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

Department of general and clinical pharmacology

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METHODOLOGICAL RECOMMENDATIONS

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

TOPIC 5**: «CLINICAL PHARMACOLOGY OF DRUGS USED IN GASTROENTEROLOGY»**

Time: 7 hours

Approved at the meeting of the department of general and clinical pharmacology

the protocol № 18 of 30.06.2022

2023

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

Diseases of the digestive system are among the most pressing problems of modern medicine. According to the World Health Organization, they are comparable to a pandemic in terms of the scale of their spread in the developed countries of the world. They are associated with a large social burden caused by temporary and persistent disability, a decrease in the quality of life and, above all, temporary death. However, despite the relevance, pharmacological developments, international guidelines and recommendations for the treatment of diseases of the digestive system, the problem is far from being solved, and often patients do not receive adequate care. For this reason, the knowledge and skillful use of medicines used in diseases of the digestive system is one of the most important tasks of modern pharmacology.

Learning objective:

- the formation of scientific knowledge about the pharmacokinetics and pharmacodynamics of drugs on the topic of the lesson in order to master the justification and conduct of rational differentiated pharmacotherapy of gastrointestinal diseases.

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:

– clinical and pharmacological classification of medicines used in the treatment of diseases on the topic of the lesson, their pharmacokinetic and pharmacodynamic features;

– indications and contraindications to prescribing medicines on the topic of the lesson, features of their use in various age groups and in various concomitant diseases; dosage regimen of drugs and their interaction with other pharmacological groups;

– principles of control over the effectiveness and safety of the corresponding medicines, possible side effects, methods of their prophylaxis and correction;

be able to:

– to choose the most effective and safe medications on the topic of the lesson, taking into account their main pharmacokinetic and pharmacodynamic features, possible side effects and drug interactions, on the one hand, the characteristics of the disease, the age and sex of the patient, the presence of concomitant pathology and the degree of violation of the main functions of the organ, on the other hand;

– to carry out objective control over the effectiveness and safety of medicines on the topic of the lesson, analyze their pharmacokinetic parameters and, based on the data obtained, calculate single and course doses;

– determine the optimal route of administration of medicines according to the topic of the lesson, prescribe them taking into account the time of day, intake and composition

of food, predict, prevent and identify side effects of medicines, avoid polypragmasia and irrational combination of various drugs;

– prescribe medications on the topic of the lesson in prescriptions;

– inform patients about the nature of the action of medicines on the topic of the lesson, the rules of their administration and possible side effects;

– evaluate scientific information on the effectiveness of the studied medicinal products, work with reference and other literature on the topic of the lesson;

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

– **from biochemistry and physiology:** physical properties and structure of cell membranes, transport of substances through biological membranes in norm and pathology;

– **from general and bioorganic chemistry**: fundamentals of chemical kinetics and catalysis, buffer solutions and systems, pH calculation;

– **from biochemistry:** kinetics of enzymatic reactions, the Michaelis-Menten kinetics equation, the concept of enzyme inhibitors, types of enzyme inhibitors;

– **from pathological physiology**: cell damage, disorders of protein, fat, carbohydrate and mineral metabolism, disorders of local and general circulation, immunopathological processes, allergy, inflammation, pathology of digestive organs;

– **from the Latin language:** the basic rules for the coordination of parts of speech and registration of prescription prescriptions when prescribing medicines;

– **from pharmacology:** general questions of pharmacology, pharmacokinetics and pharmacodynamics of drugs, general formulation and rules for prescribing drugs;

– **from internal diseases:** features of clinical and anamnestic data in patients with diseases of the digestive system, etiopathogenesis and modern approaches to the diagnosis of major diseases with gastrointestinal tract lesions, urgent conditions in gastroenterology and principles of their relief.

CONTROL QUESTIONS ON THE TOPIC OF THE CLASS

1. Clinical and pharmacological characteristics of antisecretory (proton pump inhibitors, H2-histamine blockers, M-anticholinergics) drugs, antacids.
2. Drugs that protect and regenerate GIT mucosa.
3. Scheme of eradication of Helicobacter pylori infection.
4. Classification of antiemetic drugs. Drugs affecting GIT motility.
5. Enzyme replacement therapy drugs. Use of choleretic drugs and hepatoprotectors.
6. Antidiarrheal drugs and laxatives. Drugs regulating the intestinal microbiocenosis.
7. Herbal medicine for diseases of the digestive system.

PROCESS OF THE STUDY

1.
2.
3.
4.
5.

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;
– writing an educational medical history;
– 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;
- writing an educational medical history.

The list of tasks of the SIW:

- solving practical problems in the EEMC;
- completing the test tasks of the EEMC;
- writing an educational medical history.

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;
- checking up for medical history.

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

Recommended forms of CIWS organization:

- writing an educational medical history;
- 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. Antibiotic-associated diarrhea. Modern approaches to treatment.
2. Modern tactics of therapy of the main diseases of the digestive system in childhood.
3. Phytotherapy of diseases of the digestive system.

