

**Ministry of health of the Republic of Belarus  
Educational institution  
«Gomel State Medical University»**

Department of general and clinical pharmacology

Authors:

O.S. Pershenkova, assistant of department

N.V. Trophimova, Candidate of Medical Sciences, associate professor

E.I. Mikhailova, head of department, DMS, prof.

**METHODOLOGICAL RECOMMENDATIONS**

for a practical lesson on the discipline "Pharmacology"  
for the third-year students of the Faculty of Foreign Students,  
studying at the specialty 1-79 01 01 "General medicine"

**TOPIC 31: « ANTIPROTOZOIC AND ANTIPARASITIC DRUGS.  
ANTISEPTICS AND DISINFECTANTS»**

Time: 3 hours

Approved at the meeting of the department of general and clinical pharmacology  
the protocol № 18 of 30.06.2022

## LEARNING AND EDUCATIONAL GOALS, OBJECTIVES, MOTIVATION FOR LEARNING THE TOPIC

The topic "Antiprotozoal and antiparasitic agents. Antiseptic and disinfecting agents» is the last part of the section « Antimicrobial and antiparasitic agents». Helminthiasis are a group of diseases that are caused by helminths - worms that live in the human body, other animals and plants. There are more than 250 species of human helminths. According to WHO, every year, approximately every second person on the planet is infected with one of the three main types of helminths that leads to enterobiasis (1,2 bln.), hookworm infection (900 mln) and trichuriasis (700 mln). Protozoan infections, or protozoosis, are caused by unicellular protozoa. Malaria, amoebiasis, leishmaniasis, trypanosomiasis, and others are of the greatest medical and social significance. Number of registered cases of toxoplasmosis and cryptosporidiosis has increased in recent years (predominantly opportunistic infections in HIV-infected patients). Another reason for the increase in the incidence of certain protozooses is increase in resistant parasites. Antiprotozoal agents are also used for noncommunicable diseases (systemic diseases of connective tissue, some types of arrhythmias, etc.).

Disinfectants are the main agents for prevention of infectious diseases. Antiseptic drugs are used for the prevention and treatment of skin and mucous membrane infections. They are widely used in surgery, gynecology, dermatology, otorhinolaryngology and dentistry. Knowledge of these drugs will help future practitioners in the treatment and prevention of wide range of infections.

### **Learning objective:**

- to learn how to use the given drugs with strict consideration of indications and contraindications, methods of assessment of the effectiveness and safety of their use. To be able to prescribe the drugs taking into account features of pharmacokinetics and pharmacodynamics, age, sex and concomitant diseases of the patient.

### **Educational purpose:**

- to develop their value-personal, spiritual potential, to form the qualities of a patriot and citizen, ready for active participation in the economic, industrial, socio-cultural and public life of the country; to realize the social significance of their future professional activities, to learn to follow academic and work discipline, standards of medical ethics and deontology.

### **Tasks:**

As a result of the study lesson, the student should

### **know:**

- possible ways of effecting helminths and protozoa that are capable of causing a pathological process in the human body;
- pharmacokinetics and pharmacodynamics of antiprotozoal and antiparasitic agents;
- classification, mechanism of action and conditions determining antimicrobial activity of antiseptic and disinfectants;
- the role of disinfectants in the complex of medical, preventive, sanitary, hygienic and antiepidemic measures;
- toxic effect on the macroorganism and aid for the drug poisoning.

### **be able to:**

- approve the administration of anthelmintic agents;

- choose the dose of the drug taking into account the age and other characteristics of the patient;
- choose the route of administration and the scheme of application taking into account the localization of protozoa and helminths;
- justify the choice of an antiseptic or disinfectant taking into account the suspected or found pathogens;
- prescribe medicines in the appropriate dosage form, making the calculation of doses as necessary.

#### **possess:**

- skills in choice of drugs on the topic of the lesson;
- the rules of prescribing the studied drugs in the treatment of various diseases and pathological conditions, taking into account the indications;
- skills of dosage regime correction in case of pathological changes in functions of organs or systems responsible for biotransformation and elimination of drugs or in case of joint use of different drugs;
- skills to search, analyze and summarize information about the use and effects of the studied drugs.

