



УТВЕРЖДАЮ
Заведующий кафедрой фармакологии
к.б.н., доцент С.В. Денисова

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LIST OF CHECKPOINTS FOR EXAM PREPARATION

Discipline "PHARMACOLOGY"

For 3rd year students of the Faculty of Medicine

(bilingual education program)

5th semester 2024-2025 academic year

General pharmacology

1. Sources of medicines: chemical synthesis, plants, animals, microorganisms. Recombinant drugs. Examples.
2. Pharmacokinetics, its components (absorption, distribution, elimination). Absorption of drugs. Mechanisms of transport through cell membranes (passive diffusion, facilitated (light) diffusion, active transport) and between cells (filtration). Examples.
3. Enteral routes of administration (oral, sublingual, rectal). The production forms in use. Mechanisms of absorption. The concept of bioavailability.
4. Parenteral routes of administration: subcutaneous, intramuscular, intravenous. The production forms in use. Mechanisms of absorption, bioavailability. Advantages and disadvantages of these routes of administration.
5. Parenteral routes of administration: inhalation, transdermal. The dosage forms used. Mechanisms of absorption, bioavailability.
6. Distribution of medicines in the body. Penetration through the BBB, blood-ocular and placental barriers. Binding to plasma proteins.
7. Biotransformation of medicines. Metabolic transformation and conjugation.



8. Excretion of drugs by the kidneys. The role of glomerular filtration, tubular secretion, and reabsorption. The significance of the degree of drug ionization for their renal excretion.
9. The concept of drug elimination and the elimination half-life ($t_{1/2}$). Therapeutic concentration of the drug in blood plasma.
10. Pharmacodynamics, its components. The main and side effects. Types of drug therapy: etiotropic, symptomatic, pathogenetic, substitution, preventive. Examples.
11. Mechanisms of action of drugs: interaction with membrane receptors. Types of membrane receptors (conjugated with ion channels, conjugated with enzymes, interacting with G proteins). Drug interactions with intracellular receptors. Examples.
12. Binding of drugs to receptors, the concept of affinity and intrinsic effect. Agonists (full and partial), Antagonists, agonists-antagonists. Examples.
13. Mechanisms of action of drugs: interaction with ion channels (sodium, calcium, potassium). Examples.
14. Mechanisms of action of drugs: effects on enzymes and transport systems. Examples.
15. Types of the effect of drugs: local and general (resorptive); direct, indirect and reflex; main and side effects. Examples.
16. Dependence of the effect of the drug on the dose or concentration. Minimum, average, and maximum therapeutic doses. Therapeutic index (the range of therapeutic effect). Toxic doses. Examples.
17. Unusual reactions to drugs connected to genetic abnormalities of the body (idiosyncrasy): disruption of the biotransformation rate of drugs, abnormal decrease in enzymatic activity.
18. Repeated use of medicines: habituation (tolerance), material accumulation, drug dependence (mental and physical).



19. Combined use of medicines. Synergism: additive effect and potentiation; antagonism. Examples.
20. Types of side effects of medicines. Side effects of a non-allergic nature. Examples.
21. Side effects of medicines of an allergic nature, types of allergic reactions. Reactions that occur by the mechanism of anaphylaxis. Clinical manifestations. The mechanism of development. Anaphylactic shock: measures of assistance and prevention.
21. Complications associated with discontinuation of drug administration: withdrawal syndrome. Examples.
22. Toxic effect of medicines. Principles of treatment of acute poisoning.
23. Adverse effects of drugs on the fetus. Effect on the embryo: lethal, toxic, teratogenic effects. Fetotoxic effect. Effects on the uterine tone and placental blood flow. Examples.

Special pharmacology

24. Drugs that affect cholinergic synapses. M-cholinomimetics (pilocarpine). Effects, mechanism of action, application, side effects.
25. M-anticholinergics (atropine, platyphylline, tropicamide, ipratropium, tiotropium, pyrenzepine). Effects, mechanism of action, application, side effects.
- 26 Reversible anticholinesterase agents: neostigmine (proserin), galantamine. Mechanism of action, effects, application, side effects.
27. N-cholinomimetics: nicotine. Effects on the central nervous system, cardiovascular system, smooth muscle organs and endocrine glands during smoking. Mechanism of action. The use of nicotine in medical practice.
28. N-anticholinergics acting in neuromuscular synapses.