Forms of control of CIWS realization:

- checking up for medical history;
- 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.
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Emetics and antiemetics [1-8]

Classification	Emetics	Antiemetics		
		Serotonin antagonists	Dopamine antagonists	Substance P antagonists
Drugs	*Central action:* **1. Apomorphine** *Reflex action:* **2. Syrup of Ipecacuana** **3. Copper sulphate, zinc sulphate**	**4. Ondasetron (Vero-ondasetron, Emetron)** **5. Granisetron (Citril),** **6. Tropisetron (Novoban)**	*Central:* **7. Metoclopramide (Raglan, Cerucal)** *Peripheral:* **8. Domperidone (Motilium, Motilak)**	**9. Aprepitant (Emend)**
Mechanism of action	1. Stimulates dopamine receptors of the trigger zone of the medulla oblongata (1) 2. Irritant receptors of the gastric mucosa → reflexively cause vomiting (2, 3)	1. Blockade of peripheral and central 5-HT3-serotonin receptors	1. Depresses the emetic center and chemoreceptor trigger zone of the medulla oblongata (7) 2. Blocks dopamine (D2) and serotonin (5-HT3) receptors (7) 3. Blocks peripheral dopamine receptors (8)	Blockage of neurokinin 1 (NK1) receptors
Pharmacological effects	**1. Emetic**	**1. Antiemetic**	**1. Antiemetic** **2. Prokinetic** (accelerates the emptying of the stomach, ↑ tone of the lower esophageal sphincter)	**1. Antiemetic**
Indications for use	1. Impossibility of gastric lavage after acute poisoning 2. Therapy of alcohol dependence (1)	1. Vomiting associated with chemo- and radiation therapy of malignant diseases 2. Vomiting in the postoperative period	Nausea and vomiting: 1. Due to radiotherapy, side effects of drugs, in the postoperative period, pregnancy 2. Functional GIT-disorders (esophageal achalasia, hypotonic stomach, GERD, biliary dyskinesia) 3. After dopamine agonists (antiparkinsonics) intake	1. Prevention of nausea and vomiting caused by antineoplastic drugs
Side effects	1. The collapse (1) 2. Visual hallucinations (1) 3. Aspiration of vomit	1. Headache, arterial hypotension, arrhythmias 2. Dry mouth, violation of accommodation; paresthesia 3. Liver failure 4. Extrapyramidal disorders 5. Bronchospasm, allergic reactions	1. Extrapyramidal disorders (7) 2. Somnolence, tunnitus, dry mouth (7) 3. Hyperprolactinemia, galactorrhea	1. Headache, dizziness 2. Anorexia, hiccough, constipation, diarrhea, indigestion
Contraindications	1. Stomach burns with acids and alkali 2. The gastroduodenal ulcer 3. Severe heart disease 4. Open tuberculosis	1. Liver failure 2. I trimester of pregnancy, breast-feeding	1. Mechanical intestinal obstruction, gastrointestinal bleeding 2. Epilepsy, Parkinson's disease (7) 3. Prolactin-dependent tumors 4. Glaucoma, pheochromocytoma (7)	1. Severe hepatic insufficiency 2. Hypersensitivity
NB!	Neuroleptics (antipsychotics) and muscarinic antagonists have antiemetic effect too.			

GERD - gastroesophageal reflux disease

Drug interactions	1. Drugs inhibiting the vomiting center (neuroleptics, chloralhydrate, bromides), ↓ эффективность апоморфина (1). 2. ↓ absorption of tetracyclines and copper ions (4). 5. Iron supplements in high doses, chelating agents (including penicillamine) significantly ↓ zinc absorption (4). 6.Thiazide diuretics ↑ urinary excretion of zinc (4).	1. Omeprazole, cimetidine, lovastatin, propranolol, verapamil, allopurinol, diltiazem, flucanozole, metronidazole, antidepressants, fluoroquinolones can ↓ clearance and ↑ the half-life of the drug (4) 2. Carbamazepine, rifampicin, fenilbutazon, barbiturates can ↓ effectiveness of the drug due to changes in its metabolism (4) 3. Drugs causing QT elongation: ECG changes that can lead to clinically significant consequences (5). 4. Microsomal liver enzymes inducers (including phenobarbital, rifampicin): ↓ the concentration of drug in the blood and antiemetic effect ↓ (6).	1. combination with levodopa or dopamine receptor stimulants is contraindicated (7) 2. Alcohol ↑ sedative effect of metoclopramide 3. Anticholinergic drugs and morphine ↑ GIT motility supression (7) 4. antipsychotics ↑ the risk of extrapyramidal disorders (7) 5. CNS depressants (morphine and its derivatives, tranquilizers, sedatives, antihistamines, antidepressants, barbiturates, clonidine) lead to mutual ↑ of effects (7) 6. Drugs should not be taken simultaneously with antacid and antisecretory drugs, because they reduce their bioavailability after oral administration (8). 7. Anticholinergics can neutralize the effect of the drugs (8)	1. Concomitant administration with warfarin csn result in a clinically significant decrease in MHO 2. The effectiveness of oral hormonal contraceptives can ↓ during treatment and for 28 days after its completion

