

**Ministry of Public Health of Ukraine  
Higher State Educational Institution  
"Ukrainian Medical Stomatological Academy"**

"Approved"  
at a meeting of the Department of  
Experimental and Clinical Pharmacology  
with Clinical Immunology and Allergology  
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**METHODICAL GUIDANCE FOR STUDENTS' SELF-DIRECTED  
WORK WHEN PREPARING FOR PRACTICAL SESSION**

Academic subject	Clinical Pharmacology
Topic 1	<b>Object and the task to clinical pharmacology. The basic condition of pharmacokinetics and pharmacodynamics. Interaction of medicines, the forms of the side-action of medicines, complication of the drug therapy. The clinico-pharmacological characteristic of the medicines, which influence homeostasis and lipid exchange.</b>
Year of study	5
Faculty	Foreign students training (Medical)

**Poltava 2017**

### 1. Relevance of theme:

In modern medical practices are widely used drugs different pharmacological groups whose arsenal lately increased considerably. New mechanism for building and a variety of actions means are used to treat various diseases, which greatly distributes the possibility of pharmacotherapy. Clinical Pharmacology - area of medicine, the subject looking actions ingested drugs and to define methods and principles of their application. Appointment of medicines in practice medicine must be based on modern clinical and experimental Pharmacology achievements, with relevant clinical and special control of their action.

Clinical Pharmacology includes such basic sections: pharmacodynamics, pharmacokinetics. Sound use of medicines to doctors of different professions must know the basics of pharmacodynamics, pharmacokinetics, testimony and contraindications to their appointment.

### 2. Learning objectives:

- learn the concepts and pharmacodynamics, pharmacokinetics and their value in clinical practice;
- know the milestones pharmacokinetics;
- know generic drug mechanisms.

### 3. Basic knowledge, skills necessary for studying the subject (interdisciplinary integration)

The name of the previous disciplines	The skills
Latin	The "pharmacological terminology and medicine." To possess the ability to correct spelling of a drug Latin, according to the grammar. Have knowledge about the end of the genitive case of nouns and adjectives, different cancellations for writing out the drug: in recipes
Normal physiology	The "Physiology of the cardiovascular system" - to apply the knowledge from this section
Biological chemistry	To determine the role of certain enzymes (adenosine deaminase, phosphodiesterase, guanylate cyclase, etc.) in the cardiovascular system. Apply knowledge of this section, when considering the mechanisms of action of individual drugs
Pharmacology	Section "Pharmacology of drugs that affect the function of the cardiovascular system." Apply knowledge of this section, when considering the pharmacodynamics and pharmacokinetics of individual drugs

### 4. Tasks for work during preparation for the classes.

#### 4.1. The list of key terms, parameters, characteristics which the student is to assimilate while preparing for the class:

Term	Definition
Hemorrhagic shock	severe form of hemostasis disorders, which developed as a result of significant blood loss.
Atherosclerosis	is the most common disease among residents of developed countries. With this disease (both main and concomitant) are physicians of any specialty.
Antioxidants	are substances that inhibit non-enzymatic reaction of free radical oxidation of lipids and biopolymers - proteins, nucleic acids and mucopolysaccharides.

#### 4.2. Theoretical questions for the class:

- What phase of blood coagulation.
- Describe the basic properties of heparin.
- What are the anticoagulants low.
- Share prokoahulyantiv indications for use.
- Share the indications for use of antiplatelet agents.
- What are the main complication in the treatment of anticoagulant direct action.
- Clinical and pharmacological characterization of lipid-lowering drugs.

### Content topics

#### Terminology

The minimum therapeutic dose - this is the least amount of drug that can induce a therapeutic effect.

Dose at which adverse effects occur, is called the minimum toxic dose.

Breadth of therapeutic action - is the range between the minimum toxic and minimum therapeutic dose.

Efficiency - the ability of drugs to cause the greatest possible effect.

The half-life ( $T_{1/2}$ ) - this is the time for which the body is eliminated half of the administered dose.

