. They are used mainly for intestinal infections. Enteroseptol, nitroxoline, intestopan, mexaform, mexaza suppress the pathogenic flora of the intestines and do not affect saprophytes (eubiotics).

Nalidixic acid (nevigramon, negram) is effective in diseases caused by gram-negative bacteria: enteric, dysentery, typhoid bacillus, proteus, affects strains resistant to antibiotics and sulfonamide drugs. Drugs used in protozoal diseases. Chemotherapy plays an important role in the treatment of patients with protozoal diseases.

Antimalarial drugs—hingamine (delagil, chloroquine, rezoquine), bigumal, akrihin, quinine, mefloquine, quinocide, primaquine— disrupt the metabolism of pathogens or damage their structures. Other drugs prescribed in case of protozoal diseases include: metronidazole, tinidazole — for trichomoniasis, amebiasis, giardiasis; emetine — for amebiasis, schistosomiasis; aminoquinol—for giardiasis, toxoplasmosis, leishmaniasis; solusurmin—for visceral and cutaneous leishmaniasis.

Anthelmintic agents—piperazine, pyrantel (combantrin), pyrvinium pamoate (vanquin), fenasal, aminoacryhin, chloxyl, praziquantel, mebendazole (vermox), thiabendazole, levamisole (decaris), etc.

Antiviral agents. Biochemical integration of cellular and virus-induced biosynthetic systems requires the creation of agents that should provide: blocking the adsorption and penetration of virions into healthy cells (virocidal action); selective penetration into infected and virus-reproducing cells; Violation of virus reproduction: a) by inhibition of the activity of the virus genome or virus-induced enzymes by the chemotherapeutic agent itself or by the products of its transformation in the cell, b) by inhibition of cellular enzyme systems involved in virus reproduction, c) by incorporation of the chemotherapeutic agent into the virus genome as a pseudonucleotide.

The main indications for the use of combined antibacterial (antiviral) etiotropic treatment are: mixed infection; severe course of the disease, which requires immediate prescription of antibiotics - even before bacteriological confirmation of the diagnosis; the need to enhance the etiotropic effect due to the total action of drugs (synergism), including against low-sensitivity pathogens; prevention of the toxic effect of drugs by reducing the course dose in order to obtain a stable effect.

In the practice of treating patients with various infectious diseases, cases of insufficient effectiveness of the drug are often observed. This is possible when using both etiotropic and pathogenetic therapy. Insufficient effect can be observed if the drugs used do not affect this group of microorganisms, or during prolonged use of drugs, especially with violation of dosage and regimens of their administration, over time, microorganisms develop resistance to them, which requires increasing doses or refusing to prescribe this drug.

More often in therapeutic practice, an increased reaction of the body to drugs is observed - idiosyncrasy and allergy.

Idiosyncrasy is an increased reaction of the body to drugs and food products, which is caused by a congenital deficiency of enzymes involved in the metabolism of the drug, or inhibition of their activity by the drug itself, as well as its direct effect on tissue basophils (mast cells) with the release of biologically active mediators.

An allergic reaction always has an immune basis. The negative effects of drugs also include toxic effects on individual organs and systems (ototoxicity of streptomycin, nephrotoxicity of aminoglycosides, etc.).

In the case of combined administration of drugs, synergism, potentiation and antagonism of their action are possible. Synergism is the summation of the effects of drugs (ampicillin and

oxacillin, erythromycin and tetracycline, oleandomycin and tetracycline, antibiotics and sulfonamide drugs).

Questions for self-control on the topic:

1. Infection and infectious process, the concepts of pathogenicity, virulence, toxigenicity.

2. Classification of infectious diseases.

3. Immunological criterion in infectious diseases - immunity, mechanisms of protection against infectious agents

4. Chemotherapeutic agents. used for the treatment of infectious diseases.

5. Pharmacotherapy of infectious diseases - principles, selection algorithm.

6. Causes of bacterial resistance to drugs.

7. Complications of pharmacotherapy of infectious diseases.

8. Intestinal infections:

• amebiasis - etiology, pathogenesis, clinical picture, pharmacotherapy.

• escherichiosis - etiology, pathogenesis, clinical picture, pharmacotherapy.

• food toxicoinfection - etiology, pathogenesis, clinical picture, pharmacotherapy.

• cholera - etiology, pathogenesis, clinical picture, pharmacotherapy.

9. Airborne infections:

• herpes - etiology, pathogenesis, clinical picture, pharmacotherapy.

• diphtheria - etiology, pathogenesis, clinical picture, pharmacotherapy.

• measles - etiology, pathogenesis, clinical picture, pharmacotherapy.

10. Bloodborne infections:

• hemorrhagic fevers - etiology, pathogenesis, clinical picture, pharmacotherapy.

• malaria - etiology, pathogenesis, clinical picture, pharmacotherapy.

11. Infections transmitted through skin lesions:

• tetanus - etiology, pathogenesis, clinical picture, pharmacotherapy.

12. Particularly dangerous infections: plague, anthrax - etiology, pathogenesis, clinical picture, pharmacotherapy.

List of sources on the topic:

1. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Vinnytsia: Nova Kniga, 2010. - 644 p.

2. Pharmacotherapy: a textbook for students of pharmaceutical faculties / Edited by O.V. Kraydashenko, I.G. Kupnovytska, I.M. Klishcha, V.G. Lizoguba. - Ed. 2. - Vinnytsia: Nova Kniga, 2013. - 644 p.

3. Pharmacotherapy with pharmacokinetics: a textbook for students of higher education. / I.V.Kireev, O.O.Ryabova, N.V.Zhabotynska and others; edited by I.V.Kireev. – Kharkiv: NFAU: Golden Pages, 2019. – 384 p.

4.Modern classifications and standards of treatment of diseases of internal organs. Emergency conditions in therapy. Analyses: normative indicators, interpretation of changes / Edited by prof. Yu.M.Mostovoy. – 25th ed., changes and additions – Kyiv: Center of State Clinical Laboratory, 2018. – 792 p.