#### **Motivation for learning the topic:**

- the specifics of training doctors in this specialty determines the need for students to purposefully study the main pharmacological effects, providing therapeutic and preventive effects of drugs on the topic of the class, indications and contraindications for their use, the interaction of drugs, their combined use, which will successfully complete the specialized disciplines of the specialty.

### **MATERIAL EQUIPMENT**

Reference and informational literature, charts, tables, presentations, drug collections.

### **CONTROL QUESTIONS FROM RELATED DISCIPLINES**

1. Species, features of division and cycle of growth of plasmodium.
2. Localization of amoebas, trichomonads and lamblia in the human body, their microbiological features. Concepts of leishmaniasis, types of leishmanias.
3. Species, features of vital activity and routes of helminthic invasion. Methods of dehelminthization.
4. Kinds of antimicrobial action, chemical structures and properties of antiseptic and disinfecting substances, safety techniques when dealing with toxic substances.
5. The structure of the recipe and the Latin terminology.

### **CONTROL QUESTIONS ON THE TOPIC OF THE CLASS**

1. Antiprotozoal drugs. Antimalarials: chloroquine, mefloquine, quinine, pyrimethamine, primaquine. The concept of individual and social chemoprophylaxis of malaria. Anti-amebic drugs: metronidazole, quiniofene, doxycycline, emetine, chloroquine. Pharmacological characteristics and classification, application features and possible complications. Drugs used for trichomoniasis: tinidazole, metronidazole, trichomonacid. Drugs used for giardiasis (giardiasis): metronidazole, tinidazole, mepacrine, furazolidone. Drugs used for toxoplasmosis: pyrimethamine in combination with sulfonamides (sulfadiazine, sulfadimidine) and antibiotics (clindamycin, azithromycin). Drugs used for leishmaniasis:

sodium stibogluconate, pentamidine isethionate, mepacrine. Drugs used in pneumocystosis: co-trimoxazole, pentamidine isethionate (inhalation), atovaquone. Principles of chemotherapy for protozoal infections, mechanisms of action of antiprotozoal drugs, application, side effects.

2. Antiparasitic (anthelmintic) agents: mebendazole, pyrantel, albendazole, piperazine adipate, levamisole, praziquantel, niclosamide. Classification, mechanisms of action, principles of application, side effects of anti-parasitic drugs. Drugs used for intestinal nematodes, cestodes and trematodes, their properties, application features, side effects. General characteristics of the funds used for extraintestinal helminthiasis.

3. Antiseptic and disinfectants.

The concept of antiseptics and disinfection. The difference between antiseptic and other antibacterial agents. Requirements for antiseptics. Conditions that determine the antimicrobial activity of antiseptics, mechanisms of action. The main groups of antiseptic agents: detergents: N - cetylpyridinium chloride, cerigel; metal compounds: zinc sulfate, copper sulfate; halogenated compounds: chloramine B, alcohol iodine solution; acids and alkalis: boric acid, aqueous ammonia solution; aromatic antiseptics: pure phenol, resorcinol, polycresulene, triclosan, ambazon, biclotymol, hexetidine; aliphatic antiseptics: ethyl alcohol, formaldehyde solution; oxidizing agents: potassium permanganate, hydrogen peroxide; derivatives of nitrofurans (furacilin); dyes: methylene blue, brilliant green; biguanides (chlorhexidine); imidazole antiseptics (metronidazole); quaternary ammonium compounds: benzalkonium chloride, miramistin.

Features of the use of certain antiseptics. Principles of treatment of acute poisoning with antiseptics.

## **PROCESS OF THE STUDY**

### **Theoretical part**

Theoretical questions are described in the appendix to the methodological recommendations.

### **Practical part**

1. Take notes on theoretical material demonstrated by the teacher.
2. Master the methods of solving the tasks and writing out prescriptions on the topic of the class.

### **Theme learning control**

Conducted in the form of independent written work (solution of practical problems and prescriptions for individual task).

## **METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF STUDENTS' INDEPENDENT WORK (SIW)**

### **The time given for independent work can be used by students for:**

- preparing for the practical classes;
- completing the tasks on the topic of the class in the workbook;
- preparing thematic reports, essays and presentations;
- taking notes from academic literature.

### **The main methods of organizing independent work:**

- completing tests and practical tasks of the electronic educational-methodical complex (EEMC) for self-monitoring and self-assessment.