Bioavailability - the content of free (not protein-bound) drug in plasma.

Therapeutic assessment - the definition of the clinical value of drugs to a method of administration.

The study of the therapeutic evaluation of possible outcomes:

1. Before the clinical pilot study
2. clinical Research

Chronopharmacology - the direction of pharmacology that studies the dependence of the pharmacological effect of time of day, season, biorhythms of man.

The main effect of drugs - is an action which is used to treat the patient.

Placebo - an indifferent substance in a form that mimics the pharmacological or drug.

Equilibrium concentration in the blood - is the amount of drug in blood or tissues, which is achieved at the same speed the introduction and removal of drugs.

Pharmacokinetic studies with different routes of administration drugs make it possible to recommend a specific dosage regimen for a particular route of drug in the body, depending on the localization of the pathological process, its severity and gravity.

Clinical Pharmacology is studying the interaction of drugs into the body. The essence of drugs - the complex formation with biosubstrates (submolecular and molecular levels). Emit two main section is pharmacokinetics, pharmacodynamics. Pharmacokinetics - this section of the pharmacology of absorption, distribution, due to protein metabolism and excretion of drugs.

The value of pharmacokinetics for rational drug therapy:

1. Choose the preparation.
2. The choice of dose.
3. Select the path of the introduction of medicine.
4. Fixing the Exchange schema therapy.

#### **Concepts and their clinical value of pharmacokinetics the basic concepts of pharmacokinetics and their clinical value**

The term	The definition	Clinical significance
Between life (semi-derivation, semi-eliminate the $T_{1/2}$ )	The time during which the drug concentration in plasma is reduced by 50% from baseline (a function of the volume of distribution and clearance)	Used to determine the time required to achieve a uniform concentration in the blood (usually 3-5 days periods of life). Can be used to estimate output, but less accurate and informative than the clearance
Volume of the distribution V	Hypothetical volume of body fluids, is necessary for uniform distribution of the total number of drug concentrations in analogical concentration in blood plasma	Allows for the selection of "loading dose", which is required to form an effective concentration in the blood
Clearance Cl	The volume of blood or plasma from which drug is derived per unit of time	Used for selecting a maintenance dose, which helps to achieve the equilibrium concentration in the blood. More clearance is needed to assess the administration of drugs than the half-life. Depends on the functions of the authority and the output speed of delivery of drugs to the body
Equilibrium concentration in the blood C	The number of drugs in tissues or blood, which is achieved at the same speed the introduction of drugs and its output	Against the background of uniform density develops a complete clinical response
Bioavailability F	The relative amount of the injected dose drugs, which is achieved by natural circulation, as well as the rate of appearance of drugs in the bloodstream	Used for selection of the dose of drugs for oral

#### Pharmacological characteristics of absorption of drugs in the oral cavity

Oral mucosa is covered mnogotosloynym epithelium, which normally do not orogovivaet. It is best to pass drugs through the mucosa of floor of the mouth, tongue, cheeks, and especially the gums. In these places the drug is well absorbed into the blood. Use this feature to aid in acute pathological states (example: nitroglycerin taken under the tongue, prolonged his form - attached to the gum Trinitrolong in section 4.2 of teeth). For oral use of drugs already starts to be drawn into the mouth, then dissolves in the gastrointestinal mucosa is absorbed, enters the blood system mesenteric, passes through the liver, where it undergoes partial metabolism, and only after this part of the active drug enters the systemic circulation.

The main location of absorption is the upper section of the small intestine. Absorption takes place much faster than in the stomach, so the speed of evacuation of the stomach is one of the important factors influencing the rate of absorption in the gastrointestinal tract. Thus, hormonal contraceptives raise the intake of folic and ascorbic acid, riboflavin, anticoagulants of indirect action - vitamin K, laxatives - zhirorastvoryayushih vitamins, etc. The

suction effect combination drugs. Antacids, increasing the pH, the ionization of acidic compounds is carried out and block their absorption / sulfonamides, nitrofurans, salicylates, oral anticoagulants, phenobarbital /. PAS reduces the absorption of rifampicin. Cholestyramine, which forms a chelate compound, slows the absorption of many drugs / anticoagulants, cardiac glycosides, corticosteroids, etc. /.

