

ANTIBIOTICS

A. Actuality. The most effective drugs in the fight against infectious diseases are antibiotics. Many of them are widely used in clinics of contagious diseases, therapy, surgery, etc.

B. The purpose of the training: to familiarize students with the principles of classification of antibiotics, mechanism and spectrum of action, indications and adverse reactions of antibiotics as essential drugs in fighting infections.

C. Didactic goals:

- 1) The student needs **to know**: classification, pharmacokinetics of antibiotics, dosage principles, spectrum and mechanism of action, indications, contraindications, adverse effects.
- 2) The student should **be able to**: prescribe antibiotics in existing drug forms, select antibiotics in appropriate diseases and pathological conditions.

D. The initial level of knowledge required for interdisciplinary integration

Microbiology. Notions about chemotherapy. Chemotherapeutic index. Contemporary Concepts about the Mechanism of Action of Chemotherapeutic Drugs. Bactericidal and bacteriostatic effects. Resistance of microbes to drugs and the mechanism of occurrence. Ways to combat resistance of microorganisms to antibacterial agents. Antibiotics as a variant of chemotherapeutic drugs. Unit of measurement of the main antibiotic activity. Basic methods for determining the sensitivity of microbes to antibiotics and interpreting their results.

E. Questions for self-training

1. Chemotherapy. Basic principles. The merits of L. Pasteur, I. Mечников, P. Ehrlich in this field. Requirements for antibiotics.
2. Classification of antibiotics by chemical structure, mechanism of action, spectrum of action, type of antibacterial action.
3. Beta-lactam antibiotics. Classification. Penicillins: classification, spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics. The peculiarities of penicillin use in children.
4. Cephalosporins: classification, spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics.
5. Carbapenems and monobactams: spectrum and mechanism of action, indications, side effects. Pharmacokinetics.
6. Combined beta-lactam antibiotics: spectrum and mechanism of action, indications, adverse reactions.
7. Macrolides: classification, spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics.
8. Lincosamides: spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics.
9. Aminoglycosides: classification, spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics. The use of aminoglycosides in pediatrics.
10. Tetracyclines: classification, spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics. Particularities of use in children.

11. Amphenicol derivatives: spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics. Particularities of use in children.
12. Glycopeptides: spectrum and mechanism of action, indications, dosing principle, adverse reactions, pharmacokinetics.
13. Polymyxins: spectrum and mechanism of action, indications, adverse reactions.
14. Ansamycines: spectrum and mechanism of action, indications, adverse reactions.
15. Other antibiotics (Fusidine , Fusafungine): spectrum and mechanism of action, indications, adverse reactions.
16. Anti staphylococcal antibiotics. Characteristics.
17. Antibiotics used in gram-negative bacteria induced diseases.
18. Antibiotics used in diseases caused by gram-negative anaerobic bacteria (Bacteroides fragilis etc).
19. Bacterial resistance to antibiotics. Forms of resistance. Genetic and biochemical mechanisms of appearance and ways of fighting.
20. Principles of antibiotic association. Antagonism and synergism. Basic indications for antibiotic association.

F. Brief characteristics of the compulsory drugs:

Vertical: Drug Name. 1. Sodium benzylpenicillin. 2. Benzathine benzylpenicillin. 3. Ampicillin. 4. Azlocillin. 5. Azithromycin. 6. Lincomycin. 7. Clindamycin. 8. Gentamicin. 9. Cefotaxime. 10. Cefuroxime. 11. Cefepime. 12. Cefixime. 13. Meropenem. 14. Aztreonam. 15. Clarithromycin. 16. Amicacin. 17. Phenoxymethylpenicillin. 18. Augmentin. 19. Amoxicillin. 20. Tetracycline. 21. Doxycycline. 22. Chloramphenicol. 23. Polymyxin-M sulphate. 24. Rifampicin. 25. Fucidin. 26. Vancomycin.

Horizontal: 1. Drug form. 2. Method of administration. 3. Doses (therapeutic, maximum for one socket and for 24 hours). 4. Mechanism of action. 5. Indications and contraindications. 6. Adverse reactions.

G. Questions on general and medicinal prescription.

Write the following drugs in all possible medicinal forms: 1. Sodium benzylpenicillin. 2. Benzyl benzylpenicillin. 3. Ampicillin. 4. Azlocillin. 5. Azithromycin. 6. Lincomycin. 7. Clindamycin. 8. Gentamicin. 9. Cefotaxime. 10. Cefuroxime. 11. Cefepime. 12. Cefixime. 13. Meropenem. 14. Aztreonam. 15. Clarithromycin. 16. Amicacin. 17. Phenoxymethylpenicillin. 18. Augmentin. 19. Amoxicillin. 20. Tetracycline. 21. Doxycycline. 22. Chloramphenicol. 23. Polymyxin-M sulphate. 24. Rifampicin. 25. Fucidin. 26. Vancomycin.

Medicines used in (for): prophylaxis of rheumatic fever (primary and secondary), pneumonia, gangrene, anthrax, tetanus, syphilis, meningitis caused by H. influenzae, infections caused by Ps. aeruginosa, infections caused by Bac. fragilis, osteomyelitis, Proteus infections, penicillin-resistant staphylococcal infections, methicillin-resistant staphylococcal infections, salmonellosis, pseudomembranous colitis, abdominal typhus, bacterial meningitis, tuberculosis, urinary tract infections, exanthemous typhus, bacterial dysentery, Chlamydia infections.

3) Tests (Guideline for Laboratory Work in Pharmacology, Chisinau, 2016, p. 303).

4) Clinical Case (Laboratory Guide to Pharmacology, Chisinau, 2016, p. 314).

5) **Virtual Situations** (Guidelines for Laboratory Work in Pharmacology, Chisinau, 2016, p. 316).

6) **Experimental and Virtual Didactic Film** (Guidelines for Laboratory Work in Pharmacology).

7) **Tables**

TABLE N1

Comparative feature of drugs in the penicillin group

Drugs	The way of administration	Acid-resistance (+/-)	Spectrum of action (broad / narrow)	Resistance to penicillins (+/-)	Activity against pseudomonas aeruginosa (+/-)
Sodium Benzylpenicillin					
Phenoxymethylpenicillin					
Oxacillin					
Ampicillin					
Ampiox					
Augmentin					

TABLE N2

Characteristics of drugs in the cephalosporin group

Drugs	Generation	The way of administration	Spectrum of action (broad / narrow)	Resistance to penicillins (+/-)	Activity against pseudomonas aeruginosa (+/-)
Cefazolin					
Cefuroxime					
Cefixime					
Ceftriaxon					
Cefepime					
Cefotaxime					
Ceftazidime					

TABLE N3**Select antibiotics for choice and backup in the treatment of infectious diseases**

Infectious diseases	Elective drugs	Backup medicines
Pest		
Cholera		
Bacterial dysentery		
Abdominal typhus		
Meningitis		
Diphtheria		
Tetanus		
Syphilis		
Chlamydia		
Septicemia caused Pseudomonas aeruginosa		

8) Problems**Case 1**

The patient with abdominal typhus used an antibiotic. Clinical recovery occurred, but on the 10th day angina started with high fever, rash on the mucosa of the lips and nasal meats. Hematologic examination was caused by leukopenia and agranulocytosis.

What medicine did the patient use?

What was the origin of the complications that occurred during the treatment?

Case 2

A patient with a urinary tract infection caused by gram negative bacilli has been prescribed an antibiotic. The condition of the patient improved, but after treatment, hearing loss and disorder of renal function developed.

What antibiotic could have caused these complications?