### **The list of tasks of the SIW:**

- solving practical problems in the EEMC;
- completing the test tasks of the EEMC.

**Control of the SIW is carried out in the form of:**

- assessment of an oral answer to a question, report, report, or solution of a task in a practical class;
- individual conversation.

## **METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF CONTROLLED INDEPENDENT WORK OF STUDENTS (CIWS)**

**Recommended forms of CIWS organization:**

- doing exercises on the topic of the class in the workbook;
- writing an essay on a given topic;
- preparing a report and a multimedia presentation on a given topic.

**The list of tasks of the CIWS:**

Topics of essays / multimedia presentations:

1. Phytopreparations in the complex therapy of parasitic diseases (complete the teaching workbooks).
2. History of antiseptic use.
3. Sulfur-containing drugs (birch tar, naftalan oil, ozocerite, sulfur precipitated) and their use in medical practice.

**Forms of control of CIWS realization:**

- checking and grading an essay on a given topic;
- checking and grading a multimedia presentation on a given topic.

## **LIST OF REFERENCES**

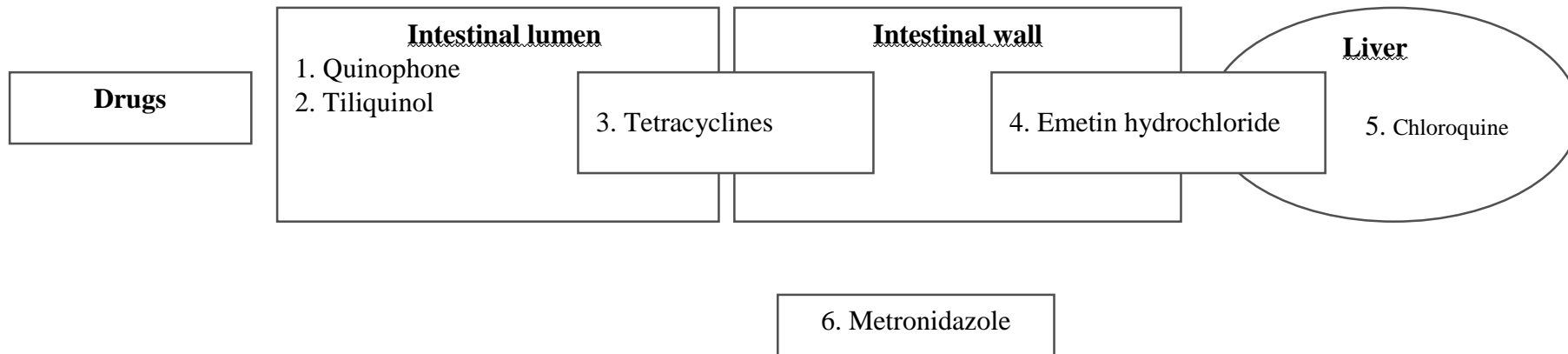
1. Kharkevitch, D.A. Pharmacology: textbook for med. students: transl. of 12th ed. of Russ. textbook "Pharmacology" (2017) / D.A. Kharkevitch. - 2nd ed. - Москва: ГЭОТАР-Медиа, 2019. - 676 с.: ил., табл. - Рек. ФГАУ "ФИРО". – Режим доступа: <http://www.studmedlib.ru/book/ISBN5970402648.html> – Дата доступа: 23.05.2022.
2. Кратко о лекарственных средствах: учебно – методическое пособие для студентов 3 и 6 курсов факультета иностранных студентов, учреждений высшего мед. образования: в 2 ч.=Drugs in short: partical workbook for 3 and 6 year students Faculty for International Students of medical higher educational institutions: in 2 parts / Е.И. Михайлова [и др.]. – Ч. 1. – Гомель: ГомГМУ, 2020. – 56с. – Режим доступа: <http://elib.gsmu.by/xmlui/handle/GomSMU/7128> – Дата доступа: 23.05.2022.
3. Кратко о лекарственных средствах: учебно – методическое пособие для студентов 3 и 6 курсов факультета иностранных студентов, учреждений высшего мед. образования: в 2 ч.=Drugs in short: partical workbook for 3 and 6 year students Faculty for International Students of medical higher educational institutions: in 2 parts / Е.И. Михайлова [и др.]. – Ч. 2. – Гомель: ГомГМУ, 2020. – 76с. – Режим доступа: <http://elib.gsmu.by/xmlui/handle/GomSMU/7129> – Дата доступа: 23.05.2022.
4. Rang and Dale's Pharmacology / J.M. Ritter [et al.]. - 9th ed. - Edinburg [et al.]: Elsevier, 2020. - xvi, 789 p.: ill., tab. + Student consult online.