Rectal drugs - drugs are absorbed more quickly than oral use. Drugs enter the systemic circulation, passing the liver, and not subjected to the action of enzymes and intestinal flora, resulting in increased bioavailability of drugs, especially those that are metabolized in the liver at first pass. Be aware that the old people and a number of diseases is reduced absorption of drugs in connection with atrophy of the mucosa of the rectum.

Thus, the absorption of drugs used in enteral always varies, so dosing is complicated. Another big change in absorption of drugs and violation observed in different diseases and, above all, in the pathology of the gastrointestinal tract.

Intravenous route of administration: the main advantage - high speed injection into the blood and, consequently, the rate of onset of effect, and the accuracy of dosing. Intravenous method of an effective emergency response. Intravenous method is effective in emergency situations. Drugs can be administered quickly / instantaneously - bolus / relatively slow / for a few minutes / and long - drip, drip method is often used after a one-time introduction of several drugs for rapid onset of effect and maintain long equilibrium Occupational blood. Disadvantages - the trauma of tissue during the injection, the need for compliance with aseptic technique, most difficult reliability unexpected reactions / anaphylactic shock, collapse, convulsions, etc. /.

Intramuscular route of administration - absorption depends on the pH and solubility of drugs in water from the local blood circulation, from the injection site.

Subcutaneous injection - rapid achievement of blood concentrations of water-soluble substances, oil solutions are absorbed slowly.

Other ways of introducing the drugs are used less frequently. When parenteral routes of administration drugs into the blood, passing the liver.

Applique / skin / route of administration - usually used to obtain a local effect. Some drugs / nitroglycerine / suction through the skin provide a systemic effect.

Inhalation route of administration of drugs - because of the large alveolar surface characteristics and circulation in the lungs allows for quick absorption of drugs. It is used for flying, and gaseous substances, for narcosis. In addition, inhaled bronchodilators and expectorants injected drugs.

The introduction of drugs into the nasal cavity, mouth, bladder and conjunctival bladder, vagina - used in the treatment of various inflammatory processes relevant location.

### Mechanisms of absorption

1. Passive diffusion - movement of molecules for drug concentration gradient.
2. Filtering - is passing through the pores of the membranes, determined by the difference between osmotic and oncotic pressure on both sides of the membrane to hydrophilic molecular compounds, and for the ions - the presence of the charge against  $\rightarrow$  opolozhnogo in relation to the charge of the day.
3. Active transport - can be held by the carrier and energy use against a concentration gradient.
4. Facilitated transport - can not proceed against a concentration gradient.
5. Pinocytosis - invagination of the cell wall with the formation of vacuoles, which transported material reaches the opposite membrane, where it becomes free.
6. Pinocytosis - invagination of cellular wall with the formation of the vacuole, in which the transferred substance reaches the opposite membrane, where it becomes free.

### The distribution of therapeutic agents in the body

Most drugs are distributed unevenly in the body. It depends on several factors: the ability of drugs to penetrate through the membrane, hemodynamic status, LAN connection with the protein.

1. The ability of drugs to penetrate through the membrane. Some drugs pass through the endothelium of the capillaries, are not able to penetrate the other membranes, and therefore can be distributed only in the interstitial fluid. Other pass freely through the membrane and are distributed throughout the body. Lipophilic drugs are readily soluble in lipids, which may lead to the formation of a depot in the tissues. For drugs that selectively accumulate in adipose tissue, is thiopental.

