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Introduction

This issue is the manual on pharmacology for students` practical training.

All topics in the manual have the similar structure: the name of the topic, the topicality of the subject, the theoretical questions, home tasks, class tasks and tests.

Carrying out the tasks, students learn:

- the nomenclature and classification of drugs;
- the interchangeability of drugs;
- how to find the logic connection between the mechanism of action, pharmacodynamics and indications; between the side effects, contraindications and principles of rational administration for providing the safe and effective pharmacotherapy.

This manual will assist for mastering the unit and development of pharmacological logic.

Module II. Drugs affecting the function of executive bodies, the system of blood, metabolism and immunity. Chemotherapeutic drugs.
Submodule 4 Drugs affecting the function of executive bodies.

CARDIOTONIC MEDICINES

Topicality of the subject

Normal cardiac activity is a base of normal functions of the whole organism. The disorders of heart activity which are connected with heart failure may be effectively corrected by cardiotonic agents, preferably cardiac glycosides. These drugs are the basic agents for treatment congestive heart failure.

Theoretical questions

1. The classification and nomenclature of cardiotonic agents.
2. The classification and nomenclature of cardiac glycosides depending on their solubility and origin.
3. The mechanism of action of cardiotonic drugs, particularly cardiac glycosides.
4. The pharmacodynamics of cardiotonic agents. The meaning of cardiotonic effect. Cardiac and extracardiac effects of cardiac glycosides.
5. The pharmacokinetics of cardiac glycosides.
6. The indications of cardiotonic drugs. The indications of cardiac glycosides depending on their pharmacokinetics.
7. The side effects and contraindications of cardiotonic agents.
8. The principles of rational administration (particularly dosing) of cardiac glycosides. The symptoms and first aid in case of poisoning with cardiac glycosides.

Home tasks

Task 1.

Write the following prescriptions:

1. Digitoxin (Digitoxinum) – tabl. 0.0001.

2. Celanid (Celanidum) – sol. f/i 0.02% - 1 ml, amp.
3. Strophanthin K (Strophanthinum K) – sol. f/i 0.05% - 1 ml, amp.
4. Adonisid (Adonisidum) – liquid 15 ml, vial.
5. Amrinone (Amrinonum) – sol. f/i 0.5% - 20 ml, amp.

Task 2.

Fill in the table concerning the comparative description of Strophanthin K and Digitoxin taking into account peculiarities of their pharmacokinetics.

Drug	Route of administration, medicinal form	Onset of action	Duration of action	Indications
Strophanthin K				
Digitoxin				

What does pharmacokinetics of cardiac glycosides depend on?

Give the explanation of cardiotoxic effect.

Class tasks

Task 1.

Classify the cardiotoxic agents. Match letters (names of pharmacological groups) with numbers (names of drugs).

Pharmacological groups

- | | |
|------------------------------------|---------------------------------------|
| A. Glycosides from Foxglove plant | E. Glycosides from Lily-of-the-valley |
| B. Glycosides from Erysimum | F. Glycosides from Strophanthus |
| C. Nonglycoside cardiotoxics | G. Glycosides from Adonis |
| D. Glycosides from Scilla maritima | |

Drugs

- | | | |
|--------------------|----------------|--------------------|
| 1. Digitoxin* | 6. Adonisid* | 11. Celanid |
| 2. Strophanthin K* | 7. Cardiovalen | 12. Milrinone |
| 3. Lantozide | 8. Cordigit | 13. Meproscillarin |

- | | | |
|--------------|--------------|---------------------|
| 4. Clift | 9. Amrinone* | 14. Strophanthine G |
| 5. Corglicon | 10. Digoxin | |

Underline the new drugs. For agents marked with asterisk point out the dosage.

Task 2.

Learning the mechanism of action of cardiac glycosides write the elements of this mechanism in a correct order. For this purpose indicate the numbers of parts of mechanism in the correct sequence.

1. Increase of Ca^{2+} ions content inside the myocardial cells.
2. Inhibition of $\text{Na}^+ - \text{K}^+ - \text{ATPase}$ in myocardium.
3. Myocardial muscles fibers contraction.
4. Increase of Na^+ ions content inside the myocardial cells.
5. Binding of Ca^{2+} ions to the specific protein (troponine).
6. Actomyosine complex formation.
7. Promotion the conditions for interaction of the contractive proteins (actine and myosine).

What is the difference between the mechanism of action of cardiac glycosides and nonglycoside cardiotonics?

Task 3.

Give the explanation of pharmacological effects that are included into the term “cardiotonic” effect. Match the meanings with the names of effects.

Pharmacological effects

- A. Positive inotropic effect.
- B. Negative chronotropic effect.

C. Positive batmotropic effects.

D. Negative dromotropic effect.

Meanings

1. Increase of myocardial excitability.
2. Decrease of cardiac conductivity.
3. Strengthening of myocardial contractility, increase of cardiac output, shortening of systole.
4. Prolonging of diastole, bradycardia.

Task 4.

Learning the pharmacodynamics of cardiac glycosides choose the pharmacological effects that are included into the pharmacodynamics of these drugs.

Pharmacological effects

- | | |
|----------------------|---|
| 1. Anticholinergic | 6. Normalization of metabolic processes in myocardium |
| 2. Cardiotonic | 7. Improvement of systemic blood circulation |
| 3. Cardiostimulative | 8. Antipsychotic |
| 4. Diuretic | 9. Sedative |
| 5. Hypotensive | 10. Anticonvulsive |

Task 5.

Preparing the information for cardiologists about the pharmacokinetics of cardiac glycosides fill in the table.

Groups of cardiac glycosides (plants)	Drugs	Peculiarities of pharmacokinetics				
		Absorption from GIT	Ability to bind to plasma proteins	Rapidity of elimination	Accumulation	Solubility (water/lipids)
1. Digitalis purpurea						
2. Digitalis lanata, ferruginea						
3. Strophanthus						
4. Adonis						
5. Lily-of-the-valley						
6. Erysimum						
7. Scilla maritima						

Task 6.

Tell the patient about side effects and symptoms of poisoning with cardiac glycosides. Point out these side effects and symptoms of poisoning.

1. Dyspepsia
2. Exacerbation of heart failure
3. Extrasystolia
4. Atrioventricular blockade
5. Syndrome of "post-action"
6. Disorders of eyesight
7. Hypopotassemia (Hypokalemia)
8. Extrapiramidal disorders
9. CNS disorders
10. Accumulation

Task 7.

Taking into account the pharmacokinetics of cardiac glycosides make the conclusion about their indications. Fill in the table.

Group of cardiac glycosides depending on solubility	Drugs	Indications	Route of administration	Medicinal form
Lipophilic agents				
Lipo-and-hydrophilic agents				
Hydrophilic agents				

Task 8.

Discuss with doctor the questions about combining cardiac glycosides with other drugs. Are following combinations rational or irrational? Why?

1. Digitoxin+Potassium chloride
2. Strophanthinum K+Calcium chloride
3. Isolanid+Panangin
4. Digitoxin+Dichlothiazide
5. Adonizid+Verapamil
6. Corglicon+Verospirone

Task 9.

Answer the doctor's questions:

1. Why do cardiac glycosides cause bradycardia?
2. What is the difference between the cardiotonic and cardiostimulative effect?

Give the examples of cardiostimulators.

3. Why do cardiac glycosides increase the diuresis?
4. What is the first aid in case of intoxication with cardiac glycosides?
5. How are cardiac glycosides dosed for treatment chronic heart failure?
6. Name the nonglycoside cardiotonics, peculiarities of their pharmacodynamics and indications.

Task 10.

Offer the substitution for Digoxin, Celanid, Amrinone:

A – among the other members of pharmacological group;

B – among the trade marks.

Task 11.

Correct the following prescriptions:

1. Rp.: Strophanthini K 1% - 2ml

D.S.:

#

2. Rp.: Sol. Digitoxini 0,5% - 1ml

D.t.d. in amp. N10.

S.: 1 ml by i/v injection

#

3. Rp.: Digoxini 0,1 N10

D.S.:

Tests

Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action.
2. Pharmacological effects → Indications → Dosage.
3. Side effects → Contraindications → Rules of rational administration.

Drugs

- | | |
|--------------|--------------------|
| 1. Digitoxin | 5. Strophanthin K* |
| 2. Digoxin* | 6. Corglicon |
| 3. Adonizid* | 7. Cardiovalen |
| 4. Amrinone | |

For agents marked with asterisk point out the dosage.

ANTIARRHYTHMIC DRUGS

Topicality of the subject

Antiarrhythmic drugs are agents that normalize the disorders of heart rate; prevent or eliminate the arrhythmias. The normal cardiac rhythm is very important for normal heart activity and for normal activity of the whole organism. That is why it is useful to know the pharmacological properties of antiarrhythmic drugs that include the representatives of different pharmacological groups.

Theoretical questions

1. Classification and nomenclature of antiarrhythmic drugs.
2. Mechanism of action of antiarrhythmic drugs.
3. Pharmacodynamics, indications, side effects, contraindications of antiarrhythmic drugs.
4. Comparative description of antiarrhythmic drugs.

Home tasks

Task 1.

Write the following prescriptions:

1. Procainamide (Procainamidum) – tabl. 0.25.
2. Amiodaron (Amiodaronum) – tabl. 0.02.
3. Quinidine (Chinidinum) – tabl. 0.2.
4. Acebutolol (Acebutololum) – tabl. 0.2.
5. Atropine sulfate (Atropini sulfas) – sol. f/i 0.1% - 1 ml, amp.
6. Verapamil (Verapamilum) – tabl. 0.04.

Task 2.

Preparing the information for doctors about the antiarrhythmic drugs name the groups of drugs which may be used for treatment tachyarrhythmias (A) and bradyarrhythmias (B). Give the examples of tachy- and bradyarrhythmias.

Class tasks

Task 1.

Classify the antiarrhythmic drugs and choose for each subgroup its mechanism of action. Match the letters with numbers. For agents marked with asterisk point out the dosage. Underline the new drugs.

Drugs

- | | | |
|----------------------|-----------------|--|
| 1. Procainamide* | 8. Quinidine* | 15. Metoprolol* |
| 2. Isoprenaline | 9. Atenolol | 16. Disopyramide |
| 3. Dobutamine* | 10. Amiodarone* | 17. Propafenone |
| 4. Verapamil | 11. Praymalin | 18. Moracisin |
| 5. Sotalol | 12. Acebutolol | 19. Phenytoin |
| 6. Propranolol* | 13. Lidocaine* | 20. Aethacisin |
| 7. Atropine sulfate* | 14. Nadolol | 21. Potassium and
Magnesium asparaginate* |

Pharmacological groups

- | | |
|--------------------------------------|--------------------------------------|
| A. Membrane stabilizers | F. $\beta_1+\beta_2$ -adrenomimetics |
| B. M-cholinoblockers | G. Potassium-containing agents |
| C. β_1 -adrenoblockers | H. Calcium channels blockers |
| D. $\beta_1+\beta_2$ -adrenoblockers | I. Agents prolonging repolarization |
| E. β_1 -adrenomimetics | |

Mechanism of action

- Prolonging of repolarization due to complex influence on cardiac activity.
- Block of Ca^{2+} ions flow inside the cells through the calcium canals.
- Block of β_1 -adrenoceptors.
- Stimulation of $\beta_1+\beta_2$ -adrenoceptors.
- Block of $\beta_1+\beta_2$ -adrenoceptors.
- Stimulation of β_1 -adrenoceptors.
- Block of M-cholinoceptors.

- h. Stabilization of cardiomyocyte cell membranes and decrease of ionic flows through these membranes.
- i. Normalization of K^+ -content in heart cells that lead to decrease of cardiac activity.

Task 2.

Choose for each antiarrhythmic drug its pharmacological effects. Match letters with numbers.

Drugs

- | | | |
|--------------------|-----------------|-----------------|
| 1.Lidocaine | 6.Propranolol | 11.Disopiramide |
| 2.Atropine sulfate | 7.Phenitoin | 12.Moracisin |
| 3.Dobutamine | 8.Acebutolol | 13.Praymalin |
| 4.Amiodaron | 9.Quinidine | 14.Isoprenalin |
| 5.Verapamil | 10.Procainamide | |

Pharmacological effects

- | | | |
|---------------------|-------------------|------------------|
| A.Antiarrhythmic | F.Sedative | K.Hypertensive |
| B.Antianginal | G.Cholinoblocking | L.Uterotonic |
| C.Antihypertensive | H.Coronarolytic | M.Anticonvulsant |
| D.Local anesthetic | I.Analgesic | N.Broncholytic |
| E.Cardiostimulative | J.Antipyretic | O.Uterolytic |

Task 3.

Learning the pharmacological properties of different groups of antiarrhythmic drugs fill in the following table:

Pharmacological group	Indications	Side effects	Contraindications
Membrane stabilizers			
β -adrenoblockers			
Calcium canals blockers			
Agents prolonging repolarization			
K^+ -containing agents			
β -adrenomimetics			
M-cholinoblockers			

Task 4.

Answer the doctors' questions:

1. What groups of antiarrhythmic drugs act preferably on:

- a). conductive heart system;
- b). efferent innervation of heart (autonomic nervous system)?

2. What antiarrhythmic drug(s) may be used also for:

- a). treatment of angina pectoris;
- b). treatment of hypertension;
- c). treatment of epilepsy;
- d). treatment of bronchial asthma;
- e). treatment of poisoning with cardiac glycosides;
- f). emergency (heart stoppage);
- g). local anesthesia?

Task 5.

Offer the patient the substitution of Isoprenalin, Dobutamine, Verapamil, Amiodaron, Praymalin, Procainamide, Metoprolol, Potassium and Magnesium asparaginate, Atropine sulfate:

A – among the other members of pharmacological group;

B – among the trade marks.

Task 6.

Correct the following prescriptions:

1. Rp.: Novocainamidi 0,5
D.S.
#
2. Rp.: Tab. Amiodaroni 1,0
S.: 1 tablet 3 times a day.
#
3. Rp.: Atropini sulfatis 10% - 1 ml
D.t.d. N 20
D.S. As always.
#
4. Rp.: Diphenini 0,1
D.t.d. in tab. N 10
S.
#
5. Rp.: Tab. Anaprilini 0,04 N 10
D.S. 1 tablet daily.

Tests

Describe the drugs using following schemes:

4. Pharmacological group → Interchangeability → Mechanism of action.
5. Pharmacological effects → Indications → Dosage.
6. Side effects → Contraindications → Principles of rational administration.

Drugs

- | | |
|------------------|--|
| 1. Procainamide* | 5. Acebutolol |
| 2. Quinidine | 6. Verapamil |
| 3. Lidocaine* | 7. Dobutamine |
| 4. Amiodaron* | 8. Atropine sulfate* |
| | 9. Potassium and Magnesium asparaginate* |

For agents marked with asterisk point out the dosage.

**ANTIHYPERTENSIVE DRUGS: SELECTIVE AGONISTS OF
IMIDAZOLINE RECEPTORS, A-ADRENOBLOCKERS, B-
ADRENOBLOCKERS, SYMPATHOLYTICS, GANGLIONIC BLOCKERS,
BLOCKERS OF CALCIUM CHANNELS, INHIBITORS OF ACE,
ANTAGONISTS OF ANGIOTENSIN II RECEPTORS, PERIPHERAL
VASODILATORS ET AL. MEANS. ANTISCLEROTIC MEDICINES.
STATINS, FIBRATES, SEQUESTRANTS OF BILE ACIDS, NICOTINIC
ACID DRUGS, CORRECTORS OF EPITHELIALDYSFUNCTION.**

Topicality of the subject.