Antiulcer drugs: agents that inhibit the system of aggression factors [1-8]

Classification	Antacid agents			Antisecretory agents		
	Systemic	**Non-systemic**	**Astringents**	**Selective muscarinic (M1) antagonists**	**Proton pomp inhibitors (PPI)**	**Histamine (H2) antagonists**
Drugs	**1. Sodium bicarbonate** **2. Calcium carbonate** **3. Sodium citrate**	**4. Magnesium oxide** **5. Magnesium hydroxide** **6. Aluminum hydrate-hydroxide**	**7. Alkaline bismuth subnitrate** **8. Vikalin, Vikair** **9. Sucralfate (Venter)**	**10. Pirenzepine (Gastrozepine)** **11. Telenzepine**	**12. Omeprazole (Omez, Losek, Gastrasol)** **13. Lansoprazole (Lanzap)** **14. Rabeprazole (Pariet)** **15. Esomeprazole (Nexium)** **16. Pantoprazole (Controller, Nolpase)** **17. Dexlansoprazole (Dexylolanth)**	**19. Cimetidine** **20. Ranitidine** **21. Famotidine** **22. Nisatidine** **23. Roxatidine** **24. Niperotidine** **25. Lafutidine** **26. Ranitidine bismuth citrate**
Mechanism of action	1. Neutralize hydrochloric acid in the stomach (1-6) 2. Envelop afferent nerve endings → ↓ their irritability (7-9)			1. Blockage of gastric muscarinic receptors	1. Blockage of H+-K+-ATPase enzyme responsible for the production of HCl	1. Blockage of H2-histamine receptors of gastric parietal cells
Pharmacological effects	**1. Antacid** **2.** Enveloping (4-6, 9) 3. Adsorbing (6, 9), astringent (7-9)			**1. Antisecretory (↓secretion of hydrochloric acid)** 2. Spasmolytic (10,11) 3. Gastroprotective (10-18)		
Indications for use	1. Gastroduodenal ulcer, hyperacid gastritis, reflux esophagitis 2. Eradication of Helicobacter pylori (10-18) 3. Zollinger-Ellison syndrome (10-26) 4. Non-steroidal gastropathy (10-26)					
Side effects	1. Alkalosis 2. Hypercalcemia, nephrocalcinosis, constipation (2) 3. Dyspepsia	1. Diarrhea (4,5) 2. Constipation (6) 3. Dyspepsia	1. Diarrhea, black feces (7.8) 2. Somnolence (9) 3. Dizziness (9) 4. Dyspepsia	1. Dry mouth 2. Infringement of an accommodation 3. Diarrhea or constipation	1. Dyspepsia 2. Candidiasis of the digestive tract 3. ↑ risk of fractures 4. Gynecomastia, edema 5. Dysfunction of the liver, hematopoiesis 6. ↑ risk of dementia in old age	1. Headache 2. Nausea, constipation 3. Skin rash 4. Liver dysfunction 5. Tachycardia 6. ↓ libido
					7. ↑ risk of Clostridium difficile-associated diarrhea	
Contraindications	1. Alkalosis 2. Hypercalcemia, nephrourolythiasis, thrombosis (2) 3. Aluminum intoxication (3)	1. Hypermagnesemia (4,5) 2. Alzheimer's disease (6)	1. Hypoacid gastritis (7.8) 2. Chronic renal failure 3. Gastrointestinal bleeding (9)	1. Prostatic hypertrophy 2. Glaucoma 3. Pyloric stenosis	1. Pregnancy and lactation	1. Liver and renal dysfunction 2. Pregnancy and lactation
NB!	**1.** Combined antacids: *Almagel, Maalox (Al (OH) 3 + Mg (OH) 2), Phosphalugel (Al (HPO3) 3), Gastal (Al (OH) 3 + Mg (OH) 2 + MgCO3), Rennie (CaCO3 + MgCO3). 2. Tenatoprazole, Ilaprazole* are at various stages of development and clinical trials.					