2. Hemodynamic state - determines the penetration of substances from the blood. Already in the first minutes after drug intake majority falls to the organs and tissues, which are most perfuziruyutsya blood - heart, liver, lungs. Slower is the saturation of physicians muscle preparations, mucous membranes, skin, adipose tissue. For education in these tissues kontsentratsii therapeutic drugs to tens of minutes to several hours. Violation of hemodynamics can alter the kinetics of distribution. Thus, when Hemorrhagic shock or congestive heart failure perfusion of most organs is reduced. Perfusion of the main cerebral infarction and reduced to a lesser extent. In addition, impaired glomerular filtration rate and hepatic blood flow leads to a decrease in renal and hepatic clearance. As a result, the concentration of drug in plasma, especially after intravenous administration, will increase. In this case, if the effect of the drug depends on the concentration, the intensity and duration of effect will also increase. For example: the duration of thiopental in shock increases.

3. LAN (Drugs) connection to the protein. The main result of processes of distribution, in terms of clinical pharmacology, is getting drugs in place of the action / biofaza /, where the drug binds to specific cellular receptors that are responsible for implementing the specific effect of the drug.

Drugs may bind to plasma proteins - albumin, lipoproteins, globulins, and formed elements of blood. Protein plays a role depot performs binding and transport function. Water-insoluble compounds are transported only in a bound state. The drug, which came into contact with the protein, indeferentny. Free / not associated with protein / drug - a biologically active form of drugs.

### **The metabolism of drugs**

Metabolism, or biotransformation of drugs - is a complex physico-chemical and biochemical transformations of drugs that have contributed to the formation of more polar water-soluble components that are more easily excreted. The majority of metabolites are pharmacologically active drugs less and less toxic than the parent compound. However, biotransformation of certain substances leads to the formation of metabolites more active in comparison with the original substance. For example, methyl dopa / dopegit / metabolized to form a more active metilnoradrenalina.

There are two types of metabolic reactions drugs: non-synthetic / redox / or synthetic. For non-synthetic reactions include oxidation, reduction, and hydrolysis. All non-synthetic reactions is divided into two groups: the microsomal - such that are catalyzed by enzymes of the endoplasmic reticulum and nemikrosomalnye - such that are catalyzed by enzymes located elsewhere. Oxidation - vostonovitelnye reaction - this is the evolutionary path of a more youthful, it can be considered as an initial stage of biotransformation. Synthetic reactions - such which are based on konyugantsiya drugs with endogenous substrates / glucuronic acid, sulfate, glycine, glutathione, methyl groups and water /. It is evolutionarily more ancient way, and the products of oxidation and recovery is usually really konyugiruyut. Compound drugs and endogenous substrates through a series of functional groups: hydroxyl, carboxyl, amine, halogen atoms. Once the reaction is conjugation of the molecule drugs are more polar and more easily excreted.

### **Excretion of drugs from the body**

Derivation of drugs from the body can pass through different mechanisms by the kidneys, digestive organs, lungs, skin, with a secret salivary, sweat and lacrimal glands.

#### **The main output path drugs from the body +**

<b>Elimination pathway</b>	<b>Mechanism of the Excretion</b>	<b>Therapeutic means</b>
Urinary excretion	Glomerular filtration and active tubular secretion	Most of the drugs in the active form
Excretion of bile	Active transport, passive diffusion, the pinocytosis	Digitoxin, penicillins, tetracyclines, streptomycin, quinine, strychnine, quaternary ammonium compounds
After removal of the intestines (bowel movements)	Passive diffusion, biliary secretion without recycling	Doxycycline, ionized organic compounds
excretion of saliva	Passive diffusion and the active transport	Penicillins, sulfonamides, salicylates, benzodiazepines, thiamine, ethanol
After removal of the lungs	Passive diffusion	Inhaled anesthetics, iodide, camphor, ethanol, essential oils
excretion through the sweat glands (perspiration)	Passive diffusion	Some sulfanilamides, thiamine
Excretion through the mammary glands (lactation)	Passive diffusion and the active transport	Anticoagulants, antibiotics, thyreostatics, lithium, carbamazepine

### Pharmacodynamics DRUGS

Pharmacodynamics studies the physiological, biophysical, biochemical changes in the function of cells, organs and tissues in response to the drug, ie She is studying the mechanism of action, biological and therapeutic effects of drugs. Mechanism of the action of the medicines

The mechanism of action of drugs

Allocate such mechanisms of action of drugs:

- 1) The action on specific receptors;
- 2) effects on specific enzymes;
- 3) physical and chemical effects on the cell membrane;
- 4) a direct chemical interaction with the substance of cells.