Hypertension and atherosclerosis are one of the most often diseases of cardiovascular system. They may be dangerous for life and may lead to different complications such as hypertensive crisis, myocardial infarction, etc. For pharmacological correction of these diseases many drug from different pharmacological groups may be used. It is very important to know the pharmacological properties of antihypertensive (hypotensive) and antiatherosclerotic drugs for rational pharmacotherapy of hypertension and atherosclerosis.

Theoretical questions.

1. Classification and nomenclature of antihypertensive drugs.
2. Mechanism of action of antihypertensive drugs. Mechanism of antihypertensive effect development for different groups of antihypertensive drugs.
3. Pharmacodynamics, indications, side effects, contraindication of antihypertensive drugs.
4. Principles of rational administration of antihypertensive drugs. The drugs of choice for treatment different forms of hypertension and hypertensive crisis.
5. The classifications and of antiatherosclerotic drugs.
6. Mechanism of action, pharmacodynamics, indications of antiatherosclerotic drugs.
7. Side effects, contraindication, principles of rational administration antiatherosclerotic drugs.
8. The comparative description of drugs.

Home task.

Task 1.

Write the following prescriptions:

1. Dibazol (Dibasolum) – sol. f/i 0.5% – 1 ml, amp.
2. Clonidine (Clonidinum) – tabl. 0.000075; sol. f/i 0.01% – 1 ml, amp.
3. Propranolol (Propranololum) – tabl. 0.01.
4. Reserpine (Reserpinum) – tabl. 0.0001.
5. Lovastatin (Lovastatinum) – tabl. 0.01.
6. Lipoic acid (Acidum lipoicum) – tabl. 0.025.

Task 2.

Answer your colleague's questions:

1. Name the factors or systems (vasoconstrictive and vasodilative) that take part in regulation of vascular tone in human body.
2. What are the main strategies in treatment of hypertension?
3. Name the groups of antiatherosclerotic drugs and explain their role in treatment of atherosclerosis.

Class tasks.

Task 1.

Classify the antihypertensive drugs. Match letters with members. For agents, marked with asterisk, point out the dosage. Underline the new drugs.

Pharmacological groups.

- | | |
|---|---|
| A. Sympatholytics | I. ACE inhibitors |
| B. α_1 – adrenoblockers | J. Antagonists of angiotensin receptors |
| C. $\alpha_1+\alpha_2$ – adrenoblockers | K. Central-acting α_2 – adrenomimetics |
| D. β_1 – adrenoblockers | L. Peripheral vasodilators |
| E. $\beta_1+\beta_2$ – adrenoblockers | M. Agonists of imidazolin receptors |
| F. Myotropic spasmolytics | N. Ganglionic blockers |
| G. Calcium canals blockers | O. $\alpha+\beta$ – adrenoblockers |
| H. Diuretics | P. Combined antihypertensive agents |

Drugs.

1. Labetalol
2. Pirroxan
3. Caposide
4. Doxasozin*
5. Methyldopa
6. Amlodipin
7. Metoprolol
8. Diazoxide*
9. Reserpine *
10. Ramipril*
11. Captopril
12. Clonidine*
13. Propranolol*
14. Hydrochlorthiazide
15. Dibazol*
16. Spironolactone
17. Valsartan
18. Furosemide*
19. Potassium losartan
20. Moxonidin
21. Isradipine
22. Molsidomine
23. Acebutolol
24. Hexamethonium benzosulfonate*
25. Prasozin
26. Adelphan – Ezidrex
27. Hydralasin

Task 2.

For understanding the pharmacodynamics of antihypertensive agents learn the mechanism of their action. Choose for each drug its mechanism of action. Match letters with numbers.

Drugs.

1. Clonidine
2. Atenolol
3. Propranolol
4. Doxasozin
5. Amlodipin
6. Enalapril
7. Moxonidin
8. Reserpine
9. Potassium losartan
10. Labetalol
11. Hexamethonium benzosulfonate
12. Hydralasin
13. Drotaverin
14. Phentolamine

Mechanism of action.

- A. Block of β_1 – adrenoreceptors.
- B. Block of α_1 – adrenoreceptors.
- C. Block of $\beta_1 + \beta_2$ – adrenoreceptors.
- D. Stimulation of central α_2 – adrenoreceptors.
- E. Block of $\alpha_1 + \alpha_2$ – adrenoreceptors.
- F. Inhibition of ACE
- G. Block of angiotensive receptors
- H. Block of membrane calcium canals
- I. Stimulation of central I_2 – receptors.
- J. Decrease of catecholamines content in presynaptic membrane
- K. Block of $\alpha + \beta$ – adrenoreceptors.
- L. Block of automatic ganglia
- M. Inhibition of phosphodiesterase accumulation of cAMP; change of contractive proteins form in smooth muscles
- N. Inhibition of phosphodiesterase, accumulation of cAMP; change of carbohydrate metabolism in smooth muscles of blood vessels.

Explain the role of each mechanism of drug action in development of antihypertensive effect.

Task 3.

Learning the pharmacological properties of antihypertensive agents choose for each drug its:

- I. Pharmacological effects and indications;
- II. Side effects and contraindications.

Match the letters and numbers with names of drugs.

Drugs.	
Clofelin	Dibazol
Anaprilin	Prasozin
Benzohexonium	Diazoxide
Enap	Amlodipin
Reserpine	

Pharmacological effects

- | | |
|----------------------|---|
| A. Antihypertensive | H. Mild neuroleptic |
| B. Antianginal | I. Broncholytic |
| C. Antiarrhythmic | J. Potentiative |
| D. Spasmolytic | K. Decrease of smooth muscles tone of prostatic part of urethra |
| E. Sedative | L. Hypothermic |
| F. Immunostimulative | M. Hypnotic |
| G. Decrease of IOP | N. Analgesic |

Indications.

- | | |
|------------------------|------------------------------|
| 1. Glaucoma | 7. Pulmonary and brain edema |
| 2. Hypertension | 8. Migraine |
| 3. Hypertensive crisis | 9. Neurosis |
| 4. Bronchial asthma | 10. Adenoma of prostate |
| 5. Angina pectoris | 11. Arrhythmia |
| 6. Momaged hypotension | 12. Colics |

Side effects.

- | | |
|------------------------------------|--|
| A. Orthosthatic hypotension | N. Water retention |
| B. Dry cough | O. Hyperacidity |
| C. Depression | P. Weakness |
| D. Insomnia | Q. Headache |
| E. Bronchospasm | R. Dizzines |
| F. Spasm of peripheral vessels | S. Impotency |
| G. Inhibition of CNS | T. Parkinson's syndrome |
| H. Hypoglycemia | U. Frequent urination |
| I. Dry mouth | V. Tolerance |
| J. Bradycardia | W. Dependence |
| K. Disorders of vision and hearing | X. "Abolition" syndrome |
| L. AV – blockade | Y. Heart failure |
| M. Hyperkalemia | Z. Decrease of exocrine glands secretion |

Contraindications.

- | | |
|---|----------------------------|
| 1. Insomnia | 11. Pregnancy |
| 2. Bronchial asthma | 12. Lactation |
| 3. Disorders of peripheral circulation | 13. Epilepsy |
| 4. Depression | 14. Marked atherosclerosis |
| 5. Bradycardia | 15. Therapy with insulin |
| 6. Edema | 16. Hyperkalemia |
| 7. Peptic ulcer (hyperacidic gastritis) | 17. Cardiogenic shock |
| 8. Parkinson's disease | 18. Marked hypotension |
| 9. Heart failure | 19. Renal failure |
| 10. Alcoholism | 20. Glaucoma |

Find the logic connection between pharmacological effects and indications; side effects and contraindications.

Task 4.

Classify the antiatherosclerotic drugs. Match the letters with numbers.

Drugs.

- | | |
|--------------------|--------------------|
| 1. Lovastatin* | 7. Ciprofibrate |
| 2. Hemfibrosil* | 8. Simvastatin |
| 3. Pyricarbate | 9. Pravastatin |
| 4. Fluvastatin | 10. Probucol |
| 5. Cholestiramine* | 11. Ascorbic acid* |
| 6. Rutin* | 12. Lipoic acid |

Pharmacological groups.

- | | |
|--------------------------|-------------------------------|
| A. Statins | D. Antioxidant |
| B. Fibrates | E. Angioprotectors |
| C. Anion exchange resins | F. Other hypolipidemic agents |

For agents, marked with asterisk point out the dosage.

Task 5.

Preparing the information for the doctors about antiatherosclerotic drugs fill in the following tables:

Table 1.

Drug	Pharmacological effects	Indications
Lovastatin		
Hemfibrosil		
Cholestiramine		
Tocoferol acetate		
Heparin		

Table 2.

Pharmacological group	Side effects	Contraindications
Statins		
Fibrates		
Anion exchange resins		

Task 6.

Answer your colleague's questions:

1. What mechanism of action do different groups of hypolipidemic drugs have?
2. What is the role of antioxidants and angioprotectors in antiatherosclerotic effect development?
3. What is the difference between the direct-acting and indirect-acting antioxidants?
4. Is it rational to combine the following agents:
 - Enalapril + Hypothiazide;
 - Anaprilin + Niphedipine;
 - Clonidine + Metoprolol;
 - Reserpine + Anaprilin;
 - Dihydroergotamine + Anaprilin;
 - Dibazol + Papaverin;
 - Cholestirol + Digoxin;
 - Lovastatin + Nicospan?

Explain your recommendations.

5. What drugs belong to other pharmacological groups; besides antiatherosclerotics?

Task 7.

Offer the patient the substitution of Captopril, Ednit, Kozaar, Hemitone, Moxonidin, Amlodipin, Adversuten, Hexamethonium benzosulfonate, Hydralasin, Propranolol, Atenolol, Lovastatin, Parmidine, Ticlopidine, Phenofibrate, Pravastatin:

A – among the other members of pharmacological group;

B – among the trade marks.

Task 8.

Correct the following prescriptions:

1. Rp.: Anaprilini 0,2
D.t.d. N 10 in tab.
S.: As always.
#
2. Rp.: Tab. Raniteci
D.t.d. in tab. N 10
S.:
#
3. Rp.: Tab. Clophelini 0,75 N 20
D. S.: 1 tablet TDS
#
4. Rp.: Sol. Dibazol 5% - 10 ml
D.t.d. in amp. N 5
S.: Subcutaneously 2 times a day
#
5. Rp.: Tab. Lovastatini 0,02 N 20
D.S.:
#

6. Rp.: Tab. Ac. Ascorbinici 0,5

D.t.d. N 30 S.:

Tests.

Describe the drugs using following schemes:

7. Pharmacological group → Mechanism of action → Interchangeability.
8. Pharmacological effects → Indications → Dosage.
9. Side effects → Contraindications → Principles of rational administration.

Drugs.

- | | |
|----------------|------------------------|
| 1. Clonidine | 9. Cholestiramine |
| 2. Propranolol | 10. Hemfibrosil |
| 3. Captopril | 11. Probucol |
| 4. Isradipine | 12. Lovastatin |
| 5. Prasozin | 13. Rutin |
| 6. Apressin | 14. Potassium losartan |
| 7 Adelfan | 15. Benzohexonium |
| 8 Dibazol | 16. Reserpine |

For agents marked with asterisk point out the dosage.

ANTIANGINAL DRUGS: NITROVASODILATORS, BLOCKERS OF CALCIUM CHANNELS, B-ADRENOBLOCKERS, CARDIOPROTECTORS.

Topicality of the subject

Nowadays there are many drugs for treatment ischemic heart disease, because the latter is one of the most important medical and social problems. For pharmacist it is necessary to know the pharmacological properties of antianginal agents for rational therapy of this disease.

Theoretical questions

- 1.The classification and nomenclature of antianginal drugs.
- 2.Nitrovasodilators: mechanism of action, pharmacodynamics, indications, contraindications, side effects and comparative description of drugs. The role of nitrovasodilators in treatment of angina pectoris.
- 3.Calcium canals blockers: mechanism of action, pharmacodynamics, indications, contraindications, side effects and comparative description of drugs. The role of calcium canals blockers in treatment of angina pectoris.
4. β -adrenoblockers: mechanism of action, pharmacodynamics, indications, contraindications, side effects and comparative description of drugs. The role of β -adrenoblockers in treatment of angina pectoris.
- 5.Other antianginal drugs: mechanism of action, pharmacodynamics, indications, contraindications, side effects and comparative description of drugs. The role of these agents in treatment of angina pectoris.

Home tasks.

Task 1.

Write the following prescriptions:

- 1.Nitroglycerin (Nitroglycerinum) – tabl. 0.0005.
- 2.Sustac-forte (Sustac-forte) – tabl. 0.0064.
- 3.Verapamil (Verapamilum) – tabl. 0.04.
- 4.Carbocromen (Carbocromenum) – tabl. 0.075.
- 5.Validol (Validolum) – tabl. 0.06.
- 6.Isosorbid dinitrate (Isosorbidi dinitras) – tabl. 0.02.

Task 2.

Divide the antianginal drugs into subgroups depending on their ability (way) to cause an antianginal effect. Match letters with numbers.

Groups

- A. Agents decreasing the oxygen consumption by myocardium.
- B. Agents increasing the supply of myocardium with oxygen.
- C. Agents improving the metabolism in myocardium.

Drugs

- | | | |
|-------------------------|-----------------|-------------------|
| 1. Nitroglycerin | 7. Panangin | 13. Pyridoxin |
| 2. Propranolol | 8. Validol | 14. Corvalol |
| 3. Dipyridamol | 9. Drotaverin | 15. Trimethasidin |
| 4. Verapamil | 10. Carbocromen | 16. Diltiazem |
| 5. Sustac | 11. Papaverin | 17. ATP |
| 6. Nandrolone decanoate | 12. Folic acid | |

Class tasks.

Task 1.

Classify the antianginal drugs into pharmacological groups depending on their mechanism of action. Match the letters with numbers.

Pharmacological groups

- | | |
|----------------------------|--|
| A. Nitrovasodilators | C. β -adrenoblockers |
| B. Calcium canals blockers | D. Agents improving metabolism in myocardium |
| | E. Other antianginal drugs |

Drugs

1.Amlodipin	8.Acebutolol	15.Papaverin*
2.Anaprilin*	9.Nicardipin	16.Riboxin
3.ATP	10.Isosorbid mononitrate	17.Talinolol
4.Validol	11.Carbocromen	18.Molsidomin
5.Verapamil*	12.Nitroglycerin*	19.Trimethasidin
6.Dipiridamol*	13.Nitrong	20.Dilthiazem
7.Isosorbid dinitrate	14.No-spa	21.Pentaerhythryl tetranitrate

Indicate the pharmacological groups of drugs that decrease the oxygen consumption by myocardium (a), that increase the supply of myocardium with oxygen (b), that improve the metabolism in myocardium (c).

For agents marked with asterisk point out the dosage. Underline the new drugs.

Task 2.

Learning the mechanism of antianginal drugs action match the letters (mechanism of action) with numbers (names of drugs).