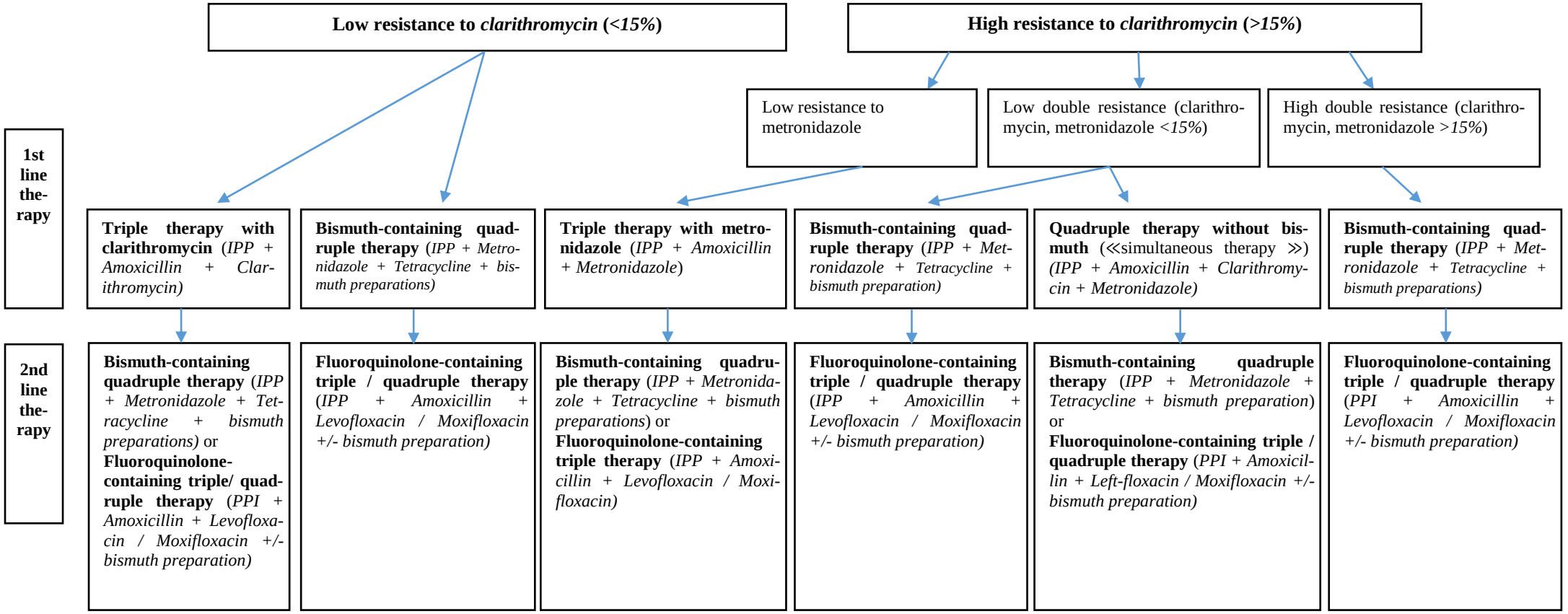
Drug interactions	1. Antacids ↓ the absorption of drugs in the GIT and, thus, ↓ their bioavailability when taken orally. This is most clearly manifested by the example of benzodiazepines, NSAIDs, antibiotics (ciprofloxacin, tetracycline, metronidazole, nitrofurantoin), anti-tuberculosis drugs (isoniazid), H2-blockers, theophylline, digoxine, quinidine, warfarin, iron sulfate, phenytoin. To avoid unwanted interactions, antacids should be prescribed 2 hours before or 2 hours after taking other medicines. 2. Sucralfate ↓ absorption of many drugs in the gastrointestinal tract (tetracyclines, fluoroquinolones, H2 blockers, digoxin, prolonged-acting theophyllines), so the intervals between their doses should be at least 2 hours. 3. Antacids, reducing acidity in the stomach, ↓ the degree of dissociation of sucralfat and weaken its activity, so they should be used no less than 30 minutes before or no earlier than 30 minutes after taking sucralfate.	1. Pirenzepine ↓ stimulating effect of alcohol and caffeine on gastric secretion. 2. The simultaneous administration of pirenzepine and H2-blockers leads to potentiation of antisecretory action, which can be used in patients with Zollinger-Ellison syndrome.	1. Omeprazole and lansoprazole moderately inhibit cytochrome P-450 in the liver and, as a result, ↓ the elimination of certain drugs, for example, diazepam, warfarin, phenytoin. The metabolism of caffeine, theophylline, propranolol, quinidine is not impaired. 2. Pantoprazole has virtually no effect on cytochrome P-450.	1.Cimetidine is one of the most potent inhibitors of the microsomal cytochrome P-450 system in the liver. It ↓ the metabolism and ↑ the concentration in the blood of a number of drugs: theophylline, diazepam, propranolol, phenobarbital, indirect anticoagulants and others. 2. Weak inhibition of cytochrome P-450 by ranitidine has no clinical significance. 3. Other H2 blockers do not have such an effect at all. H2 blockers can ↓ the absorption of ketoconazole, which depends on the presence of hydrochloric acid in the stomach.