Action on the specific receptors

Receptors are functional macromolecular structures that are extremely sensitive to the action of chemical compounds. In the course of evolution have receptors sensitive to certain endogenous regulators / hormones, enzymes, neurotransmitters / and various bioactive substances. The speed and strength of the bond drugs with receptors define a term "afinitet." At high receptor afinitete the desired effect can be achieved even with their low concentration. With the growth of the concentration of drug molecules to react with the active sites of other receptors

to which drugs to lower affinity, this leads to an increase in the number of pharmacological effects, drugs become less selective. Thus selectivity - selectivity of this drug. For example, beta-1-adrenoceptor antagonists in small doses block only beta 1-adrenergic receptors. But in large doses, they block the beta-1 and beta 2-adrenergic receptors, their selectivity disappears.

The ability of drugs as a result of interaction with receptors trigger a reaction, which coincides with the functional significance of receptor activity is known as intrinsic activity. Drugs, which are own and intrinsic activity of the receptor are called agonists or mimetics / stimulants /.

Drugs which are able to prevent affinity and interaction with receptors of endogenous and exogenous agonists are known as antagonists / blockers, Blockers /. Drugs, which combine the properties of agonists and antagonists are known as partial / partial / agonists. If the predominant blocking effect, this drug is known as an antagonist with intrinsic activity.

Ratio of specific receptors in the organs has individual differences. Their number varies in different diseases. Most drugs can alter the number of active receptors.

Receptors inherent chemical complementarity, which is to determine the distribution of ionic charges. For example, the receptor has a three-dimensional spatial-structural framework with the active center, which is a universal channel for two different molecules. When a molecule enters an enzymological center, it is not able to leave. If a short time - to the center gets another molecule by chemical interaction. If we continue here comes a third molecule, which is also inherent to the active center affinity, but not to other molecules introduced, the catalytic function of the enzyme is blocked, and the last molecule is known as a competitive inhibitor of the enzyme.

The bulk of the receptor is localized on the outer and inner surfaces of the cell membrane and its organelles. The most frequent points of the influence of drugs is a mediator and hormone receptors, ATPase  $\text{Na}^+ - \text{K}^+$  pump,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  and  $\text{Na}^+$  - transmembrane channels. In accordance with allosteric theory, the interaction of drugs with receptors is at the level of chemical or physico-chemical processes, due to the change of conformational states of active ligand-bound receptor, or a few active groups "flexible" multivalent ligands. The nature of the reaction, its strength and duration of turnover due to the peculiarities of drugs due to the receptor. Strength of the bond depends on the distance of the electrostatic interaction between two atoms. The nature of the interaction of a complex, participate in it at the same time different types of communication: van der Waals / weaknesses that wrap /; coordination covalent / chelate, such as communication and antidote drugs - unitiol arsenic / - strong, neoborachivaemye. When assigning drugs to the temporary effects on the body is necessary to link the receptor was turned around. When fighting infection, by contrast, the advantage of drugs that constitute the micro-organisms neoborachivaemye complexes.

Quantitatively measure the pharmacological response to drugs one time is determined by two parameters: the ratio of the number of employed drug receptors to their total number and the time of its confinement at a particular receptor. Effect of pharmacological response can be predicted for the kinetic Michaelis-Menten equation, whereby the effect is proportional to the number of receptors that are involved drugs. / For example, the effect of insulin in diabetes, iron supplementation with iron-deficiency anemia, etc. /. The strength of the drug depends on the speed and nature of the conformational changes in receptors. If these changes take place, then increasing the dose does not lead to further growth, as all the receptors are already occupied. For such a mechanism are nitrates. The nature and strength of the interaction of drugs and receptors appear pharmacological response, which is often due to the direct action of drugs, less likely to change in a mediocre system, and only in isolated cases - reflex action.