Non-depolarizing agents (atracurium, mivacurium, pipecuronium) and depolarizing muscle relaxants (suxamethonium). Mechanism of action, application, side effects. Overdose symptoms, aid measures.

29. Drugs that affect adrenergic synapses. Drugs that stimulate α -adrenergic receptors: phenylephrine (mezaton), naphazoline (naphthyzine), xylometazoline (galazoline), clonidine (clofelin), tizanidine. Classification. Effects, mechanism of action, application. Side effects, preventive measures.

30. β -adrenergic stimulators: dobutamine, salbutamol, terbutaline, phenoterol, salmeterol, formoterol. Effects, mechanism of action, application, side effects.

31. Drugs that stimulate α - and β -adrenergic receptors: norepinephrine (noradrenaline), epinephrine (adrenaline), dopamine. Effects, mechanism of action, application. Side effects, preventive measures.

32. Drugs that block α -adrenergic receptors: doxazosin, tamsulosin. Main and side effects, mechanism of action, application.

33. Drugs that block β -adrenergic receptors: atenolol, metoprolol, esmolol, nebivolol, propranolol. Classification. Effects, mechanism of action, application, side effects. Pharmacodynamics of carvedilol.

34. Opioid analgesics. Full opioid agonists: morphine, codeine, tramadol, trimeperidine (promedol), fentanyl, partial agonists: buprenorphine; agonists-antagonists: pentazocine. Mechanism of action. Main effects: analgesic, effect on the respiratory center, drug dependence. Application. Negative side effects. Contraindications to prescription.

35. Acute opioid intoxication. Naloxone.

36. Non-opioid analgesics (nonsteroidal anti-inflammatory drugs): acetylsalicylic acid, ibuprofen, diclofenac, ketorolac, piroxicam. Classification by chemical structure. Mechanism of action, effects. Drugs which have a predominant effect on COX-2: celecoxib, meloxicam, nimesulide. Features of pharmacodynamics. Use of



non-opioid analgesics, side effects. Paracetamol, features of pharmacodynamics, toxic effect.

37. Antipsychotic drugs (neuroleptics). Phenothiazine derivatives: chlorpromazine, perphenazine thioridazine; thioxanthene (chlorprotixene), butyrophenone (haloperidol). Effects, mechanism of action, application, negative side effects. Atypical antipsychotics: clozapine, olanzapine, risperidone.

38. Anxiolytics. Benzodiazepine derivatives: diazepam, lorazepam, medazepam, triazolam. Classification by the action duration. Effects, mechanism of action, application, negative side effects. Symptoms of intoxication. Flumazenil. Serotonin receptor agonists (buspirone), features of pharmacodynamics.

39. Drugs used in bronchial asthma. Bronchial relaxants: β 2-adrenomimetics (salbutamol, formoterol), M-anticholinergics (ipratropium, tiotropium). Mechanism of action, features of use, side effects.

40. Drugs used in bronchial asthma. Anti-inflammatory drugs: mast cell stabilizers (cromoglicic acid – cromolyn sodium, ketotifen), leukotriene receptor blockers (zafirlukast), glucocorticoids (beclomethasone, fluticasone, budesonide). Mechanism of action, features of use, side effects.

41. Drugs used in heart failure. Agents that reduce the load on the heart: ACE inhibitors (captopril, enalapril), diuretics (hydrochlorothiazide, torasemide, spironolactone). Mechanism of action, application, side effects.

42. Drugs used in heart failure. Cardiotonic agents: cardiac glycosides – digoxin, strophanthin K. Effects, mechanism of action, application. Toxic effect. Aid measures. β -adrenomimetics: dobutamine, dopamine. Application, side effects.

43. Drugs used in coronary circulation insufficiency (antianginal agents): calcium channel blockers (verapamil, diltiazem); β -adrenoblockers (atenolol, metoprolol), nitrates (nitroglycerin, isosorbide dinitrate, isosorbide mononitrate). Mechanism of action, application, side effects.