Antiulcer drugs: agents that activate defense factors *[1-8]*

Classification	Gastroprotectors	Reparants
Drugs	**1. Sucralfate (Venter)** **2. Bismuth tricalcium dicitrate (De-nol)** **3. Misoprostol (Saitotec)**	**4. Liquiriton** **5. Solcoseryl** **6. Gastroparm** **7. Sea-buckthorn oil** **8. Nandrolone (Retabolil)** **9. Vitamin U**
Mechanism of action	1. Neutralizes the gastric acid; forms a colloid mass on the surface of the gastric mucosa and envelope parietal cells (1, 2) 2. Bactericidal action on Helicobacter pylori (2) 3. ↓ secretion of hydrochloric acid and gastric juice, stimulates the regeneration of the gastric mucosa (3)	1. ↓ secretion of hydrochloric acid, ↑ synthesis of mucosal glycoproteins (4) 2. Stimulates metabolic processes (5) 3. Neutralizes the gastric acid (6) 4. ↓ activity of proteolytic enzymes of gastric juice (7) 5. Stimulate the processes of regeneration of the gastric mucosa (5-9) 6. ↑ protein synthesis in tissues, ↑ utilization of calcium, sodium, nitrogen, phosphates and chlorides (8) 7. Methylates histamine → inactivates it → ↓ gastric secretion (9)
Pharmacological effects	**1. Antacid** **2. Cytoprotective** 3. Antihelicobacter (2) 4. Absorbent (1), astringent (1,2) 5. Antisecretory (3)	1. Antisecretory (4, 9) 2. Spasmolytic (4) 3. Anti-inflammatory (4, 7) 4. Regenerative (5-9) 5. Antihypoxic (5) 6. Antacid, analgesic (6) 7. Cholagogue (7) 8. Anabolic (8)
Indications for use	1. Gastroduodenal ulcer, hyperacid gastritis 2. Reflux esophagitis (1, 2) 3. Non-steroidal gastropathy (3)	1. Gastroduodenal ulcer, hyperacid gastritis 2. Occlusal diseases of peripheral arteries (5) 3. Skin burn and trauma (7) 4. Cachexia, osteoporosis (8)
Side effects	1. Dyspeptic disorders 2. Staining the stool black (2) 3. Somnolence (1,3)	1. Allergic reactions 2. Diarrhea, bitterness in the mouth (7) 3. Dysfunction of the liver, transient jaundice (8) 4. Edema, muscle cramps, frequent urination (8) 5. Dysmenorrhea (8)
Contraindications	1. Severe renal dysfunction (1,2) 2. Pregnancy 3. Gastrointestinal bleeding (1) 4. IHD, AH, cerebral circulation disorder (3)	1. Hypersensitivity 2. Gallstone disease (7) 3. Hypertrophy and prostate cancer, prostatitis (8) 4. Acute liver disease (8) 5. Heart failure, IHD, myocardial infarction (8)

Drug interactions	1. ↓ activity of indirect anticoagulants (1) 2. ↓ clinical efficacy of amitriptyline (1) 3. For half an hour before and after taking De-Nol, it is not recommended to use other medicines, food and liquids, in particular antacids, milk, fruits and fruit juices. This is due to the fact that, with simultaneous ingestion, they can affect the effectiveness of De-Nol. 4. ↑ side effects of diclofenac and indomethacin (3) 5. Magnesium-containing antacids can lead to diarrhea (3)	1. Use with caution simultaneously with drugs that increase the potassium content in the blood, for example, potassium preparations, potassium-sparing diuretics, ACE inhibitors (5). 2. ↑ effects of indirect anticoagulants, insulin and oral hypoglycemic drugs, antiplatelet agents (8). 3. ↑ antianginal effect of nitroglycerin (9).

H.pylori eradication («Maastricht-V», 2015) [1-8]



Diagnostics
1. Urea breath test is the best choice for confirmation of eradication of H. pylori, and monoclonal antibodies to H. pylori antigen in feces can be an alternative test. The test should be performed at least 4 weeks after completion of therapy.
2. PPI (proton pump inhibitor) should be discontinued at least 2 weeks, and antibiotics and bismuth preparations 4 weeks before H. pylori testing.
3. In clinical practice, when endoscopy is needed and there are no contraindications for biopsy, a rapid urease test is recommended as a first-line test. In case of a positive result, you can immediately begin treatment. One biopsy is obtained from the body and one of the pylorus.
4. It is recommended to evaluate sensitivity to clarithromycin when the standard scheme with clarithromycin is considered as first-line therapy, excluding populations with well-documented low (<15%) resistance. This test can be performed by a standard method (antibioticogram) after cultural or a molecular test in a biopsy.

Cholagogue agents [1-8]