#### Influence on the activity of the ferments

Enzymes play an important role in the regulation of body functions. Accordingly, the mechanism of action of certain drugs based on the induction / amplification / or inhibition / suppression / activity of enzymes. For example, galantamine, Neostigmine inhibit the enzyme cholinesterase, and thus produce effects that are characteristic for the excitation of the parasympathetic NA / for lack of a crushing action on the acetylcholine cholinesterase /. Diuretic drug inhibits the activity of the enzyme diacarb carbonic anhydrase, which catalyzes the formation of carbonic acid in the kidneys, through inhibition of carbonic anhydrase and reducing sodium reabsorption in the kidney channels.

An example of enzyme induction by drugs: phenobarbital through increased activity of hepatic glucuronyl / enzyme that promotes conjugation of bilirubin / reduces bilirubinemia.

#### Physico-chemical effects on cell membranes+

Electrophysiological processes that underlie the functioning of the nervous and muscular systems are dependent on the contact ions, which alter the membrane potential. The mechanism of action of some drugs / antiarrhythmics, anticonvulsants, local anesthetics / is to change the transport of ions across cell membranes. Preparations of these groups have a membrane-effect: they alter the penetration of membranes to sodium ions, potassium and calcium, and thus raise the education of the action potential, reduce the speed of the pulse.

Change the penetration of the membranes is also the basis for the mechanism of action of some antibiotics / nystatin levorin, polymyxin / - they act as cationic detergents.

#### Direct chemical effects

The principle of direct chemical action is based antidote therapy with antidotes interact directly with molecules or ions. For example, the active sulfhydryl group unitiol react with the thiol cores in blood and tissues and formed with non-toxic complexes, which are excreted in the urine. Binding of poison leads to restoration of function of enzyme systems of the body affected by the poison. Another example of a direct chemical reaction is the neutralization of hydrochloric acid, antacid drugs.

### Materials for students' self-directed work.

#### A. Questions for the self-control:

1. Name the forms of pharmacotherapy.
2. Name the basic stages of pharmacokinetics.
3. What factors they influence the process of suction.
4. What factors they influence the process of distribution.
5. What factors they influence the process of metabolism.
6. What factors they influence the process of the output of therapeutic means.
7. Name the forms of the action of medicines.
8. Present the mechanisms of the action of medicines.

#### B. Tests for the self-control:

1. Name, what phase of the action of medicines provides for absorption, distribution, metabolism and conclusions of the medicines:

a) pharmaceutical; b) pharmacokinetic; c) pharmacodynamic.

2. What form of pharmacotherapy is directed toward elimination or limitation of the separate manifestations of the disease: A) preventive; b) substitute; c) symptomatic.

3. Name, what factors influence the distribution of the medicines: A) the connection of medicine with the protein; b) the state of hemodynamics; c) the age of patient.

4. What preparations the inherent effect of the first passage through the liver. A) Lidocaine; b) the nitroglycerine (sublingually); c) morphine.

5. Name the inhibitors of microsomal ferments.

6. Name the inducers of microsomal ferments.

7. Indicate the combination of the preparations, which lead to the competition for the connection with the proteins:

A) digoxin and sulfadimethoxine; b) digoxin and spiro lactone; c) neodikumarin and butadion; g) aspirin and nitroglycerine; d) furosemide and nitrosorbid.

#### B. Tasks for the self-control:

1. Which of the enumerated preparations increase the activity of microsomal hydrolases: penicillin, phenobarbital, butadion, propranolol, nitroglycerine, furosemide, cortisone?

2. Indicate the preparations, whose binding with the proteins of the blood decreases with the disease of the liver: Diazepam, quinidine, Oxazepam, aminazine, propranolol, tubocurarine.

3. Indicate the preparations, whose removal by kidneys rises in the acid urine: morphine, streptomycin, butadion, quinine, procainamide hydrochloride, sulfanilamides, barbiturates.