### Antimalarials – drugs used for the prevention and treatment of malaria [1-15].

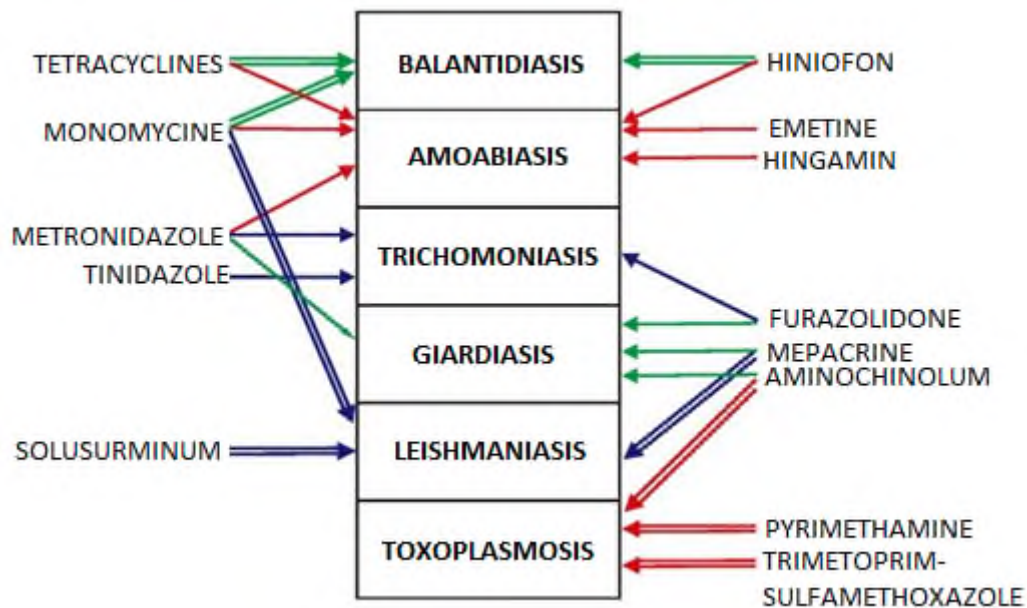
Classification	Blood schizonticides	Tissue schizonticides
Drugs	<b>1. Quinine</b> <b>2. Chloroquine (hingamin)</b> <b>3. Mefloquine</b> <b>4. Hydroxychloroquine (plaquenil)</b>	<b>5. Primaquine</b>  <b>6. Pyrimethamine</b>
Mechanism of action	1. Suppress the synthesis of nucleic acids (1-5) 2. Blocks dehydrofolate reductase, which disrupts the transformation of dehydrofolic acid into tetrahydrofolic acid, which is necessary for the development of plasmodia (6)	
Pharmacological effects	<b>1. Antiprotozoal;</b> 2. Antiarrhythmic (1, 2), 3. Uterotonic (1), 4. Anti-inflammatory, immunosuppressive (2, 4).	
Indications	<b>1. Malaria</b> 2. Prevention of transmission (5, 6) 3. Pre-travel chemoprophylaxis (2, 3, 6) 4. SLE, rheumatoid arthritis (2, 4) 5. Violation of the rhythm of the heart (extrasystole, atrial fibrillation, etc.) (1, 2) 6. Extraintestinal amebiasis (2) 7. Prophylaxis of distant relapses with quartan and tertian malarias (5)	
Side effects	1. Noise in the ears, palpitations, trembling of hands, insomnia (1) 2. Dermatitis (with prolonged use) (2,4) 3. Dizziness, headache (1, 2, 6) 4. Dyspeptic phenomena (1, 3, 5, 6) 5. Ataxia, hearing and vision impairment (3) 6. Megaloblastic anemia (6)	
Contraindications	1. Deficiency of glucose-6-phosphate dehydrogenase, diseases of the middle and inner ear, cardiac decompensation (2) 2. Diseases of the hematopoietic organs (2, 4, 5, 6) 3. Kidney disease (2-6), a violation of liver function (2-4) 4. Heart disease (2, 4) 5. Acute infectious diseases (except malaria), blood diseases, angina pectoris (5)	
NB!	<b>Primaquine</b> is lethal to <i>P. vivax</i> and <i>P. ovale</i> in the liver stage, and also to <i>P. vivax</i> in the blood stage; due to the emergence of pyrimethamine-resistant strains of <i>P. falciparum</i> , <b>pyrimethamine</b> alone is seldom used now. Combined drugs: Metakelfin (pyrimethamine + sulfametapirazin), Fansidar (pyrimethamine + sulfadoxine).	