44. Antihypertensive drugs of central action: clonidine (clofelin), moxonidine. Mechanism of action, application, side effects.
45. Antihypertensive drugs of peripheral action: α -blockers (doxazosin), β -blockers (atenolol, metoprolol, esmolol, nebivolol, propranolol), alpha beta-blockers (carvedilol). Mechanism of action, application, side effects.
46. Antihypertensive drugs. Calcium channel blockers: dihydropyridines (nifedipine, amlodipine), phenylalkylamines (verapamil), benzothiazepines (diltiazem). Drugs that reduce the activity of the renin-angiotensin system: ACE inhibitors (captopril, enalapril, enalaprilat); angiotensin receptor blockers (losartan, valsartan). Mechanisms of action, side effects.
47. Diuretics: thiazides and thiazide-like (hydrochlorothiazide, indapamide), loop diuretics (furosemide, torasemide), potassium-saving (spironolactone, triamterene), osmotic (mannitol). Acetazolamide (diacarb). Mechanisms of action, application, side effects.
48. Drugs used in peptic ulcer that reduce hydrochloric acid secretion: histamine H₂-receptor blockers (ranitidine, famotidine), proton-pump inhibitors (omeprazole, lansoprazole). Mechanism of action, application, side effects. Gastroprotectors: bismuth preparations (bismuth subcitrate potassium), sucralfate. Antibacterial agents acting on *Helicobacter pylori*: aminopenicillins (amoxicillin), macrolides (clarithromycin), tetracyclines, nitroimidazoles – metronidazole. Mechanism of action, side effects.
49. Drugs that affect thrombosis. Antiplatelet agents: thromboxane A₂ synthesis inhibitors (acetylsalicylic acid), ADP receptor antagonists (clopidogrel), glycoprotein IIb/IIIa receptor blockers (abciximab). Mechanism of action, application, negative side effects.
50. Direct-acting anticoagulants - heparin, low molecular weight heparins (nadroparin, enoxiparin). Indirect anticoagulants – warfarin. Mechanism of action, application, negative side effects.



51. Fibrinolytic agents (thrombolytics): streptokinase, alteplase. Mechanism of action, application, negative side effects.
52. Thyroid hormone preparations: triiodothyronine (lithyronine), tetraiodothyronine (levothyroxine). Effects on metabolism. Mechanism of action, application, side effects. Antithyroid drugs: propylthiouracil, thiamazole. Mechanism of action, application, negative side effects.
53. Pancreatic hormone preparations. Insulin: metabolic effects, mechanism of action, application. Short-acting insulin preparations (soluble insulin - actrapid, insulin lispro) and long-acting (zinc insulin suspension – insulin lente, monotard, zinc crystalline insulin suspension – insulin ultralente, insulin isophane – insulin NPH; insulin glargine). Pharmacokinetics. Prescription schemes. Side effects. Glucagon — metabolic effects, application.
54. Synthetic hypoglycemic agents: sulfonylurea derivatives – glibenclamide, glipizide, gliclazide; amino acid derivatives — nateglinide; biguanides – metformin; thiazolidinediones — pioglitazone; alpha-glucosidase inhibitors – acarbose. Mechanism of action, application, side effects.
55. Preparations of adrenal cortex hormones. Glucocorticosteroids. Analogues of natural hormones — hydrocortisone; synthetic derivatives - prednisolone, fluorinated synthetic derivatives - dexamethasone, triamcinolone. Glucocorticoid drugs for topical (local) application — mometasone, fluocinolone, clobetasone; for inhalation — beclomethasone, budesonide. Metabolic effects. Mechanism of anti-inflammatory and immunosuppressive action, application. Negative side effects of glucocorticoids with systemic and local application. Preventive measures.
56. Antiallergic drugs. Medications used in anaphylaxis (urticaria, Quincke's edema, pollinosis, shock): mast cell stabilizers (cromoglicic acid - cromolyn), glucocorticoids. Mechanism of action, application. Antihistamines: diphenhydramine, chloropyramine, loratadine, desloratadine, fexofenadine. Mechanism of action. Classification. Features of the action (effects on the central



nervous system, cholinergic and adrenergic receptors). Application, negative side effects.

57. Biosynthetic penicillins: benzylpenicillin, procainbenzylpenicillin, benzatinbenzylpenicillin, phenoxymethylpenicillin. Spectrum and mechanism of antibacterial action, application. Negative side effects. Medical aid in case of anaphylaxis.