Mechanism of action

1. Release of nitrogen oxide (II) that leads to activation of cGMP resulting in decrease of smooth muscles tone and dilation of vessels (especially coronary vessels).
2. Selective block of membrane calcium canals decreasing the ionic flow inside the cells of smooth muscles and cardiomyocytes that results in decrease of myocardial contractility, conductivity, smooth muscles tone, bradycardia.
3. Block of β -adrenoceptors that results in decrease of sympathetic nervous system influence on heart (especially negative inotropic effect).

4. Incompetitive block of α - and β -adrenoceptors; block of K^+ -, Ca^{2+} -, Na^+ -canals, that lead to decrease of heart rate and dilation of coronary vessels.
5. Reflex dilation of coronary vessels because of irritation of receptors in the mouth.
6. Competitive inhibition of phosphodiesterase and adenosin desaminase; increase of adenosin and cAMP content in tissues.
7. Normalization of metabolic processes in myocardium.

Drugs

- | | | |
|-------------------------|----------------|-------------------|
| 1. Nitroglycerin | 6. Riboxin | 11. Diltiazem |
| 2. ATP | 7. Verapamil | 12. Amiodaron |
| 3. Isosorbide dinitrate | 8. Propranolol | 13. Amlodipin |
| 4. Dipyridamol | 9. Molsidomin | 14. Sustac |
| 5. Validol | 10. Talinolol | 15. Nitrong |
| | | 16. Trimethazidin |

Task 3.

Choose for each pharmacological group (or drug) their pharmacological effects. Match the letters with numbers.

Pharmacological group (or drug)

- | | |
|----------------------------|----------------------------|
| 1. Nitrovasodilators | 4. β -adrenoblockers |
| 2. Calcium canals blockers | 5. Acetylsalicylic acid |
| 3. Validol | 6. Amiodaron |

Pharmacological effects

- | | | |
|----------------|-------------------|-------------------------|
| 1. Antianginal | 3. Antiarrhythmic | 5. Antiaggregant |
| 2. Hypotensive | 4. Sedative | 6. Antiinflammatory |
| | | 7. Increase of IOP, ICP |

Task 4.

All listed below drugs may be used for treatment (mono- or/and combined therapy) of ischemic heart disease. But besides this indication, some agents have other ones. Choose for each drug its indications. Match the letters with numbers.

Drug

- | | | |
|-----------------|------------------------|----------------------------------|
| 1.Nitroglycerin | 9.Acetylsalicylic acid | 17.Retabolil |
| 2.Verapamil | 10.Strophanthin | 18.Streptokinase |
| 3.Validol | 11.ATP | 19.Morphin |
| 4.Talinolol | 12.Nifedipin | 20.Vitamins |
| 5.Papaverin | 13.Dilthiazem | 21.Heparin |
| 6.Propranolol | 14.Molsidomin | 22.Nitroglycerin (i/v injection) |
| 7.Nitrong | 15.Amiodaron | 23.Trimethasidin |
| 8.Acebutolol | 16.Dipiridamol | 24.Carbocromen |

Indications

- | | |
|----------------------------------|---------------------------------------|
| A.Angina pectoris | B.Myocardial infarction |
| a).anginal attack | a).acute infarction |
| b).prophylaxis of anginal attack | b).reparative period after infarction |
| C.Tachyarrhythmia | D.Hypertension |
| E.Syndrome of hypercoagulation | F.Disorders of peripheral circulation |
| G.Colics | H.Fever |
| I.Heart failure | J.Strong pain |

Task 5.

Preparing the information for doctors about the antianginal drugs pay your attention to their side effects. Indicate for each antianginal agent its side effects. Match the letters with numbers.

Side effects

1. Reflex tachycardia
2. Increase of ICP
3. Tolerance
4. "Abolition" syndrome
5. Bronchospasm
6. Bradycardia
7. Orthostatic hypotension
8. Hypoglycemia
9. Decrease of blood flow in ischemic regions
10. Disorders of peripheral blood circulation
11. Disorders of thyroid function (hypo- or hyperthyroidism)
12. Reddening of skin of face and neck.

Drugs

- | | |
|------------------------|----------------|
| A. Sustac | E. Talinolol |
| B. Propranolol | F. Nifedipin |
| C. Isosorbid dinitrate | G. Dipyridamol |
| D. Amiodaron | |

Task 6.

Answer the doctor's questions:

1. Is it rational to combine β -adrenoblockers (non-selective) with:
 - antidiabetic drugs;
 - cardiac glycosides;
 - drugs obtained from Ergot?
2. What are the principles of rational administration of nitrates?

Task 7.

Offer the patient the substitution of Propranolol, Verapamil, Norvask, Dipyridamol, Nitroglycerin, Amiodaron, Carbocromen, Nitrosorbid:

- A – among the other members of pharmacological group;
B – among the trade marks.

Task 8.

Correct the following prescriptions:

1. Rp.: Nitroglycerini 0,0005

D.t.d. N 40

S.: As always.

#

2. Rp.: Validoli

D.S.: Use 1-2 drops in each eye.

#

3. Rp.: Dipyridamoli 0,25

D.t.d. N 20

D.S.: Use 1 tablet 3 times a day.

#

4. Rp.: Verapamili 0,02

D.S.

Tests

Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action.
2. Pharmacological effects → Indications → Dosage.
3. Side effects → Contraindications → Principles of rational administration.

Drugs

- | | |
|-------------------|------------------------|
| 1. Nitroglycerin* | 5. Dipyridamol* |
| 2. Validol* | 6. Talinolol |
| 3. Nifedipin | 7. Verapamil |
| 4. Propranolol | 8. Isosorbid dinitrate |

For agents marked with asterisk point out the dosage.

ANTACIDS, H₂-BLOCKERS OF RECEPTORS OF HISTAMIN, PROTON PUMP INHIBITORS, M₁-CHOLINORECEPTORS BLOCKERS, GASTROPROTECTORS, HEPATOPROTECTORS, CHOLERETIC DRUGS, ANTISPASMODICS. LAXATIVES. ANTIDIARRHEA DRUGS

Topicality of the subject

The gastro-intestinal tract diseases, due to their high prevalence, complexity pathogenesis, the propensity to prolonged, recurrent course, require efficient methods of medical treatment.

The problem of choice of optimal combinations of drugs for effective pharmacotherapy of gastro-intestinal tract diseases is relevant to doctors and pharmacists.

Theoretical questions

1. The mechanism of action and indications of bitters.
2. Indications of anorectic medicines.
3. Comparative pharmacological characteristics and indications of antacids.
4. Medicines that decrease the secretion of HCl (antisecretory medicines).
Mechanism of action, indications, contraindications, side effects.
5. Substitutive therapy medicines in low acid-forming function of the gastric glands.
6. Medicines that are used in disorders of exocrine pancreatic function.
7. Pharmacodynamics and indications of cholagogic medicines.
8. Mechanism of action, indications, contraindications and side effects of laxatives'.

Home tasks

Task 1.

Write the following prescriptions:

1. Gastric juice natural (Succus gastricus) 100 ml in bottles.

2. Pancreatine (Pancreatinum) – powd. 0.5.
3. Allochol («Allochololum») – tabl. № 50.
4. Almagel («Almagelum») – 170 ml in bottles.
5. Castor oil (Oleum Ricini) – caps. 1.0.
6. Famotidine (Famotidinum) – tabl. 0.150.
7. Guttalax (Guttalax) – 15 ml in bottles.

Task 2.

Fill the table 1–3.

Table 1

Medicines	Influence on the pH of gastric juice (– or +)	Indications	Conditions of administration		
			before meals	during meals	after meals
A. Substitutive therapy medicines					
B. Antacid medicines					

Indications: gastritis (hypoacidic – a, hyperacidic – b, anacidic – c, peptic (stomach and duodenal) ulcer – d).

Table 2

Medicines	Indications	Conditions of administration		
		before meals	during meals	after meals
A. Choloretic				
B. Cholagogic				

Indications: hepatitis – a, cholecystitis – b, cholangitis – d.

Table 3

Medicines	Source		Indications	Conditions of administration	
	plant origin	synthetic		overnight fasting	in the morning, afternoon, evening
A. Reflex stimulating intestinal peristalsis					
B. Synthetic					
C. Salt laxatives					
D. Oil laxatives					

Indications: atony of intestinal in adults – a, in children – b, instrumental examination of the GIT – c, food poisonings – d, hemorrhoid and proctitis – e.

Class tasks

Task 1.

Divide the following drugs into anti-ulcer (A), hepatoprotectors (B), enzymatic medicines (C) and laxatives (D). For agents, marked with asterisk, point out the dosage. Underline the new drugs.

Drugs.

- | | |
|-----------------|----------------|
| 1. Famotidine | 15. Festal* |
| 2. Omeprazole | 16. Panzinorm |
| 3. Phosphalugel | 17. Sennadexin |
| 4. De-nol | 18. Guttalax |
| 5. Vaseline oil | 19. Castor oil |

- | | |
|-------------------|----------------------|
| 6. Gastrocepine * | 20. Plantex |
| 7. Legalon | 21. Agiolax |
| 8. Tiqueol | 22. Macrogol |
| 9. Simepar | 23. Hepasteril B |
| 10. Essentiale | 24. Catergen |
| 11. Antral | 25. Carbaldrate |
| 12. Ornitine | 26. Liquiritonum |
| 13. Apcosule | 27. Laminarid |
| 14. Misoprostol | 28. Hepar compositum |

Task 2.

Match the names of medicines with their mechanisms of action and pharmacological effects.

Drugs:

- | | |
|-----------------|-------------------|
| 1. Methyluracil | 6. Bilignine |
| 2. Cimetidine | 7. Erbisol |
| 3. Omeprazole | 8. Hepasol |
| 4. Sucralfate | 9. Thiotriazoline |
| 5. Alumag | 10. Gastropharm |

Mechanism of action

- I. Formation of albuminates (protection of the gastric mucous membrane).
- II. Block of H^+/K^+ -ATPase enzyme.
- III. Stimulation of regenerative processes in stomach.
- IV. Stabilization of hepatocytes cell membranes.
- V. Neutralization of hydro-chloric acid in the stomach
- VI. Covering of the stomach mucous membrane
- VII. Decrease of free radical oxidation processes in hepatocytes.
- VIII. Normalization of metabolic processes in hepatocytes

Pharmacological effects

- | | |
|-------------------------|---------------------|
| A. Hepatoprotective | H. Astringent |
| B. Cholagogic | I. Antibacterial |
| C. Antitoxic | J. Covering |
| D. Antioxidant | K. Cardioprotective |
| E. Membrane-stabilizing | L. Anabolic |
| F. Regenerative | M. Antisecretory |
| G. Antacid | |

Task 3.

Divide the following laxatives into groups using task 1:

1. Combined drugs
2. Drugs softing feces
3. Drugs with osmotic properties
4. Drugs reflex stimulating intestinal peristalsis
5. Drugs increasing volume of intestinal contents

Task 4.

Match the names of medicines with their indications and contraindications.

Medicines	Indications
1. Ranitidine	A. Peptic ulcer
2. Gastrocepine	B. Hyperacid gastritis
3. Omeprazole	C. Hypoacid gastritis
4. De-nol	D. Gastroesophageal reflux,
5. Plantaglucidum	E. Zollinger – Ellison’s syndrome
6. Metronidazole	F. Hepatic cirrhosis
7. Ademethionine	G. Chronic hepatitis
8. Carsil	H. Acute hepatitis
9. Bisacodyl	I. Cholecystitis

10. Magnesium sulphate	J. Hepatic coma
11. Laminarid	K. Preparation for surgeries, instrumental and X-ray examinations
12. Panzinorm	L. Constipations
13. Contrycal	M. Diarrhea
14. Ursosalk	N. Biliary dyskinesia
15. Allocholium	O. Acute pancreatitis
16. Solizymum	P. Chronic pancreatitis
17. Loperamide	
18. Hepasteril B	
Contraindications	
I. Hypoacid gastritis	
II. Acute pancreatitis	
III. Cholecystitis	
IV. Hepatitis	
V. Individual intolerance of medicine	
VI. Intestinal obstruction	
VII. chronic renal insufficiency	

Task 5.

Answer the questions:

1. What is the mechanism of action of Misoprostol?
2. Why it should be taken with caution in patients with bronchial asthma, pregnant women?
3. Is it possible to use De-nol a long period of time?

Task 6

Describe the drugs using following schemes:

4. Pharmacological group → Interchangeability → Mechanism of action → Spectrum of action.

5. Pharmacological effects → Type of action → Indications → Dosage.
6. Side effects → Contraindications → Rules of rational administration.

Drugs:

- | | |
|-----------------|-------------------|
| 1. Methyluracil | 6. Bilignine |
| 2. Cimetidine | 7. Essentiale* |
| 3. Omeprazole* | 8. Hepasol |
| 4. Sucralfate | 9. Thiotriazoline |
| 5. Alumag | 10. Gastropharm |

For agents, marked with asterisk, point out the dosage.

Task 7.

Correct the following prescriptions:

1. Rp.: Siliborum 0,1

D.t.d. N 10

S.: 1 tabl. 2 times a day

#

2. Rp.: Famothidini 0,01

D.t.d. № in tab.

S. 1 tabl. a day

#

3. Rp.: Sol. Magnii sulfas 25% - 10 ml

D.t.d. № 10 in amp

S.: As always.

#

4. Rp.: Tab. Olei ricini 1,0 № 10

D.S. 1 caps. 3 times a day

#

5. Rp.: Dragee «Festali» № 100

D.S. 2 dragee before meals

DIURETIC DRUGS. ANTIGOUTY MEDICINES. UTEROTROPIC DRUGS.

Topicality of the subject

In many diseases the amount of sodium chloride reabsorbed by the kidney tubules is abnormally high. This leads to the retention of water, an increase in blood volume, expansion of the extravascular fluid compartment, resulting in edema of the tissues. For pharmacological correction of such states the diuretic drugs that increase urine flow and elimination are used. Diuretics are also widely used as components of therapy of cardiovascular system; renal and hepatic disorders.

Theoretical questions

1. The classification and nomenclature of diuretic drugs.
2. The mechanism of action, pharmacodynamics and indications of diuretics.
3. Side effects and contraindications of diuretics.
4. The comparative description of diuretics.

Home tasks

Task 1.

Write the following prescriptions:

1. Furosemide (Furosemidum) – sol. f/i 1% - 1 ml, amp.
2. Hydrochlorthiazide (Hydrochlorthiazidum) – tabl. 0.05.
3. Spironolactone (Spironolactonum) – tabl. 0.25.
4. Ethacrynic acid (Acidum Aethacrynicum) – tabl. 0.05.
5. Acetazolamide (Acetazolamidum) – tabl. 0.25.

Task 2.

Classify the following diuretics. Match the name of drug with name of pharmacological group.

Drugs

- | | | |
|-----------------------|---------------------|------------------|
| 1. Hydrochlorthiazide | 6. Urea | 11. Mannitol |
| 2. Acetazolamide | 7. Cyclomethiazide | 12. Theophyllin |
| 3. Triamteren | 8. Bearberry leaves | 13. Lespenephрил |
| 4. Ethacrynic acid | 9. Spironolactone | 14. Clopamide |
| 5. Potassium acetate | 10. Furosemide | 15. Aminophyllin |

Pharmacological groups

- | | |
|------------------------------|---|
| A. Carboanhydrase inhibitors | E. Xanthine diuretics |
| B. Plant origin diuretics | F. Osmotic diuretics |
| C. Thiazide diuretics | G. Potassium-saving (Potassium-sparing) diuretics |
| D. Loop diuretics | |

Class tasks

Task 1.