### Anti-amoebic drugs – drugs used for the treatment of amebiasis [1-15].

### Localization of amoebae



### Other antiprotozoal agents [1-15]



1. Drugs for trichomoniasis, bacterial vaginosis and nonspecific urethritis: metronidazole, ornidazole, tinidazole, furazolidone.
2. Drugs for giardiasis: metronidazole, ornidazole, furazolidone, aminoquinol.
3. Drugs for toxoplasmosis: pyrimethamine, sulfonamides.
4. Drugs for leishmaniasis: salusurumin, sodium stiboglucate (visceral and cutaneous forms), monomycin, paromomycin, meglumine antimonate, mepacrine hydrochloride.
5. Drugs for balantidiasis: monomycin, tetracyclines, hiniofon.

### Anthelmintic drugs – agents used to treat helminthiasis [1-15].

Classification	Intestinal nematodes (ascariidosis, enterobiasis, trichocephalosis)	Intestinal cestodiasis (Diphyllobothriasis, teniosis, teniarinosis)	Extraintestinal helminthiasis (opisthorchiasis, fasciolosis, schistosomiasis)
Drugs	<b>1. Mebendazole, albendazole</b> <b>2. Levamisole</b> <b>3. Piperazine adipate</b> <b>4. Pyrantel</b>	<b>5. Niclosamide</b> <b>6. Cucurbin (drug from pumpkin seed)</b>	<b>7. Ditrizine citrate</b> <b>8. Chloxyl</b>
Mechanism of action	1. Violate the synthesis of helminth tubulin, ↓ helminth absorption of glucose and the formation of ATP (1) 2. Paralysis of the musculature of helminths (2-4) 3. Inhibition of succinate dehydrogenase → disturbance of bioenergetic processes of helminths (2)	1. Paralytic effect on helminths and ↓ their resistance to proteolytic enzymes of the gastrointestinal tract (5, 6) 2. ↑ permeability of cell membranes of parasites for Ca ions → muscle contraction-tours → spastic paralysis (9)	1. Disruption of motor activity of helminths (7) 2. Destruction of nucleoproteins of epithelium and parenchyma of helminths, violates their carbohydrate metabolism (8)
Pharmacological effects	<b>1. Anthelmintic</b> <b>2. Immunostimulating (2)</b>		
Indications	1. Ascariasis 2. Enterobiasis (pinworm infection) (1, 3, 4) 3. Trichocephalosis (1, 4) 4. Trichinosis (1) 5. Ancylostomiasis (1, 2, 4)	1. Taeniasis (5, 6, 9) 2. Diphyllobothriasis (5, 6, 9)	1. Filariasis: lymphatic filariasis (elephantiasis), onchocerciasis (7) 2. Opisthorchiasis (8, 9) 3. Fascioliasis (8, 9) 4. Schistosomiasis (9)
Side effects	1. Dyspeptic disorders 2. Agranulocytosis (2) 3. Allergic reactions 4. Headache, dizziness (1,4)	1. Nausea (5, 9) 2. Allergic reactions (5, 9)	1. ↑ liver size (7,8) 2. Impaired heart rhythm, pain in the heart (8) 3. Proteinuria (8) 4. Skin itching, skin rashes (7)
Contraindications	1. Hypersensitivity to the drug 2. Agranulocytosis (2) 3. Pregnancy, breast-feeding (1, 2, 4) 4. Organic diseases of the central nervous system (3)	1. Pregnancy (5, 9) 2. Gastrointestinal ulcers (5) 3. Anemia (5) 4. Liver dysfunction (9)	1. Liver diseases not associated with helminths (8) 2. Pregnancy 3. Cysticercosis of the eye (9) 4. Eye disorders in onchocerciasis (7)
NB!	<b>Levamisole</b> - single administration before bedtime for adults 0.15 g (150 mg), children 2,5 mg/kg. If necessary, the intake is repeated after a week. <b>Mebendazole</b> is prescribed once a day for 3 days for ascariasis and enterobiasis		

ATP – adenosine triphosphate.



