ANTI-TUBERCULOSIS AND ANTI-LEPROSY DRUGS

A. Actuality. Mycobacteria, including mycobacteria of tuberculosis and leprosy, constitute a group of microorganisms characterized by structural components of the cell wall and energy metabolism. Antituberculosis drugs constitute a specific group that includes synthetic antibiotics and chemotherapeutics used in the treatment of sensitive and resistant tuberculosis. The high incidence of tuberculosis and the resistance of mycobacteria worldwide, the complex and long-term treatment require deep knowledge in the field of the pharmacology of antituberculosis drugs and the principles of association. Leprosy, although a pathology not characteristic of the republic, can present a danger as a result of migration, and knowledge in this aspect is necessary to be able to deal with it in the event of its detection.

B. The purpose of the training consists in familiarizing the students with the pharmacology of anti-tuberculosis and anti-leprosy drugs, the possibilities of using rational chemotherapeutic combinations, depending on the forms and evolution of the disease, the duration of the treatment.

C. Learning objectives:

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

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

D. Knowledge of previous and related disciplines necessary for interdisciplinary integration.

Organic chemistry. The structure of antituberculosis drugs.

Microbiology . Mycobacteria: microbiological characteristics. The tubercle bacillus. The development of resistance. Chemoprophylaxis and immunoprophylaxis of tuberculosis.

E. Self-training questions:

1. Antituberculosis drugs: classification by group membership, mechanism of action acording to WHO. Mechanisms of action.
2. Ansamycins: spectrum and mechanism of action, indications, side effects.
3. Hydrazides of isonicotinic acid: mechanism of action, indications, side effects.
4. Butanol and nicotinamide derivatives: mechanism of action, indications, side effects.
5. Antituberculosis antibiotics: mechanism of action, indications, side effects.
6. Fluoroquinolones and oxazolidinones as antituberculosis: mechanism of action, indications, side effects.
7. New antituberculosis drugs: mechanism of action, indications, side effects.
8. Anti-leprosy drugs: classification, mechanism of action, indications, side effects.

F. Individual works for the student's (points 1, 2, 3 and 4 is obligatory and is done in written form while preparing for the lesson)

1) To prescribe the following drugs in all possible medicinal forms**:** 1. Isoniazid. 2. Ethambutol. 3. Streptomycin. 4. Pyrazinamide. 5. Levofloxacin. 6. Dapsone. 7. Rifampicin. 8. Clofazimine.

No.	*The name of the drugs*	*Forms of delivery*
1	**Pyrazinamide**	Tablet 0.5
2	**Dapsone**	Tablet 0.05 ; 0.1
3	**Ethambutol**	Tablet 0.1 ; 0.4
4	**Isoniazid**	Tablets 0.1 ; 0.2 Sol. 10% - 5ml in ampoules
5	**Levofloxacin**	Tablets 0.25; 0.5 Sol.0.5% - 100ml in to the vials Eye drops 0.5% - 5ml
6	**Rifampicin**	Tablets / Capsules 0.15 ; 0.3 Powder 0.15 ; 0.6 in vials
7	**Clofazimine**	Capsules 0.05; 0.1

8	**Streptomycin**	Powder 0.25 ; 1.0 in vials

2) **List the groups and drugs used in (for):** sensitive pulmonary tuberculosis, antibiotics in tuberculosis, synthetic chemotherapeutic drugs in tuberculosis, synthetic drugs in tuberculosis, tuberculosis prophylaxis, multi-resistant tuberculosis, first-line drugs in leprosy.
3) **Tables** (knowledge consolidation)

Table 1

Determine the antituberculosis drugs

Drugs	Way of administration	Mechanism of action	Half-life	Dyspeptic disruptions	Super-infections	Hearing loss
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	-	-	-

4) Problems of situation:

1. For the complex treatment of patients with pulmonary tuberculosis, 4 drugs were used. Against the background of the treatment, some side effects were observed:
Drug A - hearing loss and kidney damage.
Drug B - peripheral neuritis and increased transaminases.
Medication C - red-orange staining of urine and increased transaminases.
Drug D - optic nerve damage and increased uric acid.
Which antituberculosis drugs can cause complications?
List other side effects that may occur with those drugs.

2. The patient was administered the following drugs:
Rp.: Isoniazid 0.3
D.t.d. N. 50 in tabl.
S. Internaly. 2 tablets/day, 3 days a week.
#
Rp.: Rifampicin 0.15
D.t.d. N. 30 in caps.
S. Internaly. One tablet/day, 3 days a week.

Indicate the groups of antimicrobial drugs prescribed in the prescriptions.
Explain the purpose of indicating this combination.
Explain the mechanism of action of the prescribed drugs.
Inform the patient about possible side effects.