Divide the following diuretics into subgroups filling in the table. For agents marked with asterisk point out the dosage.

Thiazide diuretics	Loop diuretics	Osmotic diuretics	Potassium-sparing diuretics	Carboanhydrase inhibitors	Xanthine diuretics	Plant origin diuretics

Drugs

- | | | |
|-----------------------|-------------------------|-----------------------|
| 1. Hydrochlorthiazide | 10. Spironolactone* | 19. Potassium acetate |
| 2. Bumetanide | 11. Acetazolamide* | 20. Verospirone |
| 3. Indapamide | 12. Amilorid | 21. Dichlothiazide |
| 4. Theobromin | 13. Orthosiphone leaves | 22. Cowberry leaves |
| 5. Lespenephрил | 14. Urea | 23. Horse-tail herb |

- | | | |
|---------------------|---------------------|----------------|
| 6. Furosemide* | 15. Ethacrynic acid | 24. Triamteren |
| 7. Mannitol | 16. Chlorthalidone | 25. Clopamide |
| 8. Bearberry leaves | 17. Lazix | |
| 9. Cyclomethiazide | 18. Aminophyllin | |

Task 2.

Choose for each group of diuretics the correct mechanism of action. Match letters with numbers.

Groups of diuretics

- | | |
|--------------------------------|---------------------------------|
| A.Potassium-sparing diuretics: | D.Carbonic anhydrase inhibitors |
| a)Spironolactone | E.Osmotic diuretics |
| b)Triamteren, Amilorid | F.Xanthine diuretics |
| B.Loop diuretics | G.Plant origin diuretics |
| C.Thiazides | |

Mechanism of action

- 1.Block of aldosterone receptors that leads to decrease of distal canals` membranes permeability for Na^+ , Cl^- ions (increase of their elimination) and retention of K^+ ions.
- 2.Increase of the osmotic pressure of blood and the primary urine that results in decrease of water and Na^+ ions reabsorption along the whole renal canal.
- 3.Inhibition of reabsorption of Na^+ , K^+ , Cl^- ions and water preferably in distal canals of nephron.
4. Decrease of distal canals` membranes permeability for Na^+ , Cl^- ions and retention of K^+ ions due to block of membrane Na-canals.
- 5.Inhibition of reabsorption of Na^+ , K^+ , Cl^- ions and water in loop of Henle.
- 6.Dilation of renal blood vessels (particularly due to inhibition of phosphodiesterase) and improvement of glomerular filtration; inhibition of reabsorption.

7. Inhibition of carbonic anhydrase enzyme in proximal canals of nephron that leads to increase of Na^+ and HCO_3^- ions elimination.
8. Increase of glomerular filtration due to improvement of renal blood circulation.

Task 3.

Comparing the pharmacological effects of different groups of diuretics, find the differences and similarities in their pharmacodynamics. Choose for each group of diuretics its pharmacological effects and fill in the table.

Pharmacological effects	Thiazide diuretics	Loop diuretics	Potassium-sparing diuretics	Carbonic anhydrase inhibitors	Osmotic diuretics	Plant origin diuretics	Xanthine diuretics
Diuretic:							
- potent							
- moderate							
- mild							
Hypotensive							
Antiepileptic							
↓ IOP							
↓ ICP							
Anti-inflammatory							
Antiseptic							
Spasmolytic							

Antiulcer							
Broncho-lytic							

Note! The effect is: present – “+”; absent – “-“.

Task 4.

Choose for each diuretic drug its indications. Match letters with numbers.

Drugs

- | | |
|------------------------|------------------|
| 1. Spironolactone | 5. Mannitol |
| 2. Hydrochlorothiazide | 6. Furosemide |
| 3. Bearberry leaves | 7. Acetazolamide |
| 4. Aminophyllin | 8. Lespenephрил |

Indications

- | | |
|---|--|
| A. Inflammatory diseases of kidneys and urinary tract | I. Hypopotassemia caused by administration of agents that eliminate K^+ ions |
| B. Pulmonary edema | J. Hypertension |
| C. Brain edema | K. Edema caused by hepatic failure |
| D. Glaucoma | L. Edema caused by renal failure |
| E. Hypertensive crisis | M. High level of nitrogen in blood |
| F. Epilepsy | N. Primary hyperaldosteronism |
| G. Edema caused by heart failure | O. Disorders of brain blood circulation |
| H. Intoxication caused by water-soluble poisons | |

Task 5.

Learning the side effects and contraindications of diuretics fill in the following table.

Group of diuretics	Side effects	Contraindications
Thiazide diuretics		
Loop diuretics		
Carbonic anhydrase inhibitors		
Potassium-sparing diuretics		
Osmotic diuretics		
Plant origin diuretics		
Xanthine diuretics		

Task 6.

Answer your colleague`s questions:

1. Why is Verospirone contraindicated in Addison`s disease?
2. What diuretic drugs may cause the disorders of hearing?
3. Is combination of antidiabetic drugs with thiazides or loop diuretics rational?
4. Is combination of thiazides or loop diuretics with cardiac glycosides rational?
5. Is combination of Lazix with Dichlothiazide rational?
6. Can NSAIDs influence on diuretic effect of diuretic drugs in case of their combined administration?
7. What other pharmacological groups (besides diuretics) do xanthine derivatives belong to?

Task 7.

Offer the substitution of Furosemide, Acetazolamide, Dichlothiazide, Mannit, Cowberry leaves, Ethacrynic acid, Amilorid, Euphyllin, Verospirone, Indapamide:

A – among the other members of pharmacological group;

B – among the trade marks.

Task 8.

- | | |
|---|--|
| 1. Rp.: Diacarbi
D.t.d. № 20 in tab.
S. 1 tabl. 3 TDS; 5 days.
| 3. Rp.: Furosemidi
D.t.d. № 30
S. 1 tabl. 2 times a day; 5 days.
|
| 2. Rp.: Aldactoni 0,025
D.t.d. in tab. № 50
S.
| 4. Rp.: Dichlothiazidi
D.t.d. № 20 in amp.
S.1 tabl. 4 times a day; 10 days
|

Tests

Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action.
2. Pharmacological effects → Indications → Dosage.
3. Side effects → Contraindications → Principles of rational administration.

Drugs

- | | | |
|------------------------|-------------------|-----------------|
| 1. Hydrochlorthiazide* | 4. Triamteren | 7. Theobromin |
| 2. Mannitol | 5. Verospirone | 8. Lespenephрил |
| 3. Furosemide* | 6. Acetazolamide* | |

For agents, marked with asterisk, point out the dosage.

Submodule 5 Drugs affecting the system of blood, metabolism and immunity.

**DIRECT-ACTING AND INDIRECT-ACTING ANTICOAGULANTS.
ANTIAGGREGANTS. FIBRINOLYTICS. HEMOSTATICS.
COAGULANTS OF THE SYNTHETIC, ANIMAL, PLANT ORIGIN.**

Topicality of the subject.

The disorders of blood coagulation in the body (imbalance between the systems increasing and decreasing of blood-clotting time) lead to bleedings (on the one hand) or thromboses (on the other hand).

These pathologic states (caused by different reasons) may be dangerous for life. That's why both bleedings and thromboses require the pharmacological correction by drugs affecting blood coagulation.

Theoretical questions.

1. The physiologic mechanism of blood coagulation.
2. The classification of drugs affecting blood coagulation.
3. The pharmacological description of drugs decreasing blood-clotting time.
4. The pharmacological description of drugs increasing blood-clotting time.

Home tasks.

Task 1.

Write the following prescriptions:

1. Heparin (Heparinum) – lioph. powd. f/i, 5 ml, vial.
2. Dipyridamol (Dipyridamolum) – tabl. 0.075.
3. Calcium chloride (Calcii chloridum) – sol. f/i 10% - 10 ml, amp.
4. Aminocapronic acid (Acidum aminocapronicum) – sol. f/i 5% - 100 ml, vial.
5. Fibrinogen (Fibrinogenum) – powd. f/i 1,0 - 250 ml, vial.
6. Phenindion (Phenindionum) – tabl. 0.03.

Task 2.

Learning the classification of drugs affecting blood coagulation fill in the table:

Pharmacological group	Drugs
1. Anticoagulants 2. Fibrinolytics 3. Hemostatic agents of plant origin 4. Antiaggregants 5. Fibrinolysis inhibitors	

Task 3.

Fill in the table concerning the indications for drugs affecting blood coagulation:

Indications	Drugs
1. Thrombosis 2. Myocardial infarction 3. Bleedings caused by fibrinogen deficiency 4. Trophic ulcers of legs 5. Uterine bleedings	

Class tasks.

Task 1.

Divide the drugs affecting blood coagulation into following groups: direct-acting anticoagulants (A), indirect-acting anticoagulants (B), fibrinolytics (C), fibrinolysis inhibitors (D), coagulants (E), antiaggregants (F), aggregants (G), plant origin hemostatic agents (H). Match letters with numbers. Point out the dosage for drugs marked with asterisk. Underline the new drugs.

Drugs

- | | |
|----------------------|---------------------------|
| 1. Fraxyparin | 13. Sincumar* |
| 2. Ticlid | 14. Thrombin |
| 3. Etamsylate | 15. Gelatinol |
| 4. Acenocumarol | 16. Nettle herb |
| 5. Clexan | 17. Calcium chloride |
| 6. Urokinase | 18. Vicasol* |
| 7. Aminobenzoic acid | 19. Aminocaproic acid* |
| 8. Phenindion* | 20. Water pepper herb |
| 9. Dipyridamol | 21. Acetylsalicylic acid* |
| 10. Streptokinase | 22. Fibrinolysin |
| 11. Heparin* | 23. Heparin ointment |
| 12. Fibrinogen* | 24. Alteplase |

Task 2.

Choose the correct mechanism of action for each group of drugs affecting blood coagulation. Match the letters with numbers.

Pharmacological groups

- | | |
|-----------------------------------|-----------------------------|
| A. Direct-acting anticoagulants | D. Antiaggregants |
| B. Indirect-acting anticoagulants | E. Fibrinolysis inhibitors |
| C. Fibrinolytics | F. Plant origin hemostatics |

Mechanism of action

1. Inhibition of biosynthesis of coagulation system factors in liver.
2. Inhibition of platelet aggregation.
3. Interaction of negative charged drugs with positive charged proteins of blood coagulation system that leads to inhibition of blood coagulation at different phases.
4. Decrease of vascular wall permeability.
5. Activation of fibrinolysis.

6. Inhibition of fibrinolysis due to block of plasminogen activation and plasmin function.

Task 3.

For understanding pharmacological properties and clinical usage of drugs affecting blood coagulation point out for each drug its pharmacological effects, indications, side effects, contraindications and find the logic connections between them describing each drug according to following scheme: drug→pharmacological effects→indications and drug→side effects→contraindications. Fill in the tables.

Table 1.

Drug	Pharmacological effects	Indications
1. Nadroparin		
2. Thrombin		
3. Vicasol		
4. Acenocumarol		
5. Aminocapronic acid		
6. Streptokinase		
7. Acetylsalicylic acid		
8. Heparin ointment		
9. Nettle herb		
10. Calcium chloride		

Table 2.

Drug	Side effects	Contraindications
1. Nadroparin		
2. Thrombin		
3. Vicasol		
4. Acenocumarol		
5. Aminocapronic acid		

6. Streptokinase		
7. Acetylsalicylic acid		
8. Heparin ointment		
9. Nettle herb		
10. Calcium chloride		

Task 4.

Offer the substitution of Nadroparin, Heparin ointment, Phenylin, Aspirin, Dipyridamol, Amicar, Amben, Etamsylate, Ticlid, Streptokinase, Acenocumarol:

A – among the other members of pharmacological group;

B – among the trade marks.

Task 5.

Answer your colleague's questions:

1. Why indirect-acting anticoagulants are incompatible with the salicylates, barbiturates, antiaggregants?
2. What is the reason of bleedings caused by indirect-acting anticoagulants?
3. What pharmacological effects does Heparin have, besides the anticoagulant effect?
4. In what pharmacological group (besides antiaggregants) does Aspirin belong to?
5. What advantage does Vicasol have in comparison to the oil solution of Vitamin K?
6. What is "steal syndrome" caused by Dipyridamol?
7. What drugs (among agents affecting blood coagulation) decrease the lipid content in blood?

Task 6.

Correct the following prescriptions:

1. Rp.: Sincumar 0,4
D.S.: 1 tablet TDS.
#
2. Rp.: Extr. Urticae fluidi 30 ml
D.S.:
#
3. Rp.: Ac. aminocapronici 5%-100 ml
D. t. N 2
S.:

Tests.

Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action.
2. Pharmacological effects → Indications → Dosage.
3. Side effects → Contraindications → Principles of rational administration.

Drugs

- | | |
|------------------|------------------------|
| 1. Fraxyparin | 5. Acenocumarol* |
| 2. Phenindion | 6. Dipyridamol* |
| 3. Streptokinase | 7. Aminocapronic acid* |
| 4. Heparin* | 8. Fibrinolysin |

For agents, marked with asterisk, point out the dosage.

CORRECTORS OF ERYTHROPOIESIS. PHARMACOLOGY OF IRON-CONTAINING DRUGS. LEUKOPOIESIS STIMULANTS.

Topicality of the subject.

Disorders of hemopoiesis take one of the leading places among the others internal diseases. Nowadays there are new data concerning the pathogenesis of hypo- and hyperchromic anemias, leukopenias, leukemias; that's why the number of drugs affecting hemopoiesis increases. The correct usage of information about pharmacological properties of such drugs is the base for effective and safe therapy of hemopoietic disorders.

Theoretical questions.

1. Physiological regulation of iron, cyanocobalamin, folic acid metabolism in the body. The kinds of pathologic disorders of hemopoiesis.
2. The main principles of pharmacotherapy of hemopoietic disorders.
3. The classification, nomenclature and pharmacodynamics of drugs affecting hemopoiesis.
4. The indications, side effects and contraindications.
5. The comparative description of drugs affecting erythro- and leukopoiesis.

Home tasks.

Task 1.

Write the following prescriptions:

1. Cyanocobalamin (Cyanocobalaminum) – sol. f/i 0,01% - 1 ml, amp.
2. Folic acid (Acidum folicum) – tabl. 0.001.
3. Fercoven (Fercovenum) – sol. f/i 5 ml, amp.
4. Ferrum-Lek (Ferrum-Lek) – powd. 0.03.
5. Pentoxyl (Pentoxylum) – tabl. 0.2.
6. Iron lactate (Ferri lactas) – powd. 1.0.

7. Leukogen (Leukogenum) – tabl. 0.02.

Task 2.

Divide the drugs affecting hemopoiesis into drugs for treatment iron-deficiency anemia (A), hyperchromic anemia (B), leukopenia (C), erythremia (D). Match the letters with numbers.

Drugs	
1. Ferroplex	7. Vitohepat
2. Pentoxyl	8. Ferrocal
3. Ferrum-Lek	9. Methyluracil
4. Cyanocobalamin	10. Sodium nucleinate
5. Folic acid	11. Filgrastim
6. Leukogen	12. Sodium phosphate (P ³²)

Class tasks.