**Disinfectants** are applied to the surface of non-living objects to destroy microorganisms. **Antiseptics** are applied to living tissue/skin to reduce the possibility of infection [1-15].

Classification	Halogen-containing substances	Oxidizing agents	Acids and alkalis	Metal compounds
<b>Drugs</b>	<i>Preparations of chlorine:</i> <b>1. Chloramine</b> <b>2. Chlorhexidine</b> <i>Iodine preparations:</i> <b>3. Tincture of iodine 5%</b> <b>4. Lugol's iodine</b> <b>5. Iodinolum</b> <b>6. Povidone-iodine</b>	<b>7. Hydrogen peroxide</b> <b>8. Potassium permanganate</b>	<b>9. Salicylic acid</b> <b>10. Boric acid</b> <b>11. Sodium tetraborate (borax)</b>	<i>Silver preparations:</i> <b>12. Silver nitrate</b> <b>13. Protargol (silver proteinate)</b> <b>14. Colloidal silver</b> <i>Copper preparations:</i> <b>15. Copper sulfate</b> <i>Zinc preparations:</i> <b>16. Zinc sulfate</b>
<b>Mechanism of action</b>	1. Chlorine replaces the hydrogen atom, the secondary structure of the protein is disrupted 2. Active molecular iodine interacts with NH-groups of protein molecules, causing denaturation of proteins	Release of atomic oxygen, oxidation of the substrate of a microbial cell, death of microorganisms	Denaturation of the protoplasmic protein of the microbial cell	Denaturation of protein, blockade of sulfhydryl groups of enzyme systems of the protoplasm of the microbial cell, formation of albuminates
<b>Pharmacological effects</b>	<b>1. Antimicrobial</b> 2. Deodorizing (1) 3. Spermicidal (1)	<b>1. Antimicrobial</b> 2. Deodorizing (7) 3. Astringent (8)	<b>1. Antimicrobial</b> 2. Irritating (9) 3. Keratolytic (9) 4. Anti-pediculosis (10)	<b>1. Antimicrobial</b> 2. Astringent (12,13,15,16) 3. Anti-inflammatory (12,13)
<b>Indications</b>	1. Infected wounds (1, 2, 6) 2. Hand scrubbing (1, 3) 3. Skin preparation for the prevention of surgical site infection (2, 3) 4. Sterilization of surgical instruments (2)	1. Treatment of wounds, ulcers (7, 8) 2. Rinse the mouth and throat (7, 8) 3. Bleeding wounds and capillary bleeding (7) 4. Sprinkling in gynecology and urology (8)	1. Removal of corns (9) 2. Conjunctivitis, otitis media (10) 3. Pediculosis (10) 4. Fatigue, pressure sores (11) 5. Infectious and inflammatory skin diseases	1. Conjunctivitis 2. Washing of the bladder and urethra 3. Erosions, ulcers, cracks (12) 4. Purulent wounds (14) 5. Nesting baldness (16) 6. Acne (16)
<b>Side effects</b>	1. Dryness and itching of the skin, dermatitis (2) 2. Allergic reaction 3. Irritation at the site of application (1,3-6), iodism (3-6)	1. Burning in the application area 2. Allergic reaction	1. Nausea, vomiting, diarrhea (10) 2. Burning, itching at the site of exposure 3.	1. Allergy
<b>Contraindications</b>	1. Hypersensitivity 2. Dermatitis (2) 3. Pregnancy (3-6) 4. Chronic kidney failure (6)	1. Individual intolerance 2. Damage to surrounding tissues at a strong concentration (8)	1. Impaired renal function (9, 10) 2. Pregnancy, breast-feeding	1. Pregnancy and lactemia (13) 2. Hypersensitivity