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).

ANTIPROTOZOIC DRUGS

A. Actuality. Protozoa are pathogens that cause a range of diseases with a more or less specific clinical picture. Antiprotozoal drugs form a large group of substances with specific action on the parasite depending on its location and the form of the disease caused by it. In order to achieve an effective treatment, a deep knowledge of the pharmacology of the drugs in this group is necessary.

B. The purpose of the training consists in familiarizing the students with the chemotherapeutics active in malaria, amebiasis, trichomonosis, giardosis, toxoplasmosis, leishmaniasis, balantidiasis by highlighting their general and specific properties against the parasitic agent.

C. Learning objectives:

1) The student must **know:** classification, spectrum and mechanism of action, indications, adverse reactions, principles of prophylaxis of clinical manifestations of antiprotozoal drugs, as well as prevention of contamination with the respective agents.

2) The student must **be able to:** prescribe the mandatory antiprotozoal drugs, indicate the respective drugs depending on the form of the disease and the location of the parasite, as well as the drugs used in the chemoprophylaxis of parasitic diseases.

D. Knowledge of previous and related disciplines necessary for interdisciplinary integration.

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

E. Self-training questions:

1. Classification of antiprotozoal drugs.
2. Antimalarial drugs: classification according to plasmodium forms, mechanisms of action, indications, side effects.
3. Drugs used in amoebiasis: classification, mechanisms of action, indications, side effects.
4. Drugs used in trichomonadosis: mechanism of action, indications, side effects.
5. Dugs used in giardiasis: mechanism of action, indications, side effects.
6. Drugs used in the treatment of toxoplasmosis, trypanosomiasis and pneumocystosis: classification, mechanisms of action, indications, side effects.
7. Drugs used in the treatment of balantidiasis and leishmaniasis: mechanisms of action, indications, side effects.

F. Individual works for the student's (points 1, 2, 3 and 4 is obligatory and is done in written form while preparing for the lesson)

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

1. Pentamidine. 2. Pyrimethamine. 3. Chloroquine. 4. Metronidazole. 5. Solusurmine. 6. Co-trimoxazole. 7. Azithromycin. 8. Doxycycline.

No.	*The name of the drugs*	*Forms of delivery*
1	**Chloroquine**	Tablets 0.25 Sol. 0.5% - 5ml in ampoules

2	**Co-trimoxazole Sulfamethoxazole:Trimethoprim = 5:1**	Tablets 0.24; 0.48 Suspension 80ml (0.24/5ml) Sol. 5 ml in ampoules
3	**Doxycycline**	Capsules 0.1
4	**Azithromycin**	Tablets 0.25 and 0.5 Suspension 20 ml (0.1/5 ml) in vials
5	**Metronidazole**	Tablets 0.2; 0.4 Vaginal tablets 0.5 Vaginal suppositories 0.5; 1.0 Sol. 0.5% - 10ml in ampoules Sol. 0.5% - 100ml in vials (i/v)
6	**Pentamidine**	Powder 0.2; 0.3 in vials
7	**Pyrimethamine**	Tablet 0.025
8	**Solusurmine**	Sol. 20% - 10ml in ampoules

2.List the groups and drugs used in (for): malaria coma, malaria attacks, malaria treatment (eradication), individual malaria prophylaxis, social malaria prophylaxis, malaria relapse prophylaxis, amoebiasis of any location, amoebiasis in the lumen and intestinal wall, tissue amoebiasis, giardiasis, trichomonadosis, toxoplasmosis, balantidiasis, leishmaniasis, trypanosomiasis, pneumocystosis.

3) **Tables** (recapitulation of knowledge)

Table 1

Spectrum of action of some antimalarial drugs

Drugs	Blood	Liver		Blood	Blood
	Sporozoites	Paraerythrocytic forms	Preerythrocytic forms	Erythrocyte forms	Sexual forms
Chloroquine					
Quinine					
Primaquine					
Pyrimethamine					
Sulfanilamides					

Note. note the presence of the effect with the "+" sign.

Table 2

Indications of antimalarial drugs

Directions	Chloroquine	Quinine	Primaquine	Pyrimethamine
Access to malaria				
Individual chemoprophylaxis				
Social chemoprophylaxis				
Treatment (eradication) of malaria				
Prevention of relapses				

Note: note the presence of the effect with the "+" sign.

Table 3

Select the site of action of the drugs used in amoebiasis

Drugs	Drugs used in intestinal amoebiasis			Drugs used in extraintestinal forms
	With action at the level of the intestinal lumen	With action at the level of the intestinal mucosa layer	What depresses the normal intestinal flora	
Metronidazole				
Emetine				
Chinophone				
Chloroquine				
Tetracycline				

Note: note the presence of the effect with the "+" sign.