Task 1.

Classify the drugs affecting hemopoiesis and fill in the following table:

Stimulation of		Inhibition of	
erythropoiesis	leukopoiesis	erythropoiesis	Leukopoiesis

Drugs			
1. Cyanocobalamin*	15. Methyl-oxymethyluracil		
2. Ethyl-carboxyphenylthiazolidin- acetate	16. Sodium phosphate marked with P ³²		
3. Jectofer	17. Iron saccharate		
4. Riboflavin	18. Tocopherol		
5. Ferroplex	19. Hemofer		
6. Coamid	20. Fercoven		
7. Folic acid*	21. Ferrum-Lek		
8. Filgrastim	22. Ferbitol		

- | | |
|--------------------------|-----------------------|
| 9. Ferro-gradumet | 23. Pyridoxin* |
| 10. Human erythropoietin | 24. Sodium nucleinate |
| 11. Molgramostim | 25. Myelosan |
| 12. Ascorbic acid* | 26. Mercaptopurin |
| 13. Magnesium sulfate | 27. Dopan |
| 14. Copper sulfate | |

Point out the dosage for drugs marked with asterisk.

Task 2.

Divide the drugs affecting hemopoiesis into iron-containing agents (A), colony-stimulating factors (B), erythropoietins (C) and leukopoiesis stimulants (D). Match the letters with numbers.

- | Drugs | |
|---------------------------|-----------------|
| 1. Tardiferon | 5. Ferbitol |
| 2. Epomax | 6. Molgramostim |
| 3. Sodium nucleinate | 7. Hemastimulin |
| 4. Methyl-oxymethyluracyl | |

Task 3.

Learning the mechanism of action of drugs affecting hemopoiesis choose the correct mechanism for each drug. Match letters with numbers.

- | Drugs | |
|-------------------------|---------------------------|
| 1. Human erythropoietin | 6. Iron saccharate |
| 2. Molgramostim | 7. Iron sulfate |
| 3. Cyanocobalamin | 8. Methyl-oxymethyluracyl |
| 4. Mercaptopurin | 9. Pentoxyl |
| 5. Folic acid | 10. Myelosan |

Mechanism of action

1. Stimulation of proliferation and differentiation of blood cells precursors that leads to different groups of leukocytes formation.
2. Inhibition of leukocytes formation.
3. Stimulation of nucleic acid synthesis.
4. Stimulation of hemoglobin synthesis.
5. Participation in nucleic acid synthesis and stimulation of normoblast formation and maturation.
6. Stimulation of proliferation and differentiation of erythrocytes.

Task 4.

Describe the drugs affecting hemopoiesis according to following scheme: drug→pharmacodynamics→indications→side effects→contraindications. Fill in the table. Find the logic connection between the positive and negative effects of drugs and their indications and contraindications.

Drug	Pharmaco-dynamics	Indications	Side effects	Contra-indications
1. Cyanocobalamin				
2. Iron sulfate				
3. Human erythropoietin				
4. Filgrastim				
5. Folic acid				
6. Tardiferon				
7. Methyl-oxymethyluracyl				

Task 5.

Answer the doctor's questions:

1. When is it correctly to administrate the iron-containing drugs: after or before meals?

2. How long does the course of therapy in iron-deficiency anemia last (by iron-containing drugs)?
3. How long must patient administrate the iron-containing drugs after the normalization of blood characteristics? What should be their dosage?
4. Why is cyanocobalamin or folic acid not indicated for treatment of iron-deficiency anemia?
5. What food contains iron?
6. What food or drugs can alter the iron absorption from gastrointestinal tract?
7. What are the symptoms of iron-containing drugs overdose?

Task 6.

Offer the substitution of Iron sulfate, Ferrum-Lek, Cyanocobalamin, Filgrastim, Leukogen:

A – among the other members of pharmacological group;

B – among the trade marks.

Task 7.

Correct the following prescriptions:

1. Rp.: “Ferroplexi” 100,0
 D.S.: 2 tablets in the morning before meals
 #
2. Rp.: Pentoxyli
 D. t. d. N 12 in tab.
 S.: 1 tablet a day during 5-7 days
 #
3. Rp.: Acidi folici 0,01
 D. t. d. N 20 in tab.
 S. 1 tablet three times a day.

Tests.

Describe the drugs using following schemes:

10. Pharmacological group → Interchangeability → Mechanism of action.

11. Pharmacological effects → Indications → Dosage.

12. Side effects → Contraindications → Principles of rational administration.

Drugs

- | | |
|-------------------------|---------------|
| 1. Ferrum-Lek | 5. Folic acid |
| 2. Human erythropoietin | 6. Ferbitol |
| 3. Leukomax | 7. Ferroplex |
| 4. Cyanocobalamin* | 8. Filgrastim |

For agents, marked with asterisk, point out the dosage.

HORMONAL DRUGS OF HYPOTHALAMUS, PITUITARY GLAND, THYROID AND PARATHYROID GLANDS, PANCREAS. ORAL HYPOGLYCEMIC DRUGS.

Topicality of the subject.

Nowadays the number of patients with endocrine disorders increases. The diabetes mellitus, hypothyroidism, hyperthyroidism are the most widespread endocrine diseases. There are many hormonal drugs which are used clinically, that's why it's necessary for pharmacist to know the pharmacology of these drugs.

Theoretical questions.

1. The nomenclature, classification and indications of drugs affecting the production of pituitary gland hormones.
2. The classification and nomenclature of drugs that mimic the activity of pituitary gland hormones.
3. The pharmacodynamics of hormonal drugs of pituitary gland and hypothalamus.
4. The pharmacological effects and indications of thyroidal drugs.
5. The mechanism of antithyroidal drugs action.
6. The indications and side effects of antithyroidal drugs.
7. The parathyroidal drugs. Their pharmacological effects and indications.
8. The classification of insulins (depending on the origin, duration of action, etc.), their mechanism of action, pharmacodynamics and indications.
9. Oral hypoglycemic agents. Classification, nomenclature, mechanism of action.
10. The peculiarities of pharmacodynamics of sulfonylurea derivatives and biguanide derivatives. The indications of oral hypoglycemic drugs.

Home tasks.

Task 1.

Write the following prescriptions:

1. Corticotropin (Corticotropinum) – 1 ml (20U), vial.
2. Pituitrin (Pituitrinum) – 1 ml (5U), vial.
3. Thyroidine (Thyreoidinum) – powd. 0.02, vial.
4. Thiamazol (Thiamazolium) – tabl. 0.005
5. Parathyroidine (Parathyreoidinum) – 1 ml, vial.

Task 2.

Before preparing the report for endocrinologists, please, recollect:

- the structure of pituitary gland and its role in the body;
- the names of hormones which are produced by pituitary gland, thyroid gland, parathyroid glands and pancreas;
- the classification of hormonal drugs.

Class tasks.

Task 1.

Classify the hormonal and antihormonal drugs. Match the letters with numbers.

Pharmacological groups

- A- drugs affecting the secretion of pituitary gland hormones;
- B- hormonal drugs of pituitary gland;
- C- hormonal drugs of thyroid gland;
- D- hormonal drugs of parathyroid glands and agents regulating phosphoric and calcium metabolism;
- E- insulins;
- F- oral hypoglycemic agents;
- G- antithyroidal drugs.

Drugs

- | | | |
|------------------------------------|-------------------------------------|-----------------------|
| 1. Somatoliberin | 11. Glyclaside | 21. Parathyroidine* |
| 2. Somatotropin | 12. Glybenclamide | 22. Bromocriptin |
| 3. Levothyroxine sodium | 13. Thyroidine* | 23. Gonadorelin |
| 4. Calcitonin | 14. Lactin | 24. Lysproinsulin |
| 5. Adiurecrin | 15. Oxytocin* | 25. Amorphous insulin |
| 6. Thyreocomb | 16. Thiamazol* | Zinc suspension |
| 7. Corticotropin* | 17. Dihydrotachisterol | 26. Menopausal |
| 8. Prothyrelin | 18. Danazol | gonadotropin |
| 9. Intermedin | 19. Acarbose | |
| 10. Synthetic salmon
calcitonin | 20. Human insulin for
injections | |

Write the dosage for drugs marked with asterisk. Underline the new drugs.

Task 2.

Divide the following drugs into such groups:

- I. Thyroidal drugs (A - monocomponent agents, B - combined agents);
- II. Antithyroidal drugs;
- III. Oral hypoglycemic drugs (A- sulfonylurea derivatives, B – biguanide derivatives).

Drugs

- | | |
|---------------------|--------------------------|
| 1. Methformine | 6. Glyclaside |
| 2. Propylthiouracyl | 7. Thiamazol |
| 3. Thyreocomb | 8. Glybenclamide |
| 4. Tolbutamide | 9. Buformine |
| 5. Thyroidine | 10. Levothyroxine sodium |

Task 3.

After learning the mechanism of action of hormonal drugs, match the pharmacological groups with their mechanism of action.

Pharmacological groups

- A- Insulins;
- B- Oral hypoglycemic agents (sulfonylurea derivatives);
- C- Oral hypoglycemic agents (biguanide derivatives).

Mechanism of action

1. Stimulation of insulin production by β -cells of Langerhans islands.
2. Participation in carbohydrate metabolism: improvement of glucose utilization by tissues due to increase of cell membrane permeability for glucose.
3. Inhibition of gluconeogenesis in the liver, stimulation of glycolysis in peripheral tissues, increase of the binding to insulin receptors, decrease of the glucose absorption in GIT, inhibition of insulin inactivation.

Task 4.

Choose for each drug its pharmacological effects and indications and describe the drugs according to following scheme: drug \rightarrow pharmacodynamics \rightarrow indications.

Drugs

- | | |
|---------------------------------|-------------------|
| I. Human insulin for injections | VI. Oxytocin |
| II. Methformine | VII. Thiamazol |
| III. Corticotropin | VIII. Thyroidine |
| IV. Danazol | IX. Calcitonin |
| V. Somatotropin | X. Parathyroidine |

Pharmacological effects

1. Inhibition of gonadotropic hormones (follicle-stimulating and luteinizing hormones) secretion.
2. Hypoglycemic effect.
3. Anabolic effect.
4. Anorexigenic effect.
5. Antiallergic effect.
6. Increase of milk production.

7. Fibrinolytic effect.
8. Antiinflammatory effect.
9. Increase of tissue growth and differentiation.
10. Increase of uterine contractions.
11. Immunosuppressive effect.
12. Increase of the functional activity of nervous and cardiovascular systems.
13. Inhibition of thyroid gland activity.
14. Increase of phosphorus and calcium concentration in blood.
15. Increase of phosphorus and calcium content in bones.
16. Inhibition of basal metabolism.

Indications

- | | |
|----------------------------------|---|
| A. Hypophysis dwarfism | K. Osteoporosis |
| B. Insulin-independent diabetes | L. Endometriosis |
| C. Postnatal uterine bleedings | M. Spasmophilia |
| D. Hyperglycemic coma | N. Hypercalcemia |
| E. Labor induction | O. Tetany |
| F. Insulin-dependent diabetes | P. First type diabetes combined with obesity |
| G. Hypogalactia | Q. Secondary hypofunction of the adrenal gland cortex |
| H. Hypothyroidism | |
| I. Hyperthyroidism | |
| J. Benign tumor of mammary gland | |

Task 5.

Answer the questions:

1. What drug is used for diagnostics of endocrinopathies?
2. What is the principle of rational administration for Corticotropin avoiding the “abolition” syndrome?
3. What drugs have to be used together with Insulin for decrease of insulin dose?
4. What Thyroidine side effects are dangerous for patient’s life?
5. Give the pharmacological description of Lactin, Acarbose, Pituitrin, Isodibute.

Task 6.

Offer the substitution of Gonadotropin menopausal, Danazol, Thiamazol, Calcitonin, Human insulin for injections, Tolbutamide:

A – among the other members of the pharmacological group;

B – among the trade marks.

Task 7.

Correct the following prescriptions:

1. Rp.: Thyreoidini 0,5
D.S. 1 tablet 3 times a day
#
2. Rp.: Insulinum 10 ml
D.t.d. N 5 in flaconis
S. To introduce s/c.
#
3. Rp.: Tab. Mercazolili 0,05
D.S. 1 tablet a day.
#
4. Rp.: Methformini 0,005
D.t.d. N 100
S. As always

Tests.

Describe the drugs using following schemes:

1. Pharmacological group – Interchangeability – Mechanism of action.
2. Pharmacological effects – Indications – Dosage.*
3. Side effects – Contraindications – Principles of rational administration.

Drugs

1. Glybenclamide*
2. Human insulin for injections
3. Thyreoidine
4. Thiamazol
5. Oxytocin
6. Methformine
7. Menopausal gonadotropin
8. Somatoliberin

For agents, marked with asterisk, point out the dosage.

HORMONAL DRUGS OF ADRENAL GLAND CORTEX AND GONADS. ANABOLIC STEROIDS. CONTRACEPTIVES. DRUGS AFFECTING MYOMETRIUM (UTEROTONICS AND UTEROLYTICS).

Topicality of the subject.

There are great number of inflammatory and allergic diseases that are treated using the hormonal drugs of adrenal gland cortex. Their immunosuppressive effect is useful for transplantation of organs. The usage of hormonal drugs of gonads results in sterility treatment and contraception.

Theoretical questions.

1. The classification and nomenclature of hormonal drugs of adrenal gland cortex.
2. What pharmacological effects and mechanism of action results in usage of glucocorticoids for:
 - treatment of inflammatory diseases;
 - treatment of allergic reactions;
 - transplantation of tissues and organs;
 - treatment of shock.
3. The indications and side effects of gluco- and mineralcorticoids.
4. The classification and mechanism of action of drugs with activity of female sex hormones.
5. The differences between pharmacodynamics of estrogens and gestogens.
6. The indications and side effects of drugs of female sex hormones.
7. The pharmacological description of contraceptives.
8. Drugs affecting myometrium (classification, mechanism of action, pharmacodynamics, indications, side effects, contraindications).
9. The pharmacological description of anabolics and androgens. The differences and similarities between androgens and anabolics.

Home tasks.

Task 1.

Write the following prescriptions:

1. Prednisolon (Prednisolonum) – tabl. 0.005.
2. Hydrocortison (Hydrocortisonum) – sol. f/i 2.5% - 5 ml, vial.
3. Locacorten (Locacortenum) – oint. 0.02% - 15.0.
4. Dexamethason (Dexamethasonum) – tabl. 0.005.
5. Estron (Oestronum) – oil sol. f/i 0,1% - 1 ml, amp.
6. Testosteron propionate (Testosteroni propionas) – sol. f/i 1% - 1 ml, amp.

Task 2.

Answer the questions:

1. What is the reason of death in case of adrenal cortex excision (adrenectomy)?
2. What is the classification of female sex hormones? What are their physiological functions in the body?

Task 3.

Divide the following hormonal drugs into: hormonal drugs of adrenal cortex (A); female sex hormones (B); drugs affecting the myometrium (C).

