ANTIBIOTICS

A. Actuality. Antibiotics have a major impact on human health, through their ability to prevent, treat and prevent the transmission of infectious diseases. The rational use of antibiotics requires deep knowledge regarding the peculiarities of the spectrum and mechanism of action, indications, adverse reactions and use. Inadequate administration of antibiotics has determined the development of microbial resistance, and negative impact of antibiotic resistance on human health is huge and difficult to estimate, constituting a pressing problem at the global level.

B. The purpose of the training is: familiarizing students with the principles of classification, spectrum and mechanism of action, indications and side effects of antibiotics.

C. Learning objectives:

1) The student **must know:** classification, spectrum and mechanism of action, indications, contraindications, adverse effects, pharmacokinetics of antibiotics.

2) The student must **be able to:** prescribe antibiotics in medicinal forms existing, select antibiotics in diseases and pathological conditions.

D. 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 the resistance of microorganisms to antibacterials. Antibiotics as an alternative to chemotherapeutic drugs . The unit of measurement of the activity of the main antibiotics. The basic methods of determining the sensitivity of microbes to antibiotics and the interpretation of their results.

E. Self-training questions:

1. Chemotherapy. Basic principles. Antibiotic requirements.
2. Classification of antibiotics according to chemical structure, mechanism of action, spectrum of action, type of antibacterial action.
3. Penicillins: classification, spectrum and mechanism of action, indications, adverse reactions, pharmacokinetics .
4. Cephalosporins : classification, spectrum and mechanism of action, indications, adverse reactions, pharmacokinetics .
5. Carbapenems and monobactams : spectrum and mechanism of action, indications, adverse reactions, pharmacokinetics .
6. Beta-lactam combined antibiotics: spectrum and mechanism of action, indications, adverse reactions.
7. Macrolides : classification, spectrum and mechanism of action, indications, adverse reactions, pharmacokinetics .
8. Lincosamides : spectrum and mechanism of action, indications, adverse reactions, pharmacokinetics .
9. Aminoglycosides : classification, spectrum and mechanism of action, indications, adverse reactions, pharmacokinetics .
10. Tetracyclines : classification, spectrum and mechanism of action, indications, side effects, pharmacokinetics .
11. Amphenicol derivatives : spectrum and mechanism of action, indications, adverse reactions, pharmacokinetics .
12. Glycopeptides : spectrum and mechanism of action, indications, , side effects pharmacokinetics .
13. Polymyxins: spectrum and mechanism of action, indications, side effects, pharmacokinetics .
14. Ansamycins : spectrum and mechanism of action, indications, adverse reactions .

15. Antibiotics from miscellaneous groups: spectrum and mechanism of action, directions, adverse reactions.
16. Antistaphylococcal antibiotics . characteristic.
17. Antibiotics used in the infections caused of bacilli gram negatives.
18. Antibiotics used in diseases caused by gram-negative anaerobic bacteria (bacteroides fragile etc.).
19. Resistance bacteria to antibiotics: the forms of resistance, biochemical and genetic mechanisms of appearance, ways of combating.
20. Antibiotic association principles. antagonism and synergism. directions of basis for combining antibiotics.

F. Independent work (points 1, 2, 3 and 4 is done in written form while preparing for the lesson)

1) Questions on medical prescriptions.

To prescribe the following drugs in all possible medicinal forms:

1. Sodium benzylpenicillin. 2. Benzathine benzylpenicillin. 3. Ampicillin. 4. Amoxicillin. 5. Azlocillin. 6. Cefuroxime. 7. Cefotaxime. 8. Cefixime. 9. Cefepime. 10. Meropenem. 11. Augmentin. 12. Lincomycin. 13. Clindamycin. 14. Clarithromycin. 15. Azithromycin. 16. Gentamicin. 17. Amikacin. 18. Polymyxin-M sulfate. 19. Doxycycline. 20. Chloramphenicol. 21. Vancomycin. 22. Rifampicin. 23. Tetracycline. 24. Fusidine. 25. Ceftriaxone.

No.	***The name of drugs***	***Form of delivery, dosage***
1	**Amikacin**	Lyophilized powder 0.1; 0.5 in vials Sol. 25% - 2ml in ampoules Gel 5% - 30.0
2	**Amoxicillin**	Tablet / Capsules 0.25; 0.5 Powder / Granules for suspension 5.1 (0.25/5ml) in vials
3	**Ampicillin**	Tablet / Capsules - 0.25 Lyophilized powder 0.5; 1.0; 2.0 in vials
4	**Augmentin** **(Amoxicillin + Acid clavulanic)**	Tablet 0.625; 1.0 Powder for suspension 23.0 (0.4 +0.057/5ml) in vials
5	**Azithromycin**	Tablet / Capsules 0.25; 0.5 Powder for suspension 16.5 (0.1/5ml) in vials
6	**Azlocillin**	Lyophilized powder 0.5; 1.0 in vials
7	**Benzathine benzylpenicillin**	Lyophilized powder 600000UA; 1200000UA in vials
8	**Sodium benzylpenicillin**	Lyophilized powder 500000UA; 1000000UA in vials
9	**Cefepime**	Lyophilized powder 0.5;1.0 in vials
10	**Cefixime**	Tablet / Capsules - 0.4 Powder for suspension 32.0 (0.1 /5ml) in vials
11	**Cefotaxime**	Lyophilized powder. 0.5; 1.0 in vials
12	**Cefuroxime**	Lyophilized powder 0.75; 1.5 in vials
13	**Cefuroxime axetil**	Tablet / Capsules - 0.25; 0.5 Powder/ granules for suspension (0.125/5ml) in vials
14	**Clarithromycin**	Tablet / Capsules - 0.25; 0.5 Lyophilized powder 0.5 in vials Suspension 60ml (0.125/5ml) in vials

