

## ANTI-SPIROCHETE DRUGS

**A. Actuality.** Diseases, caused by spirochetes, leptospire and borelias, have epidemiological interest with sexually transmitted diseases (syphilis) or pathologies less known by doctors who require in-depth study of specific action drugs.

**B. The purpose of the training is** to study the pharmacology of anti-spirochete drugs, necessary for prophylaxis and differential treatment of diseases caused by these specific pathogenic agents.

### **C. Learning objectives:**

1) The student must **know:** Classification, spectrum, and mechanism of action, indications, side effects and pharmacokinetic properties.

2) The student must **be able to:** prescribe the compulsory anti-spirochete drugs; administer the drugs depending on the pathogenic agents.

### **D. Initial level of knowledge required for interdisciplinary integration:**

**Microbiology.** Pale treponema. Mechanisms of transmission, activity and toxicological features. Classification of leptospire. Ways of leptospire transmission. Pathogenic agents of recurrent typhus. Viruses. Classification and general characteristics.

### **E. Self-training questions:**

1. Classification of anti-spirochete drugs.

2. Drugs used in the treatment of syphilis: classification, mechanisms of action, indications, side effects.

3. Drugs used in the treatment of leptospirosis and recurrent typhus: the particularities of the spectrum and mechanism of action, indications.

**F. Independent work** (is done in written form while preparing for the lesson)

### **1.) Brief characteristics of compulsory drugs:**

**Down:** Drug name. 1. Sodium benzylpenicillin. 2. Benzatinbenzylpenicillin. 3. Erythromycin.

**Across:** 1. Medicinal form. 2. Way of administration. 3. Doses (therapeutic, maximal for one intake and for 24 hours). 4. Spectrum of action 5. Mechanism of action. 6. Indications and contraindications. 7. Side effects.

### **2.) Questions on medical prescriptions.**

**To prescribe** the following drugs in all the possible medicinal forms: 1. Sodium benzylpenicillin. 2. Benzatinbenzylpenicillin. 3. Erythromycin.

**Drugs used in (for):** syphilis treatment, prophylaxis of syphilis relapses, treatment of leptospire, recurrent typhus.

**3.) Tests** (Guidelines for Laboratory Work in Pharmacology).

**4.) Clinical case** (Guidelines for Laboratory Work in Pharmacology).

**5.) Virtual situations** (Guidelines for Laboratory Work in Pharmacology).

6.) **Virtual didactic movie.**

7.) **Tables**

8.) **Solve the case:**

In the treatment of a patient with syphilis, was administered a drug with degenerative bactericidal action. On the second day after the administration, the patient's condition worsened: the fever increased, the symptoms of poisoning intensified, the rashes characteristic of syphilis increased.

Which drug was used and explain the mechanism of action?

Which is the cause of the reactions?

## **ANTI-TUBERCULOUS AND ANTILEPTIC DRUGS**

**A. Actuality.** The World Health Organization considers tuberculosis a public health problem and represents a disease with a high incidence of disease and mortality. Currently the resistance of mycobacteria is greatly increased. Specific antituberculous medication includes chemotherapies of synthesis and antibiotics. Tuberculous treatment is complex and lasting and requires profound knowledge about groups of drugs used in this condition and principles of their association.

The mycobacteria of leprosy, a variety of mycobacteria, are a health problem determined by the particularities of development and evolution, as well as by the number of medicines insufficient for the treatment of leprosy, including resistant to the available preparations.

**B. The purpose of the training is** to study the pharmacology of anti-tuberculous and antileptic drugs, the possibilities of using rational chemotherapeutic combinations, taking into consideration the forms and evolution of the disease, the duration of treatment.

**C. Didactic goals:**

1) The student must **know:** classification and name of drugs, pharmacokinetics, and pharmacodynamics of anti-tuberculous and antileptic drugs, the principles of the pharmacotherapy of tuberculosis.

2) The student must **be able to:** prescribe basic anti-tuberculous drugs and indicate them according to the form of the disease.