Drugs

- | | |
|-----------------|-----------------------|
| 1. Oxytocin | 10. Dexamethason |
| 2. Betamethason | 11. Triamcinolon |
| 3. Prednisolon | 12. Estron |
| 4. Progesteron | 13. Phenoterol |
| 5. Pregnin | 14. Pituitrin |
| 6. Hexoprenalin | 15. Testenate |
| 7. Dinoprost | 16. Estradiol |
| 8. Ergotamin | 17. Allylestrenol |
| 9. Synestrol | 18. Methyltestosteron |

Task 4.

Choose for each group of hormonal drugs the pharmacological effects. Match letters with numbers.

Pharmacological groups

- A. Hormonal drugs of adrenal gland cortex.
- B. Hormonal drugs of estrogens.
- C. Hormonal drugs of gestagens.
- D. Hormonal drugs of androgens.

Pharmacological effects

- 1. Inhibition of proliferation of connective tissue and T-lymphocytes.
- 2. Uterotonic effect.
- 3. Inhibition of ovulation.
- 4. Retention of sodium ions and water; elimination of potassium ions from the body.
- 5. Uterolityc effect.
- 6. Androgenic effect.
- 7. Estrogenic effect.
- 8. Gestagenic effect.
- 9. Decrease of vascular permeability.
- 10. Increase of vascular sensitivity to adrenaline.
- 11. Antiinflammatory effect.
- 12. Stimulation of protein synthesis.
- 13. Immunosuppressive effect.
- 14. Antitoxic effect.
- 15. Antishock effect.

Class tasks.

Task 1.

Classify the hormonal drugs. Match the letters with numbers.

Pharmacological groups

- A. Hormonal drugs of female sex hormones:
 - a. gestagens;
 - b. estrogens.
- B. Hormonal drugs of male sex hormones (androgens);
- C. Anabolic steroids.
- D. Hormonal drugs of adrenal corticosteroids:
 - a. glucocorticoids;
 - b. mineralcorticoids.

Underline the new drugs. Point out the dosage for drugs marked with asterisk.

Drugs

- | | |
|--------------------------------|--------------------------|
| 1. Ethynylestradiol | 15. Estron |
| 2. Testosteron propionate* | 16. Methylandrosterndiol |
| 3. Silabolin | 17. Hydrocortison |
| 4. Budesonid | 18. Methyltestosteron |
| 5. Desoxicorticosteron acetate | 19. Dimestrol |
| 6. Dexamethason | 20. Nadrolon decanoate |
| 7. Allylestrenol | 21. Estriol |
| 8. Tetrasteron | 22. Testenate |
| 9. Pregnin | 23. Flunisolid |
| 10. Prednisolon* | 24. Acetomepregenol |
| 11. Triamcinolon | 25. Norethysteron |
| 12. Synestrol | 26. Phenobolin |
| 13. Progesteron* | 27. Betamethason |
| 14. Beclomethason | 28. Methandrostenolon |

Task 2.

Classify the contraceptives into following groups:

- A – monophasic combined estrogen–gestagen agents;
- B – diphasic combined estrogen–gestagen agents;
- C – triphasic combined estrogen–gestagen agents;
- D – microdoses of gestagens;
- E – postcoital agents;
- G – vaginal contraceptives (spermicidal agents).

Match the names of groups (letters) with names of drugs (numbers).

Drugs

- | | |
|--------------------------------|---------------------------|
| 1. Continuin | 10. Norgestrel |
| 2. Tri-regol | 11. Triquilar |
| 3. Anteovin | 12. Milvane |
| 4. Postinor | 13. Phemoden |
| 5. Nonoxinol | 14. Benzalkonium chloride |
| 6. Microlute | 15. Minizistone |
| 7. Medroxyprogesterone acetate | 16. Diane–35 |
| 8. Levonorgestrel | 17. Non–Ovlon |
| 9. Marvelone | 18. Rigevidone |

Pay the attention on mechanism of action of different groups of contraceptives.

Match the names of drugs (arabic numerals) with their mechanism of action (roman numerals).

Mechanism of action

- I. Inhibition of the hypothalamus–hypophysis system (inhibition of FSH, LH production).
- II. Damage of the spermatozoon`s cell membrane resulting in fragmentation and death of spermatozoons.

- III. Change of the normal secretory phase of the menstrual cycle; induction of the temporary atrophic changes in the ovaries.
- IV. Decrease of the cervical mucosa production and change of its physical and chemical properties; inhibition of endometrium proliferation; inhibition of the uterine tubes motility.
- V. Inhibition of the of FSH, LH production; suppression of the ovulation; increase of the cervical mucosa viscosity; interruption of the fetal ovum implantation; prevention of the spermatozoons movement.

Task 3.

Divide the drugs affecting myometrium into uterotonics (A) and uterolytics (B). Match the letters with numbers. Point out the dosage for agents marked by asterisk.

Drugs

- | | |
|--------------------------|----------------------------|
| 1. Oxytocin* | 10. Gynepral |
| 2. Phenoterol* | 11. Ergotal |
| 3. Turinal | 12. Methyloxytocin |
| 4. Cotarnine chloride | 13. Prostenon |
| 5. Estron | 14. Salbupart |
| 6. Shepherd`s purse herb | 15. Ritodrin |
| 7. Pituitrin | 16. Dinoproston* |
| 8. Dinoprost | 17. Estradiol dipropionate |
| 9. Sigetin | |

Task 4.

Learning the pharmacological properties of estrogens match their pharmacological effects with indications and contraindications.

Pharmacological effects

- 1. Proliferation of endometrium.
- 2. Stimulation of uterus and secondary sexual characters development.

3. Stimulation of uterine contractions.
4. Dilation of brain and peripheral blood vessels.
5. Decrease of smooth muscles tone.
6. Proliferation of gastric and intestinal mucous membrane.
7. Inhibition of gonadotropic hormones secretion.

Indications

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Sterility. 2. Infantilism. 3. Climacteric period. 4. Spasm of peripheral blood vessels. 5. Hypoplasia of mammary glands. | <ol style="list-style-type: none"> 6. Inhibition of lactation. 7. Hormone-dependent tumors of male reproductive system and female reproductive system among the elderly women (after menopause). 8. Peptic ulcer. 9. Cholecystitis (gallbladder inflammation). 10. Labor induction. |
|---|--|

Contraindications

1. Uterine bleeding.
2. Predisposition to malignant tumors.
3. Pregnancy.

Task 5.

Chose for hormonal drugs of androgens (A), mineralcorticoids (B); anabolic steroids (C) their pharmacological effects. Match letters with numbers.

Pharmacological effects

1. Causing of the positive nitrogen balance.
2. Increase of the protein content in organs and tissues.
3. Development of secondary male sexual characters.
4. Vasodilatation.
5. Stimulation of spermatogenesis.

6. Suppression of tumor growth in female reproductive system (among young women).
7. Improvement of myocardial trophism.
8. Retention of sodium ions and water in the body.
9. Increase of skeletal muscles tone.
10. Hypopotassemia.

Task 6.

Learning the pharmacodynamics of glucocorticoids divide the pharmacological effects of these drugs into positive (therapeutic) (A) and negative (side) (B). Match the letters with numbers.

Pharmacological effects

- | | |
|--|---|
| 1. Anti-inflammatory effect. | 7. Mental disorders (euphoria, hallucinations). |
| 2. Ulcerogenic effect. | 8. Immunosuppressive effect. |
| 3. Disorders of water-salt metabolism. | 9. Exacerbation of chronic infectious disease. |
| 4. Antiallergic effect. | 10. Antitoxic effect. |
| 5. Inhibition of ACTH secretion. | 11. Hyperglycemia. |
| 6. Antishock effect. | 12. Increase of BP. |

Task 7.

Choose for glucocorticoids (A), mineralcorticoids (B), androgens (C), anabolic steroids (D) their indications. Match letters with numbers.

Indications

- | | |
|---------------------------|--------------------------------|
| 1. Rheumatoid arthritis. | 8. Hypoadrenocorticism. |
| 2. Impotency. | 9. Myasthenia. |
| 3. Dystrophy, cachexia. | 10. Transplantation of organs. |
| 4. Myocardial infarction. | 11. Acute leukemia. |

- | | |
|---|---|
| 5. Tumors of mammary gland (among young women). | 12. Addison's disease (chronic adrenocortical insufficiency). |
| 6. Shock. | 13. Male sterility. |
| 7. Bronchial asthma. | 14. Chronic infections. |

Task 8.

Preparing the report about side effects of contraceptives divide them into estrogen– dependent (A) and gestagen–dependent (B) ones. Match letters with numbers.

Side effects

- | | |
|------------------------------|---------------------------------|
| 1. Headache. | 6. Nausea, vomiting. |
| 2. Increase of body weight. | 7. Gastro-intestinal disorders. |
| 3. Depression. | 8. Hypertension. |
| 4. Thrombophlebitis. | 9. Libido decrease. |
| 5. Intermenstrual bleedings. | |

Answer the question: Why are contraceptives incompatible with laxatives, activated charcoal, inductors of microsomal liver enzymes?

Task 9.

Offer the substitution for Benzalkonium chloride, Rigevidone, Masipredone, Hydrocortison, Oxytocin, Pregnin, Tetrasteron, Nadrolon decanoate, Dinoprost, Partusisten:

A – among the other members of pharmacological group;

B – among the trade marks.

Task 10.

Recommend for the patient the correct dosing regimen for each drug. Match letters with numbers.

Drugs

- | | |
|----------------------|----------------------|
| 1. Norplant | 4. Phenabolin |
| 2. Depo-Provera | 5. Retabolil |
| 3. Methandrostenolon | 6. Methandrostendiol |

Dosing regimens

1. Before meals.
2. After meals.
3. Subcutaneously in forearm for 5 years.
4. Intramuscularly 1 time every three months.
5. Subcutaneously 1 time a month.
6. Intramuscularly 1 time every 7-15 days.
7. Intramuscularly 1 time every 2-3 weeks.
8. 1 tablet 3 times a day orally.
9. 1 tablet 2 times a day sublingually.

Task 11.

Answer the doctor's questions:

1. Why are Fenoterol with calcium-containing drugs and vitamin D; estrogens with indirect- acting anticoagulants; Prednisolon with anticoagulants and salicylates incompatible?
2. What are the chronopharmacological peculiarities of glucocorticoids dosing?
3. Why does danger occur in such cases:
 - A. Uncontrolled administration of glucocorticoids;
 - B. Long-term administration of anabolic steroids;
 - C. Abrupt discontinuation of glucocorticoid therapy;
 - D. Administration of estrogens for abortion?

Task 12.

Correct the following prescriptions:

1. Rp.: Testosteroni propionates 1% - 1 ml

D.S.: I/m.

#

2. Rp.: Oxytocini 1 ml

D. t. d. N 10 in amp.

S.: I/v

#

3. Rp.: Progesteroni oleosae 5% - 1 ml

D. t. d. N 10 in amp.

S. I/v.

Tests.

Describe the drugs using following schemes:

4. Pharmacological group → Interchangeability → Mechanism of action.
5. Pharmacological effects → Indications → Dosage.
6. Side effects → Contraindications → Principles of rational administration.

Drugs

- | | |
|----------------------------|---------------|
| 1. Retabolil | 6. Oxytocin* |
| 2. Testosteron propionate* | 7. Phenoterol |
| 3. Allylestrenol | 8. Tri-regol |
| 4. Progesteron* | 9. Ovidone |
| 5. Estron | 10. Anteovin |

For agents, marked with asterisk, point out the dosage.

Submodule 6 Chemotherapeutic drugs.

ANTIBIOTICS: PENICILLINS, CEPHALOSPORINS, CARBAPENEMS, MONOBACTAMS, MACROLIDES, TETRACYCLINES.

Topicality of the subject

Even now infectious diseases occupy a leading position in human pathology. In this connection from year to year the arsenal of antibiotics that effectively suppress the infectious process are increased. According to WHO, antibiotics take first place in the world for mass use. The widespread use of antibiotics in medicine requires from the pharmacist deep knowledge of their mechanism and antibacterial spectrum, in creative collaboration with a physician will provide efficacy and safety of antibiotic treatment.

Theoretical questions

1. Classification and the rational use of antibiotics.
2. Routes of administration of antibiotics.
3. Requirements to antibiotics.
4. The group of penicillin antibiotics – natural and semi-synthetic. Classification and the mechanism of action of penicillins.
5. The spectrum and the type of antimicrobial action of penicillins.
6. Pharmacodynamics and indications of penicillins, side effects and measures to prevent them.
7. Classification and the mechanism, the spectrum and the type of antimicrobial action of cephalosporins.
8. Pharmacodynamics and indications of cephalosporins, side effects and measures to prevent them.
9. Classification and the mechanism, the spectrum and the type of antimicrobial action of carbapenems and monobactams.

10. Pharmacodynamics and indications of carbapenems and monobactams, side effects and measures to prevent them.
11. Classification and the mechanism, the spectrum and the type of antimicrobial action of tetracyclins.
12. Pharmacodynamics and indications of tetracyclins, side effects and measures to prevent them.
13. Classification and the mechanism, the spectrum and the type of antimicrobial action of macrolides and azalides.
14. Pharmacodynamics and indications of macrolides and azalides, side effects and measures to prevent them.
15. The mechanism, and the spectrum of action of antifungal antibiotics.
16. Indications of antifungal antibiotics.

Home tasks

Task 1.

Write the following prescriptions:

1. Benzylpenicillin sodium salts (Benzylpenicillinum natrium) pwd. for inj. 1000000 U
2. Tienam (Tienam) pwd. for inj. 0.5
3. Cephazolin(Cephazolinum) pwd. for inj. 0.5
4. Roxythromycine (Roxythromycin) tabl. 0.1
5. Tetracycline(Tetracylinum) eyes ointmant 3%
6. Erythromycine (Erythromycinum) tabl. 0.25
7. Doxycycline (Doxycycline hydrochloridum) caps. 0.1
8. Ampicillin (Ampicillinum) tabl. 0.5
9. Nistatin (nistatinum) tabl. 500000 U

Task 2.

Preparing the information for therapists about the antibiotics of the following group: penicillins, cephalosporins, carbapenems and monobactams, tetracyclins,

macrolides and azalides. Fill in the table, use “+” if the corresponding index is present.

The group of antibiotics	The spectrum of antimicrobial action			The type of antimicrobial action	
	broad	moderate	narrow	Bactericidal	Bacteriostatic
Amoxicillin					
Cephazolin					
Tetracycline					
Tienam					
Aztreonam					
Azythromycine					
Cephtriaxone					

Task 3.

Upon the sale of drugs answer to the patient’s questions:

1. Why pregnant women shouldn’t be used tetracyclines?
2. How to prevent the development of dysbiosis while taking antibiotics with a broad-spectrum of action?
3. Why is unacceptable introduction of penicillin less 4 times a day?
4. Can be use semi-syntetic penicillins, if the natural one occur nettle-rash?
5. Explained to the mother why the penicillins and cephalosporins are most often used in pediatric practice?
6. Explain to the patient receiving tablets of tetracycline, what has caused the emergence of loss an appetite, nausea, vomiting, bloating, diarrhea?

Class tasks

Task 1.

Classify the antibiotic drugs. Match the letters with numbers. Point out the dosage for drugs marked with asterisk.