4. Indicate the preparations, whose conclusion by kidneys rises in the alkaline urine: morphine, streptomycin, butadion, barbiturates, sulfanilamides.

5. To the patient of 24 years, who is ill by hyperacidic gastritis, apropos sharp angina appointed erythromycin- basis at the daily dose of 3,0 g (0,75 X 4) dispensary. Pus from the almonds for determining the sensitivity of microflora to the antibiotics was simultaneously sown with this. They looked around patient after 3 days. Its state deteriorated. The sensitivity of microflora to the preparation is high. Why the therapy by erythromycin is ineffective?

### Materials for work when preparing for practical session.

The enumeration of the training practical tasks, which must be carried out in the practical instruction: what is the object of the study of pharmacokinetics; to give the determination of the concept of pharmacokinetics; to name basic laws governing the suction of distribution, biotransformation and the removal of medicines; what is the object of the study of pharmacodynamics; to name the universal mechanisms of the action of the medicines/

#### Professional algorithms relative to mastery of habits and of the skills:

Task	Indications	Note
To master the habits of the selection of effective and safe pharmacotherapy taking into account pharmacokinetics of the patient	1. Selection of medicine to achieve taking into account the special features of pharmacokinetics of the medicine	To focus attention on value in the rational treatment of the selection of the method of introduction, dose of medicine, duration of the treatment
To master the habits of the selection of effective and safe pharmacotherapy taking into account the pharmacodynamics of the patient	1. Selection of medicine to achieve taking into account the special features of pharmacokinetics of the medicine	To focus attention on value in the rational treatment of the pharmacodynamics of the medicine

Training tasks, tests, the tasks, which supplement independent work in the practical instruction, and also additional materials. It is applied.

**Literature:****Basic (studying):**

1. Pharmacology: textook / V.M. Bobyrov, T.O. Devyatkina, O.M. Vazhnicha, V.M. Khristyuk. – Vinnytsia: NOVA KNYHA Publishers, 2010.– 520 p.
2. Chekman I.S., Gorchacova N.O., Panasenko N.I., Bech P.O. Pharmacology. – Vinnytsya: NOVA KNYHA Publishers, 2006. – 384 p.
3. Samura B.B. Clinical pharmacology: Manual. - Vinnytsya, 2010. – 283 p.

**Additional:**

1. Basic and Clinical Pharmacology by Anthony J. Trevor, Bertram G. Katzung, Susan B. Masters, 2009.
2. Medical Pharmacology at a Glance by Michael J. Neal, 2009.
3. Introduction to Clinical Pharmacology by Marilyn W. Edmunds, 2009.
4. Introduction to Clinical Pharmacology by Marilyn W. Edmunds, 2009.
5. Introductory Clinical Pharmacology by Sally S. Roach, Susan M. Ford, 2008.

**Web sources:**

1. <http://cardio.medi.ru/66.htm/>
2. <http://eurheartj.oxfordjournals.org/>
3. <http://intl-ajrcm.atsjournals.org/>
4. <http://thorax.bmjournals.com/>
5. <http://ukrcardio.org/>
6. <http://ukrmed.org.ua/>
7. <http://www.aafa.org/>
8. <http://www.cardiolog.org/>
9. <http://www.cardiosila.ru/>
10. <http://www.chestjournal.org/>
11. <http://www.consilium-medicum.com/>
12. <http://www.drfalkpharma.ru/>
13. <http://www.escardio.org/>
14. <http://www.ifp.kiev.ua/>
15. <http://www.likar.info/pro/kardiologiya-revmatologiya-kardiohirurgiya/kardiologia/>
16. <http://www.medlit.ru/>
17. <http://www.medscape.com/>
18. <http://www.nhlbi.nih.gov/>
19. <http://www.phassociation.org/>
20. <http://www.pulmonology.ru/>
21. <http://www.thoracic.org/>  
<http://www.zheludok.ru/>

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