Classification	Choleretics	Cholekinetics	Cholespasolytics
Drugs	*Preparations of bile acids:* **1. Allochol** **2. Cholenzym** **3. Lyobil** *Synthetic agents:* **4. Oxafenamide (Osalmide)** *5.* **Nicodine** *Herbal preparations:* **6. Brier syrup** **7. Cornsilk** *Hydrocholeretics:* **8. Alkaline mineral water**	**9. Extract of Cynara leaves** **10. Magnesium sulfate (per os)** **11. Spirituous tincture of leaves of barberry** **12. Oils (sunflower, olive); amarines (wormwood, yarrow)** **13. Cholecystokinin** **14. Sorbitol, mannitol**	*With myotropic action:* **15. Papaverine** **16. Drotaverine (No-spa)** **17. Mebeverin (Duspalatin)** **18. Aminophylline (Euphyllinum)** *Muscarinic antagonists:* **19. Atropine** **20.Patifillin** **21. Metacin**
Mechanism of action	1. Stimulation of receptorsof the small bowel mucosa, secretory function of the liver parenchyma → ↑ bile formation (1-7) 2. ↑ osmotic gradient between bile and blood → osmotic filtration of water and electrolytes into the bile capillaries (1-7) 3. ↑ bile flow through the bile ducts → prevention of ascent of infection and ↓ inflammatory process (1-7) 4. ↑ cholates content in the bile → ↓ the possibility of bile cholesterol precipitation and the formation of gallstones (1-7) 5. ↑ the amount of bile due to the water component → ↑ fluidity of bile (8)	1. Irritate duodenal mucosa → excretion of cholecystokinin → contraction of the gallbladder, relaxation of the sphincter of Oddi → the entry of bile into the duodenum and the removal of cholestasis	1. PDE inhibition → ↑ intracellular cAMP → ↓ Ca2+ ions and ↓ smooth muscle tone (15,16,18) 2. Blocks the flow of Na+ and Ca2+ ionsinto the cell → slows membrane depolarization and prevents the contraction of muscle fibers → relaxes smooth muscles (17) 3. Blockage of muscarinic receptors → prevent acetylcholine action → antispasmodic effect (19-21)
Pharmacological effects	1. Cholagogue 2. Laxative (1) 3. Antispasmodic (4), antibacterial (5) 4. Diuretic, hemostatic (7)	**1. Cholagogue** 2. Hepatoprotective (9) 3. Spasmolytic (10) 4. Choleretic (11,14)	1. **Antispasmodic** 2. Myotropic (15-18) 3. Bronchodilating (18)
Indications for use	1. Chronic hepatitis (1,2,4,6,7,8) 2. Chronic cholecystitis (1-8) 3. Chronic cholangitis (1,4,5,6,7,8) 4. Chronic pancreatitis (2,3,8) 5. Atonic constipation (1), cholelithiasis (4), urinary tract infection (5), dyskinesia of bile ducts (5,6)	1. Hypokinetic biliary dyskinesia 2. Duodenal drainage 3. Chronic cholecystitis 4. Chronic hepatitis	1. Hyperkinetic biliary dyskinesia 2. Cholelythiasis, cholecystitis (15,16,18-21) 3. Irritable bowel syndrome (16,17) 4. Hepatic colic (15-17,19-20)
Side effects	1. Diarrhea 2. Allergic reactions 3. Edema (8)		1. Nausea 2. Palpitations, arrhythmias (15,16,18) 3. Atropine-like effect (19-21)
Contraindications	1. Acute hepatitis (1,2,4) 2. Acute pancreatitis (1,2,3) 3. Obturation jaundice (1-4,6,7) 4. The gastroduodenal ulcer (1,2,4) 5. Calculous cholecystitis (1,2,3,6,7) 6. Anacid gastritis (5); thrombophlebitis, ↑ blood coagulability (7)	1. Acute liver disease 2. Stones in the gallbladder 3. Exacerbation of peptic ulcer	1. Arrhythmias (15,16,18-21) 2. Severe hepatic failure (15,16) 3. The gastroduodenal ulcer (18) 4. Glaucoma (19-21) 5. Prostatic hypertrophy (19-21)

Drug interactions	1. Preparations containing aluminum hydroxide, colestyramine, colestipol ↓ the absorption (and ↓ effect) of the drug, simultaneous administration is impractical (1). 2. In combination with synthetic or plant-derived choleretics, ↑ bile formation can occur; combination with laxatives leads to the elimination of constipation (1). 3. The simultaneous use of antacids containing calcium carbonate and / or magnesium hydroxide can lead to ↓ the effectiveness of the drug (2). 4. Significant drug interactions in conjunction with other drugs have not been identified (3,4,5,6).	**1.** No interactions	1. ↓ antihypertensive effect of methyldopa (15) 2. Anticholinergic drugs ↑ anticholinergic effects (15) 3. ↓ antiparkinsonian effect of levodopa (16) 4. ↑ antioxidant effect of papaverine and other antispasmodics, including m-anticholinergic drugs (16) 5.No data on interaction with other drugs (17) 6. Mineralocorticoids lead to a risk of hypernatremia (18) 7. Glucocorticoids lead to mutual ↑ of undesirable effects (18) 8. Sorbents, antidiarrheal agents perpetuate to ↓ the effectiveness of the drug (18) 9. ↓ action of muscarinic agonists and anticholinesterase agents (19) 10. With simultaneous use with muscarinic antagonists, agents with anticholinergic activity, ↑ anticholinergic action is possible (21)

Cholelitholytics are medicines that promote the dissolution of bile (cholesterol) stones [1-8]