Pharmacological groups

- | | |
|--|----------------------------------|
| <i>A. Natural penicillins</i> | <i>F. Tetracyclins</i> |
| <i>B. Aminopenicillins</i> | <i>G. Cephalosporins</i> |
| <i>C. Antistaphylococcal penicillins</i> | <i>H. Macrolides</i> |
| <i>D. Antipseudomonal penicillins</i> | <i>I. Azalides</i> |
| <i>E. Monobactams</i> | <i>J. Carbapenems</i> |
| | <i>K. Antifungal antibiotics</i> |

Drugs

- | | |
|----------------------------------|--------------------|
| 1. Benzylpenicillin sodium salts | 16. Methacycline |
| 2. Oxacillin sodium salts | 17. Amphotericin B |
| 3. Dicloxacillin | 18. Levorine |
| 4. Bicillin-1 | 19. Tienam* |
| 5. Tetracycline* | 20. Doxycycline |
| 6. Bicillin-5 | 21. Azlocillin |
| 7. Phenoxymethylpenicillin | 22. Cefuroxime |
| 8. Cephepim | 23. Cefotaxime |
| 9. Aztreonam | 24. Azithromycin |
| 10. Amoxiclav* | 25. Ceftriaxone |
| 11. Ampicillin | 26. Roxithromycin |
| 12. Amoxicillin | 27. Spiramycin |
| 13. Cephazolin | 28. Midecamycin |
| 14. Carbenicillin | 29. Piperacillin |
| 15. Cefpirom | 30. Cephaclo |

Task 2.

Learning the mechanism of different groups of antibiotic, match the letters (mechanism of action) with numbers (names of antibiotic group).

The group of antibiotic

A. *Penicillins*

B. *Cephalosporins*

C. *Tetracyclins*

D. *Macrolides*

L. *Azalides*

M. *Monobactams*

N. *Carbapenems*

O. *Antifungal antibiotics*

Mechanism of action

1. Inhibitors of synthesis of a microbic wall components.
2. Inhibitors of protein synthesis.
3. Inhibitors of cytoplasmatic membrane permeability.

Task 3.

Prepare the information material for doctors on the theme: “Pharmacological characteristic of β -lactams, macrolides and tetracyclines”, fill in the table:

Pharmacological characteristic	Penicillins			Cephalosporins		Tetracyclines		Carbapenems	Mono-bactams	Macrolides	
	Benzylpenicillin sodium salts	Phenoxymethylpenicillin	Bicillin-5	Cephalaxim	Cephtriaxone	Tetracycline	Doxycycline	Tienam	Aztreonam	Erythromycine	Roxythromycine

1. single dose for adults.
2. resistance to penicillinase
3. the acid resistance

4. the route of administration
5. regimen of use
6. duration of use
7. ability to penetrate through the BBB
8. ability to penetrate through the placenta

Task 4.

Consult managers who access you to connection with the purchase of antibioticson on the following questions:

1. The difference between the spectrum of antimicrobial activity of natural penicillins from aminopenicillins, antistaphylococcal and antipseudomonal.
2. The difference between the spectrum of action of IV-generation of cephalosporins from each other.
3. The advantages of semi-synthetic macrolides in comparison with erythromycin.
4. Features of the spectrum of antimicrobial action of tetracyclines.
5. The difference between the spectrum of action of azalides from monobactams and carbapenems.

Task 5.

Match the names of medicines with their indications.

Drugs

- | | |
|----------------------------------|------------------|
| 1. Benzylpenicillin sodium salts | 8. Azlocillin |
| 2. Erythromycine | 9. Spiramycine |
| 3. Doxycycline | 10.Cefotaxime |
| 4. Aztreonam | 11.Cephopirasone |
| 5. Ampicillin | 12.Nistatin |
| 6. Amoxicillin | 13.Cloxacillin |
| 7. Tienam | 14.Azythromycine |
| | 15.Bicillin-1 |

Indications

- | | |
|--|-----------------------|
| A. prevention of infections after surgery | H. legionelas disease |
| B. blue pus (pseudomonal) infection | I. meningitis |
| C. candidomycoses of the skin and mucous | J. sepsis |
| D. peptic ulcer disease | K. rickettsioses |
| E. infections caused by <i>Staphylococci</i> | L. syphilis |
| F. diphtheria | M. brucellosis |
| G. lymphadenitis granulematous, trachoma | N. dysentery |
| | O. rheumathism |

Task 6.

Preparing the information for doctors about the antifungal antibiotics. Fill in the table.

Fungous diseases	Antibiotics	Mechanism of action	Routes of administration
candidomycoses of the soft tissues			
dermatomycoses			
General mycoses			

Task 7.

Choose side effects for penicillins (A), cephalosporins (B), tetracyclins (C). Match letters with numbers.

Side effects:

1. Allergic reaction
2. Photodermatitis
3. Dispeptices disorders
4. Hepatotoxicity
5. Nephrotoxicity
6. Neurotoxicity

7. Disbacteriosis, superinfections
8. Toxicity action to the blood system
9. Teratogenicity
10. Anti-anabolic action (decrease of the body weight, increase the excretion of azot with the urine)
11. Pain on intramuscular administration, the occurrence of phlebitis, thrombophlebitis when injected into a vein)

Task 8.

After learning the contraindications of penicillins, cephalosporins, tetracyclins, macrolides match their names with their contraindications:

Antibiotics:

- | | |
|-------------------|-----------------|
| 1. Penicillins | 3. Tetracyclins |
| 2. Cephalosporins | 4. Macrolides |

Contraindications:

1. allergic reaction to β -lactams
2. age under 8
3. disfunction of the kidneys
4. pregnancy, lactation
5. severe diseases of the liver

Task 9.

Answer patient's questions:

1. Which antibiotics have postantibiotic effect?
2. What are the differences between cephalosporins of different generations?
3. What are the main general side effects for antibiotic therapy?
4. What is the differences between Tienam and Meronem?
5. What are the main principles of correct antibiotic therapy?
6. What group of antibiotic provoked convulsions?
7. What mechanism of action is connected preferably to bacteriostatic and bacteriocidal effects?

8. What antibiotics are used for treatment syphilis?
9. Why in case of allergy to penicillins patient may have allergy to cephalosporins?
10. What antibiotics are traditionally widely used in pediatrics? Why?

Task 10.

Correct the following prescriptions:

1. Rp.: tab. "Amoxiclav" №15
D.S.: 1 tablet 6 times a day
#
2. Rp.: Tetracyclini
D.t.d. №15
S.: 1 tabl. 6 times a day
#
3. Rp.: Cephazolini
D.t.d. №9
S.:

Tests

Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action.
2. Spectrum of action → Type of action → Indications.
3. Side effects → Contraindications → Rules of rational administration.

Drugs.

- | | |
|-------------------|---------------|
| 1. Amoxicillin* | 4. Tienam* |
| 2. Roxythromycine | 5. Cefotaxime |
| 3. Nistatin | |

For agents, marked with asterisk, point out the dosage.

**ANTIBIOTICS OF DIFFERENT GROUPS: AMINOGLYCOSIDES,
GLYCOPEPTIDES, LINCOSAMIDES, PHOSPHOMYCINES, FUSIDINES,
POLYMYXINES, CHLORAMPHENICOLS, RIFAMYCINES.**

FLUOROQUINOLONES

Topicality of the subject

The widespread use of antibiotics in medicine requires from the pharmacist deep knowledge of their mechanism and antibacterial spectrum, in creative collaboration with a physician will provide efficacy and safety of antibiotic treatment.

Theoretical questions

1. Classification and nomenclature, mechanism, spectrum and the type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of aminoglycosides.
2. Classification and nomenclature, mechanism, spectrum and the type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of glycopeptides.
3. Classification and nomenclature, mechanism, spectrum and the type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of lincosamides.
4. Classification and nomenclature, mechanism, spectrum and the type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of phosphomycines.
5. Classification and nomenclature, mechanism, spectrum and type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of fusidines.
6. Classification and nomenclature, mechanism, spectrum and type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of polymyxines.

7. Classification and nomenclature, mechanism, spectrum and type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of chloramphenicols.
8. Classification and nomenclature, mechanism, spectrum and type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of rifamycines.
9. Classification and nomenclature, mechanism, spectrum and type of action, pharmacodynamics, indications, side effects, contraindications and medicinal forms of fluoroquinolones.
10. Rational combinations of those antibiotics.

Home tasks

Task 1.

Write the following prescriptions:

1. Levomycetine (Laevomycetinm) tabl. 0.5, sol. 3 %
2. Gentamycine (Gentamycini sulfas) 4% - 2 ml in amp.
3. Streptomycine (Streptomycini sulfas) pwd. for inj. 0.5
4. Polymyxine B sulphate (Polymyxini B sulphas) pwd. for inj. 0.05
5. Amycacine (Amycacin sulfate) sol. for inj. 5 %
6. Lincomycine (Lincomycini hydrochloridum) sol. for inj. 30 %
7. Rifampicine (Rifampicinum) caps. 0.6
8. Cyprofloxacin (Cyprofloxacin) tabl. 0.25

Task 2.

Prepare the information for doctors about antibiotics. Fill the table.

Pharmaceutical characteristics	Aminoglycosides	Polymyxines	Chloramphenicols	Fluoroquinolones
the spectrum of antimicro-				

bal action				
the type of antimicrobial action				
Absorption from gastrointestinal tract				
ability to penetrate through the placenta				
ability to penetrate through the BBB				

Task 3.

Distribute the antibiotics over the spectrum of action. Fill in the table.

Drugs are active against G ⁺ microorganisms and G ⁻ cocci		Drugs with a broad spectrum of action	
bactericidal action	bacteriostatic action	bactericidal action	bacteriostatic action

Class tasks

Task 1.

Classify the antibiotics into following groups:

- A. Aminoglycosides
- B. Chloramphenicols
- C. Glycopeptides
- D. Fluoroquinolones
- E. Antibiotics of different group

Drugs

- | | |
|-------------------------------|---------------------------|
| 1. Neomycine | 12. Norfloxacin |
| 2. Syntomycine | 13. Rifampicin |
| 3. Fusidine natrium | 14. Ristomycina sulfas |
| 4. Chloramphenicol* | 15. Vancomycine |
| 5. Clindamycine | 16. Amycacine |
| 6. Lomefloxacin | 17. Ofloxacin |
| 7. Canamycine | 18. Gentamycine |
| 8. Pefloxacin | 19. Polymyxine B sulphate |
| 9. Gramycidine | 20. Cyprofloxacin |
| 10. Lincomicina hydrochloride | 21. Streptomycine |
| 11. Tobramycine | 22. Netilmycine |

Task 2.

Learning the mechanism of action antibiotics of different group match the letters (mechanism of action) with numbers (names of group).

Group of antibiotics

- | | |
|---------------------|---------------------|
| 1. Aminoglycosides | 4. Glycopeptides |
| 2. Lincosamides | 5. Fluoroquinolones |
| 3. Chloramphenicols | 6. Polymyxines |

Mechanism of action:

- A. Antibiotics disturb the synthesis of bacterial proteins
- B. Antibiotics break the structure and function of cytoplasmic membranes
- C. Antibiotics suppress the synthesis of the cellular wall peptidoglycane
- D. Antibiotics inhibit DNA-gyrase (topoisomerase) of bacteria and it leads to disturbance of biosynthesis of DNA, RNA.

Task 3.

Point out the spectrum and the type of action with antibiotics.

Antibiotics

1. Aminoglicosides
2. Lincosamides
3. Chloramphenicols
4. Rifampicine

5. Glycopeptides
6. Fluoroquinolones
7. Polymyxines
8. Fusidine

The spectrum of action

- A. – broad
- B. – narrow
- C. – moderate

The type of antimicrobial action

- a). bactericidal
- b). bacteriostatic

Task 4.

Match the names of medicines with their indications.

Antibiotics

1. Aminoglicosides
2. Lincosamides
3. Chloramphenicols
4. Rifampicine

5. Glycopeptides
6. Fluoroquinolones
7. Polymyxines
8. Fusidine

Indications

- | | |
|-------------------------------------|--------------------------|
| 1. Pseudomembranous colitis | 7. intestinal infections |
| 2. Pseudomonas infection | 8. tuberculoses |
| 3. infections of skin, soft tissues | 9. osteomyelitis |
| 4. abdominal and pelvis infections | 10.sepsis |
| 5. severe wound infections | 11.typhoid fever |
| 6. staphylococcal infections | 12.rickettsioses |
| | 13.meningitis |

Task 5.

Answer your college's questions:

Task 6.

Tell your colleague about side effects of antibiotics. Match the most characteristic side effects using «+». Point out antibiotics with side effects.

Antibiotics	allergic reactions	inhibition of renal function	inhibition of hematopoiesis	inhibition of VIII pairs of cranial nerves	dysbiosis, superinfection	teratogenicity	non-depolarizing effect	Neurotoxicity	dysplasia of cartilage tissue among children	pseudomembranous colitis
Aminoglicosides										
Chloramphenicol										
Polymyxines										
Fluoroquinolones										
Lincosamides										

Contraindications

- A. allergic reactions
- B. pathogen resistance
- C. inhibition of VIII pairs of cranial
- D. miasthenia
- E. pregnancy
- F. dysfunction of the kidneys
- G. inhibition of hematopoiesis
- H. dysfunction of the liver
- I. psoriasis, eczema
- J. simultaneous use with nephrotoxic drugs
- K. first months of life
- L. age under 8
- M. lactation
- N. age under 16

Task 7.

Analyze the combinations of antibiotics that are represented in sheets of appointments: the rational (A) or irrational (B).

1. Penicillins+Streptomycine
2. Streptomycine+Canamycine
3. Carbenicillin+Gentamycine
4. Cephalosporins+ Aminoglicosides
5. Levomycetine+ Gentamycine
6. Levomycetine+Sulphanilamides

Task 8.

Correct the following prescriptions:

1. Rp.: Gentamycini sulfatis – 2 ml

D.t.d. №20 in amp.

S.: i/m

#

2. Rp.: Levomycetini

D.t.d. №6 in tab.

S.

#

3. Rp.: Ristomycini sulfatis 500000 ED

D.t.d. №5 in amp.

S.: i/m

#

4. Rp.: Ciprofloxacini

D.t.d. №20 in tab.

S.

#

5. Rp.: Rifampicini

D.t.d. №30

S.

Tests

Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action → Spectrum of action.
2. Pharmacological effects → Type of action → Indications → Dosage.
3. Side effects → Contraindications → Rules of rational administration.

Drugs.

- | | |
|---------------------|-----------------|
| 1. Ampicillin* | 5. Cephasoline* |
| 2. Tetracycline* | 6. Norfloxacin |
| 3. Chloramphenicol* | 7. Polymyxine |
| 4. Erythromycine | 8. Lincomicine |

For agents, marked with asterisk, point out the dosage.

SULFONAMIDES. ANTITUBERCULOUS MEDICINES

Topicality of the subject

Sulfonamides are the oldest group of chemotherapeutic agents used clinically. Now sulfonamides are still widely used for treatment different infections. But they may cause serious side effects. That's why it's important to know the pharmacology of sulfonamides.

The tuberculosis is one of the most dangerous infectious diseases, because of its contagiousity. It's necessary to know the principles of effective therapy of tuberculosis.

Theoretical questions

1. Classification and nomenclature of sulfonamides.
2. Pharmacokinetics of sulfonamides.
3. Mechanism and type of action of sulfonamides. What does type of action depend on?
4. Pharmacodynamics of different groups of sulfonamides.
5. Spectrum of action and indications of sulfonamides.
6. Side effects, contraindications, principles of rational administration of sulfonamides.