**D. The initial level of knowledge required for interdisciplinary integration:**

**Organic chemistry.** The structure of anti-tuberculous drugs.

**Microbiology.** Tuberculous bacillus. Resistance development. Chemoprophylaxis and immunoprophylaxis of tuberculosis.

**E. Self-training questions:**

1. Classification of anti-tuberculosis drugs by origin and use. Mechanisms of action.

2. Ansamycin antibiotics as anti-tuberculosis: spectrum and mechanism of action, indications, contraindications, side effects, pharmacokinetics.
3. Hydrazines as anti-tuberculosis: spectrum and mechanism of action, indications, contraindications, side effects, pharmacokinetics.
4. Nicotinamide derivatives as anti-tuberculosis: spectrum and mechanism of action, indications, contraindications, side effects, pharmacokinetics.
5. Butanol derivatives as anti-tuberculosis: spectrum and mechanism of action, indications, contraindications, side effects, pharmacokinetics.
6. Anti-tuberculous antibiotics: spectrum and mechanism of action, indications, contraindications, side effects, pharmacokinetics.
7. Fluorquinolones as anti-tuberculosis: the particularities of action and use.
8. New anti-tuberculous drugs (bedaquiline, delamanid, oxizolidindiones, etc.): the particularities of action and use.
9. Tuberculosis treatment principles.
10. Anti-leprotic drugs: classification and mechanisms of action.
11. Anti-leprotic drugs first-line: pharmacodynamics, indications, contraindications, side effects.

**F. Independent work** (is done in written form while preparing for the lesson)

**1.) Brief characteristics of compulsory drugs:**

**Down:** Drug name. 1. Isoniazid. 2. Ethambutol. 3. Rifampicin. 4. Streptomycin. 5. Sodium aminosalicylate. 6. Levofloxacin. 7. Difenilsulfon. 8. Solasulfone. 9. Pyrazinamide.

**Across:** 1. Medicinal form. 2. Way of administration. 3. Doses (therapeutic, maximal for one intake and for 24 hours). 4. Mechanism of action. 5. Indications and contraindications. 6. Side effects.

**2.) Questions on medical prescriptions.**

**To prescribe** the following drugs in all the possible medicinal forms: 1. Isoniazid. 2. Ethambutol. 3. Rifampicin. 4. Streptomycin. 5. Sodium aminosalicylate. 6. Levofloxacin. 7. Difenilsulfon. 8. Solasulfone. 9. Pyrazinamide.

**Drugs used in (for):** tuberculous meningitis, tuberculosis prophylaxis, active pulmonary tuberculosis, extensive drug-resistant tuberculosis, leprosy.

**3.) Tests** (Guidelines for Laboratory Work in Pharmacology).

**4.) Clinical case** (Guidelines for Laboratory Work in Pharmacology).

**5.) Virtual situations** (Guidelines for Laboratory Work in Pharmacology).

**6.) Virtual didactic movie.**

**7.) Tables**

Table N1

**Determine anti-tuberculous drugs**

Dru g	Way of administratio	Mechanism of action	Half-life	Dyspeptic disruption	Super- infection	Hearin g loss

	n			s	s	
A	parenteral	Inhibition of protein synthesis	2 – 3	-	+	+
B	internal	Para-aminobenzoic acid competitive antagonist	2 – 3	+	-	-
C	internal	RNA synthesis inhibition	2 – 5	+	+	-
D	internal	Mycolic acid synthesis inhibition	Aceylators fast 0,5 – 1,6 slow: 2 – 4	-	-	-

### 8.) Problem:

For the complex treatment of patients with pulmonary tuberculosis was used 4 drugs.

Appreciate side effect of the drugs.

The drug A-hearing loss and kidney damage.

The drug B-peripheral neurites and transaminase growth.

The drug C- led coloration of urine in red-orange and increase transaminases.

The drug D-affects the optic nerve and increases uric acid.

### What anti-tuberculosis drugs can cause complications?

List any other side effects that may occur from those medicines.

## ANTIPROTOZOAL MEDICATIONS

**A. Actuality.** Protozoa are pathogenic agents, which cause a range of maladies having more or less specific clinics. Antiprotozoal drugs form a considerable group of drugs with specific action on the parasites depending on the location and form of the disease. For an efficient treatment is needed deep knowledge of the pharmacology of the given group.

**B. The purpose of the training is to study chemotherapeutic drugs**

active in malaria, amebiasis, trichomoniasis, toxoplasmosis, leishmaniasis, balantidiasis revealing general and specific properties towards the parasite.

### **C. Didactic goals:**

1) The student must **know**: Classification, spectrum, and mechanism of action, indications, side effects, principles of prophylaxis of clinical manifestations of antiprotozoal drugs, and also how to avoid the contaminations with the specific agents.