58. Semi-synthetic penicillins: resistant to β -lactamases of gram-positive bacteria (oxacillin), aminopenicillins (ampicillin, amoxicillin), ureidopenicillins (piperacillin). The spectrum and mechanism of antibacterial action, application, negative side effects. Inhibitor-protected penicillins (amoxicillin/clavulanic acid).

59. Cephalosporins of the 1st generation (cefazolin), 2nd generation (cefuroxime), 3rd generation (cefotaxime, ceftriaxone, ceftazidime, cefixime), 4th generation (cefpirome). Spectrum and mechanism of antibacterial action, application. Negative side effects.

60. Macrolides and azalides: erythromycin, clarithromycin, azithromycin. Spectrum and mechanism of antibacterial action, application. Negative side effects.

61. Tetracyclines: tetracycline, doxycycline. Spectrum and mechanism of antibacterial action, application. Negative side effects.

62. Antibiotics of the aminoglycoside group: streptomycin, neomycin, kanamycin, gentamicin, tobramycin, amikacin. Spectrum and mechanism of action, application. Negative side effects.

63. Antibiotics of the lincosamide group: lincomycin, clindamycin. Spectrum and mechanism of antibacterial action, application, negative side effects.

64. Antibiotics of the glycopeptide group: vancomycin. The spectrum and mechanism of antibacterial action. Application, negative side effects.

65. Antibacterial agents of the fluoroquinolone group: norfloxacin, ofloxacin, ciprofloxacin, levofloxacin, moxifloxacin. Classification of fluoroquinolones. Spectrum and mechanism of action, application, negative side effects.



66. Antibacterial agents of the nitrofurantoin derivatives group: nitrofurantoin (furadonin), furazolidone, nifuroxazide. Spectrum and mechanism of action, application, negative side effects.
67. Antibacterial agents of the nitroimidazole derivatives group – metronidazole. Spectrum and mechanism of action, application, negative side effects.
68. First-line (isoniazid, rifampicin, ethambutol, streptomycin, pyrazinamide) and second-line (ethionamide, cycloserine, kanamycin, fluoroquinolones) anti-tuberculosis drugs. Mechanism of action, side effects. Principles of anti-tuberculosis therapy.
69. Antiviral drugs. Classification by mechanism of action. Drugs that disrupt the absorption, cell penetration and deproteinization of the virus (rimantadine). Nucleoside analogues (acyclovir, valacyclovir, famciclovir, ganciclovir, telbivudine). Neuraminidase inhibitors (oseltamivir). Antiretroviral drugs – reverse transcriptase inhibitors (zidovudine, lamivudine, nevirapine), protease inhibitors (saquinavir). Spectrum and mechanism of action, application, side effects. Interferons – interferon α 2a (roferon A), interferon α 2b (intron A). Spectrum and mechanism of action, application, negative side effects.
70. Antifungal agents: azoles of local (clotrimazole) and systemic action (ketoconazole, fluconazole, itraconazole); antibiotics (griseofulvin, nystatin, natamycin, amphotericin B); allylamines (terbinafine). Spectrum and mechanism of action. Use in superficial and deep mycoses, negative side effects.



List of medications for prescription at the exams

Azithromycin	Loratadine
Amoxicillin	Metronidazole
Amlodipine	Metoprolol
Amoxicillin/Clavulanate	Naloxone
Atropine	Naphazoline
Acetylsalicylic acid	Neostigmine
Acyclovir	Nitroglycerin
Budesonide	Nitrofurantoin
Benzylpenicillin Na	Nifedipine
Benzatin benzylpenicillin	Oxacillin
Verapamil	Paracetamol
Vancomycin	Pilocarpine
Gentamicin	Prednisolone
Heparin	Ranitidine
Hydrochlorothiazide	Salbutamol
Diazepam	Spirolactone
Digoxin	Zinc insulin suspension
Dobutamine	Thiamazole
Isoniazid	Trimeperidine
Ibuprofen	Formoterol
Isosorbide mononitrate	Cefuroxime
Soluble insulin (short-acting)	Ciprofloxacin
Clonidine	Enalapril
Clotrimazole	Epinephrine (adrenaline)
Levothyroxine	Ceftazidime