### Disinfectants and antiseptics (cont.) [1-15]

Classification	Phenols	Dyes	Aldehydes and alcohols	Detergents	Nitrofurans	Tar
Drugs	<b>1. Phenol, tricresol</b> <b>2. Resorcin</b> <b>3. Pheresolum</b> <b>4. Phenyl salicylate (salol)</b> <b>5. Policresulen</b>	<b>6. Methylene blue</b> <b>7. Brilliant green</b> <b>8. Ethacridine lactate (rivanol)</b>	<b>9. Formaldehyde (formalin)</b> <b>10. Hexamethylene tetramine (urotropin)</b> <b>11. Ethyl alcohol</b>	<b>12. Bar soap</b> <b>13. «Hibiscrub» base</b> <b>14. LIC 76</b> <b>15. Myramistin</b>	<b>16. Nitrofurantoin (furacilin)</b> <b>17. Furazolidone</b> <b>18. Furazidone (furagin)</b>	<b>19. Tar birch</b> <b>20. Ichthyol</b> <b>21. Vinisol</b> <b>22. Citral</b> <b>23. Sülsen</b>
Mechanism of action	Block the enzymatic activity of dehydrogenase, cause protein denaturation	Inhibit enzymatic processes, form hardly soluble complexes	Denaturation of cell proteins	↓ surface tension at the interface → The permeability of the microbial cell membrane is disturbed, the osmotic equilibrium → the death of the bacterium	Reduce nitro- group in the amino group → violate the function of DNA, inhibit the cellular respiration of microbes	The action is provided by a complex of bioactive substances
Pharmacological effects	<b>1. Antimicrobial</b> , 2. Irritating (1, 11, 19), 3. Local anesthetizing (2, 20), 4. Trichomonasidic (5), 5. Deodorizing (9), 6. Tanning (11), 7. Washing, foaming (12-15), 8. Anti-inflammatory (20,22), 9. Analgesic (22)					
Indications	1. Disinfection of premises, hands (1) 2. Skin diseases (eczema, seborrhea) (2) 3. Removal of papillomas (3) 4. Diseases of the intestines, cystitis, pyelonephritis (4) 5. Inflammatory diseases of the vagina, cervix (5)	1. Burns, pyoderma, folliculitis (6,7) 3. Cystitis, urethritis (6) 4. Poisoning by cyanide, carbon monoxide, hydrogen sulphide (6) 5. Treatment of wounds, cleansing cavities in surgery (8) 6. Diseases of the oral cavity and nasopharynx (8)	1. Disinfection of surgical instruments (9, 11) 2. Increased sweating (9) 3. Urinary tract infections, eyes diseases (10) 4. Compresses (11) 5. Pulmonary edema (vapour) (11)	1. Disinfection of hands (12-14) 2. Syphilis, gonorrhea (15) 3. Fungal skin lesions (15) 4. Diseases of the ENT organ (15)	1. Purulent wounds, ulcers, pressure ulcers, burns (16) 2. Infectious bowel disease (17) 3. Urinary infections (18) 4. Conjunctivitis, blepharitis (16)	1. Skin diseases (19) 2. Neuralgia, neuralgia (20) 3. Burns, trophic ulcers, pressure ulcers (21) 4. Keratitis, conjunctivitis (22) 5. Seborrhea of the scalp (23)
Side effects	1. Allergic reactions 2. Redness, swelling of the vagina and vulva (5)	1. Allergic reactions	1. Irritation of the skin (9, 10) 2. Hematuria (10) 3. Skin burn	1. Allergic reactions 2. Nausea, vomiting (13)	1. Allergic reactions 2. Nausea, vomiting	1. Allergic reactions 2. Diarrhea (22)
Contraindications	1. Extensive lesions of the skin and mucous membranes (1) 2. The nevi (3) 3. Chronic renal failure (4) 4. Menstruation (5)	1. Hypersensitivity 2. Kidney disease (8)	1. Inflammatory processes of skin (9) 2. Hypersensitivity	1. Hypersensitivity 2. Application with soap, nitrates, iodides, potassium permanganate, alkalis (13)	1. Allergic dermatoses 2. Increased sensitivity to nitrofurantoin and its derivatives	1. Hypersensitivity