2) The student must **be able to**: prescribe the compulsory antiprotozoal drugs, indicate the effective drugs depending on the form of the disease and location of the parasite, and also the drugs used for prophylaxis of parasitic diseases.

### **D. The initial level of knowledge required for interdisciplinary integration:**

**Biologia.** Parasitism. The specificity of parasitic environment. Classification. Protozoa types. Characteristics. Class sarcodae. Amoebic dysentery, intestinal amoeba. Class flagellae. Leishmania. Class trichomonada. Lamblia. Trypanosoma. Class sporozoa. Toxoplasma. Plasmodium species. Class infuzoriae. Balantiditia. Morphofunctional characteristics of protozoa, development cycle, pathogenic action.

### **E. Self-training questions:**

1. Classification of antiprotozoal drugs.
2. Drugs used in malaria: classification, mechanisms of action, indications.
3. Chinolin derivatives: spectrum and mechanism of action, indications, side effects.
4. Tissue schizontocides: spectrum and mechanism of action, indications, side effects.
5. Drug used in amebiasis: classification, mechanisms of action, characteristic.
6. Drug used in trichomonadosis: classification, mechanisms of action, characteristic.
7. Drug used in lamblia: classification, mechanisms of action, characteristic.
8. Drug used in toxoplasmosis: classification, mechanisms of action, characteristic.
9. Drug used in trypanosomiasis: classification, mechanisms of action, characteristic.
10. Drug used in pneumocystodosis: classification, mechanisms of action, characteristic.
11. Drug used in the treatment of balantidiasis and leishmaniasis:

**F. Independent work** (is done in written form while preparing for the lesson)

#### **1.) Brief characteristics of compulsory drugs:**

**Down:** Drug name. 1. Chloroquine. 2. Metronidazole. 3. Trichomonacide. 4. Furazolidone. 5. Pyrimethamine. 6. Doxycycline. 7. Pentamidine. 8. Solusurmine. 9. Clarithromycin. 10. Co-trimoxazole.

**Across:** 1. Medicinal form. 2. Way of administration. 3. Doses (therapeutic, maximal for one intake and for 24 hours). 4. Mechanism of action. 5. Indications and contraindications. 6. Side effects.

**2.) Questions on medical prescriptions.**

**To prescribe** the following drugs in all the possible medicinal forms:

1. Chloroquine. 2. Metronidazole. 3. Trichomonacide. 4. Furazolidone. 5. Pyrimethamine. 6. Doxycycline. 7. Pentamidine. 8. Solusurmine. 9. Clarithromycin. 10. Co-trimoxazole.

**Drugs used in (for):** malaria treatment, individual prophylaxis of malaria, social prophylaxis of malaria, relapse prophylaxis of malaria, amebiasis of different location, amebiasis in lumen and wall of the intestine, tissular amebiasis, lambliosis, trichomoniasis, toxoplasmosis, balantidiasis, leishmaniosis, pneumocystosis.

**3.) Tests** (Guidelines for Laboratory Work in Pharmacology).

**4.) Clinical case** (Guidelines for Laboratory Work in Pharmacology).

**5.) Virtual situations** (Guidelines for Laboratory Work in Pharmacology).

**6.) Virtual didactic movie.**

**7.) Tables**

*Table N1*

**The spectrum of action of some anti-malarial drugs**

Preparations	Blood	Liver		Blood	Blood
	Sporoids	Para-erythrocytic form	Pre-erythrocytic form	Erythrocytic form	Sexual forms
Chloroquine					
Quinine					
Primaquine					
Pyrimethamine					
Sulfonamide					

Note. Presence of the effects indicate with “+” sign.

*Table N2*

**Indications for antimalarial drugs**

Indications	Chloroquine	Quinine	Primaquine	Pyrimethamine
Individual chemoprophylaxis				
Social chemoprophylaxis				
Malaria treatment				
Relapse prophylaxis				

Note. Presence of the effects indicate with “+” sign.

Table N3

**Select the directions of action of the anti-amoebic remedies**

Preparations	Drugs used in intestinal ameobiasis			Preparatele utilizate în formele extraintestinale
	With action at the level of the intestinal lumen	With action at the level of intestinal mucus	That depresses the normal intestinal flora	
Metronidazole				
Emetine				
Chiniofon				
Chloroquine				
Tetracycline				

Note. Presence of the effects indicate with “+” sign.