Home tasks

Task 1.

Write the following prescriptions:

1. Sulfacetamide (Sulfacetamidum) – sol. 30% - 10 ml, eye drops.
2. Streptocide (Streptocidum) – lin. 10% - 50.0.
3. Sulfalen (Sulfalenum) – tabl. 0.2.
4. Streptomycin sulfate (Streptomycini sulfas) – tabl. 0.2.
5. Rifampicin (Rifampicinum) – caps. 0.15.

6. Co-trimoxazole (Co-trimoxazolium) – tabl. N 20.
7. Ethambutol (Ethambutolum) – tabl. 0.1.

Task 2.

Answer your colleague's questions:

1. Name the resorbative-acting sulfonamides.
2. What sulfonamides are used for treatment of GIT infections?
3. What sulfonamides are used for treatment of urinary tract infections?
4. Why does Co-trimoxazole have bactericidal effect?
5. What is difference between the drugs for tuberculosis treatment of first- and second- line therapy?
6. What are principles of tuberculosis treatment?

Class tasks

Task 1.

Divide the following drugs into sulfonamides (A) and agents for treatment tuberculosis (B). What agents belong to “first line” (I) and “second line” (II) therapy of tuberculosis? For agents, marked with asterisk, point out the dosage. Underline the new drugs.

Drugs.

- | | |
|--------------------|--------------------|
| 1. Ethionamide | 13. Bactrim* |
| 2. Isoniasid | 14. Saluzid |
| 3. Salazopiridazin | 15. Prothionamide |
| 4. Ethazol | 16. Pirazinamide |
| 5. Cycloserine* | 17. Ethambutol |
| 6. Phthalazol* | 18. Urosulfan |
| 7. Sulfadimetoxin | 19. Sulfaguanidine |
| 8. Streptomycin | 20. Lidaprim |
| 9. Rifampin | 21. Mafenide* |

- | | |
|-------------------|-------------------------|
| 10. Pasomycin | 22. Algimafe |
| 11. Sulfacetamide | 23. Silver sulfadiazine |
| 12. Sulfatone | 24. Capastat |

Task 2.

Classify the resorbative-acting sulfonamides. Match letters with numbers.

Pharmacological groups.

- A. Short-acting sulfonamides.
- B. Long-acting sulfonamides.
- C. Superlong-acting sulfonamides.
- D. Sulfonamides combined with trimethoprim.
- E. Derivatives of sulfonamides and salicylic acid.

Drugs.

- | | |
|----------------------|---------------------|
| 1. Streptocide | 9. Sulfadimetoxin |
| 2. Urosulfan | 10. Salazodimetoxin |
| 3. Sulfaethidol | 11. Ditrin |
| 4. Sulfamonomethoxin | 12. Sulfadiazine |
| 5. Co-trimoxazole | 13. Norsulfazole |
| 6. Sulfathiazole | 14. Sulfapiridazin |
| 7. Sulfadimidin | 15. Potesetta |
| 8. Sulfalen | 16. Salazopiridazin |

Task 3.

Describe the pharmacological properties of different sulfonamides filling in the table:

Drug	Mechanism of action	Type of action	Pharmacological effects
Sulfonamide			
Sulfamonomethoxin			

Sulfadiazine			
Silver sulfadiazine			
Mafenide			
Co-trimoxazole			
Phthalylsulfathiazole			
Salazodimetoxin			
Sulfacetamide			
Sulfatone			

Task 4.

Learning the pharmacology of sulfonamides pay your attention at the spectrum of their action. Divide the following microorganisms into very sensitive (A), sensitive (B), resistant (C) ones.

Microorganisms.

1.	Staphylococcus	10.	Protozoa
2.	Spirochete	11.	Filterable virus
3.	Pneumococcus	12.	Cholera bacillus
4.	Proteus	13.	Salmonella
5.	Enterococcus	14.	Streptococcus
6.	Gonococcus	15.	Meningococcus
7.	Dysenteric ameba	16.	Big viruses
8.	Mycobacterium tuberculosis	17.	Colon bacillus (E.coli)
9.	Blue pus bacillus (Pseudomonas aeruginosa)		

Task 5.

Arrange the following antituberculous drugs depending on their antituberculous activity from the most effective to the least effective one. For

agents, marked with asterisk, point out the mechanism of action, type of action, pharmacological effects, indications.

Drugs.

- | | |
|-----------------------|------------------------------|
| 1. Lomefloxacin* | 8. Cycloserine* |
| 2. Florimycin sulfate | 9. Thioacetazone |
| 3. Streptomycin* | 10. Rifampin* |
| 4. Prothionamide* | 11. Ethionamide |
| 5. Isoniazid* | 12. Saluzid |
| 6. Pirazinamide | 13. Paraaminosalicylic acid* |
| 7. Kanamycin | 14. Ethambutol |

Task 6.

Preparing the information for doctors fill in the table concerning the dosing regimens of several groups of sulfonamides that are connected with their pharmacokinetics.

Groups of drugs	Half-live time (period)	Loading dose	Maintaining dose	Interval between drug intake
Short-acting drugs				
Long-acting drugs				
Superlong-acting drugs				

Task 7.

Tell your colleague about the indications and side effects of sulfonamides (A) and drugs for tuberculosis treatment (B). Choose for each group of drugs their indications and side effects. Match the letters with numbers.

Indications.	Side effects
1. Bronchitis, pneumonia	I. Dyspepsia (nausea, vomiting, absence of appetite)
2. Leishmaniasis	II. Allergy
3. Cystitis, urethritis	III. Hypertension
4. Malaria	IV. Crystalluria
5. Cholecystitis	V. Edemas
6. Mycoses	VI. Disorders of hemopoiesis (especially agranulocytosis)
7. Burns, bedsores	VII. Intravascular hemolysis of erythrocytes
8. Non-specific ulcer colitis	VIII. Disorders of hearing
9. Dysentery, salmonellosis	IX. Disorders of CNS
10. Tuberculosis	X. Hepatotoxicity
11. Grippe (influenza)	XI. Decrease of smooth muscles tone
12. Conjunctivitis, blepharitis	XII. Disorders of bones development (especially in children)
13. Leprosy	

Task 8.

Inform the patient about the principles of rational administration of sulfonamides. Choose from the following list the rules of correct administration of sulfonamides.

Principles of rational administration (rules of correct administration).

- A. In the very beginning the loading dose, then – maintaining dose has to be given.
- B. The equal doses of drug have to be given during the whole course of therapy.
- C. Course of therapy is not more than 7 days.
- D. Course of therapy is not less than 7 days.

- E. It is necessary to drink the alkaline drinks after the administration of sulfonamides.
- F. It is rational to take drug after meals.
- G. It is rational to take drug between meals (2 hours after meals).

Task 9.

Offer the patient the substitution of Co-trimoxazole, Silver sulfadiazine, Salazosulfapyridin, Sulfadimetoxin, Pirazinamide, Viomycin, Rifampin, Capreomycin sulfate, Isoniazid:

- A – among the other members of pharmacological group;
- B – among the trade marks.

Task 10.

Correct the following prescriptions:

1. Rp.: Phthalazoli 0,2
 D.t.d. N 10 in tab.
 S.: 1 tabl. 3 times a day
 #
2. Rp.: Ethambutoli 0,1
 D.S.: 1 tabl. daily
 #
3. Rp.: Tab. Sulfasalazini 0,5 N10
 D.S.: As always.

Tests

Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action → Spectrum of action.
2. Pharmacological effects → Type of action → Indications → Dosage.

3. Side effects → Contraindications → Rules of rational administration.

Drugs.

- | | |
|------------------------|------------------|
| 1. Co-trimoxazole | 5. Sulfalen* |
| 2. Capreomycin sulfate | 6. Sulfacetamide |
| 3. Salazosulfapyridin* | 7. Ethambutol |
| 4. Phthalazole* | 8. Algimate |

For agents, marked with asterisk, point out the dosage.

ANTIHELMINTHIC, ANTIFUNGAL, ANTIVIRAL MEDICINES

Topicality of the subject

Antihelminthic, antifungal, antiviral are chemotherapeutic drugs realizing their action inside the body. Antihelminthic medicines are used to treat and prevent helminthiases (helminthic invasions). Antifungal are the preparations for the treatment of infections caused by pathogenous fungi (mycoses). Antiviral drugs are preparations for the treatment of viral infections.

Theoretical questions

1. Classification and nomenclature of antihelminthic drugs.
2. Mechanism of action of antihelminthic drugs.
3. Pharmacodynamics and indications of antihelminthic drugs.
4. Classification and nomenclature of antifungal drugs.
5. Mechanism of action of antifungal drugs.
6. Pharmacodynamics and indications of antifungal drugs.
7. Classification and nomenclature of antiviral drugs.
8. Mechanism of action of antiviral drugs.
9. Pharmacodynamics and indications of antiviral drugs.
10. Side effects, contraindications of antihelminthic, antifungal, antiviral drugs.
11. Principles of rational administration of antihelminthic, antifungal, antiviral drugs.

Home tasks

Task 1.

Write the following prescriptions:

1. Pyrantel (Pirantelum) – tabl. 0.25
2. Mebendazole (Mebendazolium) – tabl. 0.1
3. Levamisole (Levamisolum) – tabl. 0.025; 0.05

4. Natamycine (Natamycinum) - tabl. 0.1
5. Griseofulvin (Griseofulvinum) – tabl. 0.5
6. Clotrimazole (Clotrimazole) – sol. 1%
7. Amixin (Amixinum) - tabl. 0.125
8. Gancyclovir (Gancyclovirum) – caps. 0.25
9. Oxolin (Oxolinum) – ointment 3%.

Task 2.

Answer your colleague's questions:

7. What drugs are used for treatment children helminthiases?
8. What drugs are effective against different groups of helminths?
9. Side effects of antihelminthic drugs.
10. Terms of rational use of antihelminthic drugs.

Task 3.

Prepare the information for doctors about antifungal drugs. Fill the table.

Drugs for systemic treatment		Drugs for local treatment	
Drug	Form of drug	Drug	Form of drug

Class tasks

Task 1.

Divide the following drugs into the groups:

Group	Drugs
Antihelminthic	
Antifungal	
a) antibiotics	
b) azoles	
c) undecylenic acid derivatives	

Antiviral	
d) anomalous nucleosides	
f) adamantine derivatives	
j) pyrophosphate analogues	

Drugs.

- | | |
|-----------------|----------------------|
| 1. Nystatin | 8. Zincundan |
| 2. Miconazole | 9. Mebendazole |
| 3. Natamycine | 10. Levamisole |
| 4. Griseofulvin | 11. Prasiquantel |
| 5. Pyrantel | 12. Ribavirine |
| 6. Pirazinamide | 13. Sodium foscarnet |
| 7. Gancyclovir | 14. Remantadine |

Task 2.

Learning the mechanism of antihelminthic, antifungal, antiviral drugs action match the letters (mechanism of action) with numbers (names of drugs).

Drugs

- | | |
|---------------------------|-----------------------------|
| 1. Pyrantel | 9. Prasiquantel |
| 2. Ethylene tetrachloride | 10. Remantadine |
| 3. Levamisol | 11. Albendazole |
| 4. Ribavirine | 12. Interferon- α -1 |
| 5. Cycloferon | 13. Mebendazole |
| 6. Fluconazole | 14. Clion D |
| 7. Aminoacrichine | 15. Famcyclovir |
| 8. Natamycine | 16. Amixin |

Mechanism of action

- A. Disturb the neuromuscular system functions in helminths.

- B. Increase of helminths muscular tone turning into spastic paralysis.
- C. Increases calcium ion permeability of cell membranes of helminths promoting the increase of their muscular tone turning into spastic paralysis.
- D. Disturb metabolic processes in helminths
- E. Inhibit viral RNA release from protein, altering RNA penetration into cell nucleus.
- F. Inhibit viral RNA and DNA synthesis.
- G. Block viral-specific protein synthesis.
- H. Stimulate synthesis of endogenous interferon in human body.
- I. Inhibition of ergosterol synthesis.

Task 3.

For a deeper understanding the pharmacodynamics of antifungal drugs fill the table.

Pharmacological effects	Drugs
1. Fungicidal	
2. Fungistatic	
3. Antibacterial	

Task 4.

Preparing the information for the doctors about antihelminthic drugs indications, fill the table using «+», if the effect is present and «-» if it's absent.

Drugs	Indications				
	Ancylostomiasis	Cestodosis	Trichophaliasis	Enterobiasis	Ascariasis
Levamisole					
Prasiquantel					
Albendazole					

Pyrantel					
Mebendazole					
Aminoacrichine					

Task 5.

Tell your colleague about side effects of antifungal drugs. Choose from the list the most characteristic side effects.

1. Allergy	6. Disorders of CNS
2. Crystalluria	7. Nephrotoxicity
3. Hepatotoxicity	8. Thrombophlebitis
4. Anemia	9. Dyspepsia
5. The withdrawal syndrome	10. Skin rash

Task 6.

Preparing the information for the doctors about side effects of antihelminthic drugs, fill the table using «+», if the effect is present and «-» if it's absent.

Side effects	Drugs		
	Mebendazole	Levamisole	Prasiquantel
The teratogenic effect			
Leukopenia			
Disorders of CNS			
Dyspepsia			

Task 7.

From the proposed list of side effects match the letters (drugs) with numbers (names of side effects).

Drugs

A. Interferons	C. Acyclovir
B. Zidovudine	D. Remantadine

Side effects

1. Hallucinations	6. Bone marrow suppression
2. Myalgia	7. Fever
3. Nephrotoxicity	8. Headache
4. Nausea, vomitig	9. Hepatitis and cholestasis
5. Heart failure	10. Insomnia

Task 8.

Inform the patient about the principles of rational administration of antihelminthic, antifungal, antiviral drugs.

Choose from the following list the rules of correct administration of this groups.

Combine the indexes of numbers with the letters

Principles of rational administration (rules of correct administration).

- H. The equal doses of drug have to be given during the whole course of therapy.
- I. It is necessary to requires special diet, administration of laxatives.
- J. Does not require special diet, administration of laxatives.
- K. It is rational to take drug after meals.
- L. It is rational to take drug between meals (2 hours after meals).

Drugs

- 1. Pyrantel
- 2. Mebendazole
- 3. Nystatin
- 9. Aminoacrichine
- 10. Tansy flowers
- 11. Acyclovir

4. Ketoconazole

12. Ethylene tetrachloride

Task 9.

Correct the following prescriptions:

6. Rp.: Suppos. Nistatini 500 000 IU

D.S.:

#

7. Rp.: Tabul. Mebendasoli 1,0 N10

D.S.: 1 tabl. daily

#

8. Rp.: Caps. Fluconasoli 0,5 N 20

D.S.: As always.

#

9. Rp.: Acycloviri 0,4 N10

D.S.: 1 tabl. daily

Tests

Describe the drugs using following schemes:

4. Pharmacological group → Interchangeability → Mechanism of action → Spectrum of action.
5. Pharmacological effects → Type of action → Indications → Dosage.
6. Side effects → Contraindications → Rules of rational administration.

Drugs.

1. Nystatin

5. Natamycine

2. Mebendazole*

6. Prasiquantel

3. Levamisole

7. Acyclovir*

4. Ketoconazole*

8. Cycloferon

For agents, marked with asterisk, point out the dosage.