4) **Situation problem**

A patient with malaria was prescribed a medicine, 1 tablet 3 times a day. To accelerate the effect, the self-supporting patient started using the drug 2 tablets 3 times a day. On the 4th day of treatment, the patient experienced psychological disturbances: verbal and motor excitability, unmotivated actions, hallucinations. A yellowish coloring of the skin and integuments is determined.

What medication was prescribed to the patient?

What was the cause of the mental disorders?

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).

ANTIHELMINTIC DRUGS

A. Actuality. Helminthiasis, diseases caused by parasitic worms, are quite common, especially in children, and are often asymptomatic. Their treatment, in most cases, is empirical due to the difficulties of diagnosis. The selection of anthelmintic preparations depends on the type of parasitic agent and its location, a deep knowledge of the spectrum of action and the principles of their use is required.

B. The purpose of the training is to familiarize students with the pharmacological properties of anthelmintic drugs.

C. Learning objectives:

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

2) The student must **be able to:** prescribe mandatory anthelmintic drugs in prescriptions, indicate the drugs in different helminthiasis.

D. Knowledge of previous and related disciplines necessary 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), small tapeworm. The cycle of development. Cylindrical worms. Ascarids, development cycle.

E.Self-training questions:

1. Classification of anthelmintic drugs.
2. Drugs used in intestinal nematodes: spectrum and mechanisms of action, indications,

contraindications and side effects.

3. Medicines used in intestinal cestodoses: spectrum and mechanisms of action, indications, contraindications and side effects.
4. Medicines used in extraintestinal helminthiasis: spectrum and mechanisms of action, indications, contraindications and side effects.

F. Individual works for the student's (points 1, 2, 3 and 4 is obligatory and is done in written form while preparing for the lesson)

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

1. Levamisole. 2. Mebendazole. 3. Pyrantel. 4. Albendazole. 5. Niclosamide. 6. Praziquantel. 7. Diethylcarbamazine. 8. Ivermectin.

No.	***The name of the drugs***	***Forms of delivery***
1	**Albendazole**	Tablet 0.4
2	**Diethylcarbamazine**	Tablet 0.05; 0.1
3	**Ivermectin**	Tablet 0.006
4	**levamisole**	Tablet 0.05 ; 0.15
5	**Mebendazole**	Tablet 0.1 Suspension 2% - 30ml in vials
6	**Niclosamide**	Tablet 0.25
7	**Pyrantel**	Tablet 0.25
8	**Praziquantel**	Tablet 0.6

2)List the groups and drugs used in (for): intestinal nematodes, intestinal cestodes, ascariasis, enterobiosis, tissue nematodes, tissue cestodes, tissue trematodes.

Table1

Indicate the drugs according to the type of helminths

The type of helminthiasis	**Types of helminths (causative agent)**	**Get ready**
Intestinal:		
I. <u>*Nematodes:*</u>	**Nematodes:**	
Ascariasis	*Ascaris lumbricoides*	
Trichuriasis	*Trichocephalus trichiurus*	
Hookworm disease	*Strongyloides stercoralis*	
Enterobiosis	*Entero bius vermicularis*	
Strongiloidosis	*Strongyloides stercoralis*	
II. <u>*Cestodes:*</u>	**Cestodes:**	
Diphyllobothriasis	*Diphyllobothrium latum*	
Botryocephaphosis	*Bothriocephalus acheilognathi*	
Teniosis	*Taenia solium*	
Teniarynchosis	*Taeniarhynchus saginatus*	
Extraintestinal:		
I. <u>*Nematodes:*</u>	**Nematodes:**	
Filariasis	*Wuchereria bancrofti*	
Trichinosis	*Trichinella spiralis*	
II. <u>*Trematodes:*</u>	**Trematodes**	
Fascioliasis	*Fasciola hepatica*	
Opisthorchosis	*Opisthorchis felineus*	
Schistosomiasis	*Schistosoma haematobium*	

Table 2

Mechanism of action of antihelmintic drugs.

The mechanism of action (on helminths)	Mebendazole	Levamisoil	Niclosamida	Praziquantel	Albendazole	pyrantel
Dysregulation of the function of the neuromuscular system						
Dysregulation of energy processes						
Dysregulation of tubulin synthesis and polymerization						
Disorder of calcium metabolism						
Decreasing the resistance of helminths to proteolytic enzymes						

4.Situation problem

One patient was prescribed a medicine for the treatment of ascariasis. Usually the drug is indicated for mass deworming. Mechanism of action consists in the paralysis of the neuromuscular apparatus of the helminths. It is prescribed without use of laxatives and following a special diet.

Determine the patient's prescribed medication.

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).