15	**Clindamycin**	Capsules 0.15; 0.3 Sol.15% - 2 ml in ampoules Vaginal cream 2% - 20.0 Gel 1% - 30.0
16	**Chloramphenicol**	Tablet / Capsules - 0.25; 0.5 Eye drops 0.25% - 10ml in bottles Liniment 10% - 25.0
17	**Doxycycline**	Tablet / Capsules - 0.1; 0.2 Lyophilized powder 0.1; 0.2 in ampoules / vials
18	**Ceftriaxone**	Powder in vials 0.5 and 1.0
19	**Fusidine**	Tablet 0.125; 0.25 Lyophilized powder 0.25; 0.5 in vials
20	**Gentamicin**	Sol. 4% - 1ml in ampoules Lyophilized powder 0.08 in bottles Ophthalmic solution 0.3% - 5ml Ointment / Cream 0.1% - 30.0
21	**Lincomycin**	Capsules 0.25; 0.5 Sol. 30% - 1 ml in ampoules Ointment 2% - 30, 0
22	**Meropenem**	Lyophilized powder 0.5; 1.0 in vials
2. 3	**Polymyxin- M sulfate**	Tablet - 500000UA Ointment 30.0 (20 000 AU/g)
24	**Rifampicin**	Capsules 0.15; 0.3 Lyophilized powder 0.15; 0.6 in vials
25	**Tetracycline**	Tablet / Capsules 0.1; 0.25 Ophthalmic ointment 1% - 3.0 Ointment 3% - 30.0
26	**Vancomycin**	Lyophilized powder 0.5; 1.0 in vials Capsules 0.125; 0.25

2) List the groups and drugs used in (for): prophylaxis of rheumatism, pneumonia, gas gangrene, anthrax, tetanus, syphilis, meningitis caused by H. influenzae, infections caused by Ps. aeruginosa, infections caused by Bac. fragilis, proteus infections, benzylpenicillin -resistant staphylococcal infections, methicillin- resistant staphylococcal infections, salmonellosis, pseudomembranous colitis, exanthematic typhus, typhoid fever, bacterial meningitis, tuberculosis, urinary infections, enterococcal infections, intra-abdominal infections, community-acquired pneumonia, gastric ulcer and duodenal, infections due to neutropenia and immunodeficiency, perioperative prophylaxis in surgery, bone and joint infections, toxoplasmosis, intestinal decontamination in surgical interventions, atypical infections (Chlamydia , Legionella), dangerous infections (brucellosis, tularemia, plague), cholera.

Table 1

Comparative characteristics of penicillin group drugs

Drugs	The way of administration	Acid-resistance (+/-)	Spectrum of action (broad / narrow)	Resistance to penicillinases (+/-)	Activity against pseudomonas aeruginosa (+/-)

Sodium benzylpenicillin					
Phenoxymethyl-penicillin					
Oxacillin					
Ampicillin					
Ampiox					
Augmentin					

Table 2

Characteristics of drugs from the cephalosporin group

Drugs	Generation	Spectrum of action	Resistance to beta-lactamases of gram "+" microorganisms	Resistance to beta-lactamases of gram "-" microorganisms	Activity towards Pseudomonas aeruginosa
Cefazolin					
Cefuroxime					
Cefixime					
Cefepime					
Cefotaxime					
Ceftazidime					

Table 3

Select antibiotics of choice and reserve in the treatment of infectious diseases

Infectious diseases	The drugs of choice	Backup drugs
Pest		
Cholera		
Bacterial dysentery		
Abdominal typhus		
Meningitis		
Diphtheria		
Tetanus		
Syphilis		
Chlamydia		
Septicemia with Pseudomonas aeruginosa		

3) Problems of situation:

Problem 1

Patient with typhoid fever used an antibiotic. Clinical recovery occurred, but on the 10th day angina with high fever, eruptions on the mucous membranes of the lips and nasal passages began. The hematological examination revealed leukopenia and agranulocytosis.

What medicine did the patient use?

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

Problem 2

A patient with a urinary tract infection caused by gram-negative bacilli has been prescribed an antibiotic. The patient's condition improved, but following the treatment, hypoacusis and dysregulation of renal functions developed.

What antibiotic could have caused these complications?

5)Tests for self-training (Guidelines for Laboratory Work in Pharmacology).

G) Interactive activity

1. Experimental and virtual didactic movie (elaboration of minutes, conclusions).

2. Clinical case (Guidelines for Laboratory Work in Pharmacology).

3. Virtual situations (Guidelines for Laboratory Work in Pharmacology).