Classification	Cholelitholytics
Drugs	**1. Chenodeoxycholic acid (Henofalk, Henodiol)** **2. Ursodeoxycholic acid (Ursofalk, Ursosan)**
Mechanism of action	1. ↓ synthesis of cholesterol in the liver and ↓ its absorption in the intestine. *Bile containing a lot of bile acids and phospholipids, can dissolve small cholesterol gallstones in the gallbladder in about 50% of patients.*
Pharmacological effects	**1. Chololitholytic** 2. Hepatoprotective (2) 3. Cholagogue (2)
Indications for use	1. Small cholesterol gallstones (up to 20 mm) invisible in X-rays 2. Chronic hepatitis, toxic hepatitis (2) 3. Primary biliary cirrhosis (2) 4. Primary sclerosing cholangitis (2) 5. Biliary dyskinesia (2)
Side effects	1. Diarrhea / constipation 2. Nausea, epigastric pain 3. Increased hepatic transaminases level
Contraindications	1. Gallstones visualized during routine radiology 2. Severe dysfunction of the intestine 3. The gastroduodenal ulcer 4. Diseases of the pancreas 5. Frequent biliary colic 6. Chronic hepatitis, cirrhosis, cholangitis
Drug interactions	1. Colestyramine, colestipol and aluminum-containing antacids bind chenodeoxycholic acid and ursodeoxycholic acid in the intestine, ↓ their clinical effectiveness.

Biliary colic management
Biliary or hepatic colic is pain from a blocked bile duct. It is a complication of cholelythiasis and some other hepatobiliary diseases. ***Management:*** 1. *Myotropic spasmolythics* (Platyphylline 0.2% by 2 mL IM; atropine sulfate 0.1% by 1 mL IM; Drotaverine 2% by 2–4 mL IM, IV by drop infusion; Papaverine 2% by 2 mL IM, IV by drop infusion) 2. <u>For severe pain:</u> *antispasmodics* + *analgesics* (Baralgin 5 mL IM, IV; Analgin 50% by 2 mL IM; Ketorolac by 1 mL IM, right up to narcotic analgesics – promedol, tramadol).

Hepatoprotectors are drugs that increase the resistance of the liver to the effects of damaging factors, promote the restoration of its functions, increase its detoxification capabilities [1-8].

Classification	Herbal preparations	Amino acids	Complex of essential liver phospholipids	Vitamins; antioxidants
Drugs	**1. Legalon (Karsil, Silymarin)** **2. Bilignin** **3. LIV-52** **4. Hepatofalk planta**	**5. Ademethionine (Heptral)** **6. Gepa-Merz:** ornithine + aspartate	**7. Essentiale** (Essential phospho-ipids + vitamins (pyridoxine, cyanocobalamin, nicotinamide, panto-tenanoic acid) + fatty acids (linoleic, linolenic acids)	**8. Lipoic acid (Thiocacid, Thiogamma, Thioctic acid)** **9. Choline Chloride** **10. Vitamins A, E, C**
Mechanism of action	1. Normalization of metabolic processes and restoration of the integrity of hepatocyte cell membranes 2. ↓ peroxide oxidation of lipids (1,4)	1. Normalization of metabolic processes 2. Activation of membrane phospholipids synthesis, as well as the formation of glutathione, sulfates and taurine which have detoxifying properties (5) 3. Inhibition of urea biosynthesis (6)	1. Normalization of metabolic processes 2. Restoration of the phospholipid composition of hepatocyte membranes 3. Stimulation of interferon production, ↑ phagocytosis (8)	1. Participates in the regulation of lipid and carbohydrate metabolism, affects the exchange of cholesterol, has a detoxifying effect (8) 2. Participates in the metabolism of phospholipids, donator of methyl groups (9)
Pharmacological effects	**1. Hepatoprotective** **2. Lipid-lowering** 3. Antioxidant (1,4)	**1. Hepatoprotective** 2. Antioxidant (5) 3. Antidepressant (5)	**1. Hepatoprotective** 2. Antioxidant	**1. Hepatoprotective** 2. Antioxidant (8)
Indications for use	1. Acute (toxic) hepatitis (1,3,4) 2. Chronic hepatitis, liver cirrhosis	1. Chronic hepatitis, liver cirrhosis 2. Hepatic encephalopathy (6) 3. Depressive syndrome (5)	1. Chronic hepatitis, liver cirrhosis 2. Toxic hepatitis 3. Fatty liver degeneration	1. Chronic hepatitis, liver cirrhosis 2. Hepatitis A 3. Coronary atherosclerosis (8) 4. Neuropathies (8)
Side effects	1. Dyspeptic disorders			
Contraindications	1. Hypersensitivity	1. I and II trimesters of pregnancy	1. Hypersensitivity	
NB!	See pharmacological characteristics of vitamins in the topic «Antioxidants. Vitamins. Enzymes and antienzymes»			

Drug interactions	1. ↓ the concentration of ibuprofen, ↓ bioavailability of tetracycline and doxycycline (3).	1. They should be used with caution in combination with selective serotonin reuptake inhibitors, tricyclic antidepressants (such as clomipramine), as well as herbs and drugs containing tryptophan (5).	1.No data	1. ↑ action of insulin and oral antidiabetic drugs (9). 2. Bind metals, therefore, they should not be prescribed simultaneously with preparations containing metals (for example, supplements of iron, magnesium, calcium) and dairy products. The interval between doses should be at least 2 hours (9).