**8.) Solve the case:**

A patient with malaria has been prescribed a drug, 1 tablet 3 times a day. To accelerate the effect, the patient started to use the drug in a greater amount, 2 tablets 3 times a day. The fourth day of treatment the patient showed psychic disturbances: verbal and motor excitability, unmotivated actions, hallucinations. Yellowish color of the skin is determined.

Which drug was indicated to the patient?

What was the cause of mental disorders?

**ANTHELMINTIC DRUGS**

**A. Actuality.** Helminthiasis, diseases caused by parasitic worms, are very frequently met, mostly in children and sometimes they have no clinical symptoms. Their treatment, in most cases, is empirical because of difficulty to diagnose. Because the choice of anthelmintic drug depends on the type of parasitic agent and its location, deep knowledge of the spectrum of action and of the principles of dosing them is required.

**B. The purpose of the training is** to study the pharmacological properties of anthelmintic drugs, taking into consideration the type of parasitic agent on which they act.

C. Didactic goals:

1) The student must **know:** Principles of classification, spectrum, and mechanism of action, indications, side effects and peculiarities of dosing the anthelmintic drugs.

2) The student must **be able to**: prescribe the compulsory anthelmintic drugs, administer the specific remedies in different helminthiasis.

**D. The initial level of knowledge required for interdisciplinary integration:**

**Biology.** The term of the helminth. Types of helminths. Flatworms. Trematoda. Fasciola hepatica, cat's two-mouth, lanceolate trematode, pulmonary trematode. Class cestoda: taenia saginata (beef tapeworm), taenia solium (pork tapeworm), taenia coli. The cycle of development. Cylindrical worms. Ascarids, development cycle.

**E. Self-training questions:**

1. Classification of anthelmintic drugs.
2. Drugs used in intestinal nematodes: mechanisms of action, indications, contraindications, side effects, pharmacokinetics.
3. Drugs used in intestinal cestodes: mechanisms of action, indications, contraindications, side effects, pharmacokinetics.
4. Drug used in extra-intestinal helminthiasis: mechanisms of action, indications, side effects, pharmacokinetics.

**F. Independent work** (is done in written form while preparing for the lesson)

**1.) Brief characteristics of compulsory drugs:**

**Down:** Drug name. 1. Levamisole. 2. Mebendazole. 3. Pyrantel. 4. Niclosamide. 5. Diethylcarbamazine. 6. Praziquantel. 7. Niridazole. 8. Emetine hydrochloride. 9. Pyrvinium pamoate. 10. Ivermectin. 11. Albendazole.

**Across:** 1. Medicinal form. 2. Way of administration. 3. Doses (therapeutic, maximal for one intake and for 24 hours). 4. Mechanism of action. 5. Indications and contraindications. 6. Side effects.

**2.) Questions on medical prescriptions.**

**To prescribe** the following drugs in all the possible medicinal forms: 1. Levamisole. 2. Mebendazole. 3. Pyrantel. 4. Niclosamide. 5. Diethylcarbamazine. 6. Praziquantel. 7. Niridazole. 8. Emetine hydrochloride. 9. Pyrvinium pamoate. 10. Ivermectin. 11. Albendazole.

**Drugs used in (for):** ascariasis, enterobiasis, tricocefalosis, ancylostomiasis, strongyloidiasis, teniasis, botriocefalosis, taeniarhynchosis, extra-intestinal helminthiasis.

**3.) Tests** (Guidelines for Laboratory Work in Pharmacology).

**4.) Clinical case** (Guidelines for Laboratory Work in Pharmacology).

**5.) Virtual situations** (Guidelines for Laboratory Work in Pharmacology).

**6.) Virtual didactic movie.**

**7.) Tables**

*Table N1*

**Mechanism of action of antihelmintic drugs.**

Mechanism of action (on helminths)	Mebenda -zole	Levami -sole	Niclosa -mide	Praziqua n-tel	Piperazin e adipate	Pyranter ol
Disturbances in functions of the neuromuscular system						
Disturbances in energetic processes						
Destruction of the tissue coating						

**8.) Solve the case:**

A patient was given a drug for ascariidosis treatment. Usually, this drug is given for a massive dehelminthization. Mechanism of action is to paralyze the neuro-muscular apparatus of helminths. It is prescribed without laxatives and with a special diet.

**Determine the prescribed medication.**