Drugs for pancreatic function disturbances [1-8]

Classification	Enzymes			Antienzymes
	Animal enzymes drugs	**Preparations containing pancreatin, bile components, hemicellulase, etc.**	**Vegetable drugs**	
Drugs	**1. Pancreatin (Pancrenorm)** **2. Pancitrate** **3. Mezim-forte** **5. Penzital** **6. Panzinorm forte-H**	**6. Festal** **7. Digestal** **8. Enzistal** **9. Panzinorm forte**	**7. Pepfiz** **8. Oraza** **9. Solizim**	**10. Tracerol** **11.Gordox** **12. Counter** **13. Pantrypine**
Mechanism of action	1. Split fats, proteins and carbohydrates → their absorption in the small intestine 2. ↓ abdominal pain syndrome	1. Split fats, proteins and carbohydrates → their absorption in the small intestine 2. Enzyme hemicellulase ↑ splitting of plant fiber and digestive processes → ↓ formation of gases (6-8) 2. Amino acids ↑ secretion of gastric juice, intestinal and pancreatic enzymes. Hydrochloric acid ↑ acidity of stomach contents (9)	1. Normalizes digestion, ↓ gas formation and ↑ motility of the gastrointestinal tract	1. Inhibit proteases (trypsin, chymotrypsin, plasmin) → prevent the release of biologically active polypeptides (kinin) → stabilize the permeability of capillaries, inhibit the development of edema and pancreatic necrosis
Pharmacological effects	**1. ↑ digestion** 2. Cholagogue (6-8)			**1. Antifibrinolytic**
Indications for use	1. Chronic pancreatitis with insufficient pancreatic function 2. Maldigestia and malabsorption syndrome 3. Hypo- and anacid gastritis 4. Flatulence 5. After an operation on the pancreas	1. Chronic pancreatitis with insufficient pancreatic function 2. Flatulence 3. Cholecystectomy 4. Maldigestia and malabsorption syndrome 5. Biliary dyskinesia	When intolerance to pancreatic enzymes in: 1. Chronic pancreatitis with insufficient pancreatic function 2. Flatulence 3. Errors in nutrition	1. Prevention of blood loss during operations 2. Acute pancreatitis and exacerbation of chronic pancreatitis 3. Shock
Side effects	1. Nausea, vomiting			1. Vascular thrombosis 2. Impaired renal function 3. Dyspepsia 4. Arterial hypotension
Contraindications	1. Hypersensitivity 2. Acute pancreatitis	1. Hypersensitivity 2. Hepatitis, hepatic failure, hyperbilirubinemia (5) 3. Acute pancreatitis	1. Patients with fungal and household sensitization (8) 2. Allergy to penicillins (9) 3. Hypersensitivity	1. DIC-syndrome (except for coagulopathy phase) 2. Pregnancy 3. Hypersensitivity
NB!	There are combined enzymes containing pancreatin in combination with plant enzymes, vitamins (wobenzyme, phlogenzyme).			

Drug interactions	1. ↓ absorption of folic acid and iron (1,2,3,5,6)	1. ↑ absorption of PASA, sulfonamides, antibiotics (7-9). 2. ↓ absorption of iron preparations (7-10). 3. Antacids containing calcium carbonate and / or magnesium hydroxide ↓ efficacy of drugs (7-9) 4. H2 receptor blockers and proton pump inhibitors ↑ action of pancreatic enzymes (7-10).	1. Do not use simultaneously with iron preparations and antacids (13)	1. ↓ the effect of streptokinase or urokinase (14-16). 2. The solution of Trasilol is incompatible with the infusion forms of other drugs. 3. It is a weak inhibitor of serum pseudocholinesterase, which can slow down the metabolism of suxamethonium chloride and ↑ muscle relaxation, there is a risk of apnea (14). 4. Not compatible with antibiotics (especially β-lactams), with solutions containing dextran, amino acids or lipids (16). 5. Drug interaction of drugs not described (17.18)

NB!	Combined enzymes containing pancreatin in combination with plant enzymes, vitamins (vobenzim, flogenzim).

Acute pancreatitis management [1-8]

1. No food or drink; **cold** (ice pack) on the epigastric area	
2. Analgesics	*Narcotic drugs* for severe pain syndrome (*Trimeperedine (promedol)* subcutaneously or IV by 1 ml 1% or 2% every 6 hours *Non-narcotic* (at option: *Metamizole (analgin)* IM or IV by 2 ml 50% solution every 6-8 hours; *Tramadol* by 50-100 mg IV or IM every 6-8 hours); * Morphine is not recommended: it provokes spasm of sphincter of Oddy
3. Spasmolytics	*Papaverine* 2 ml 2% solution IM, *drotaverine* 40-80 mg 1-3 times daily IM, IN or subcutaneously
4. Muscarinic antagonists	*Atropine* 0,1% solution (if there are no comrtaindications) 1 ml subcutaneously twice daily; *platyphylline* 1-2 ml 0,2% solution subcutaneously twice daily
5. Infusion therapy	Up to 40 ml per 1 kg of patient body mass: basic infusion solutions: saline (0,9% sodium chloride solution), 5% or 10% dextrose solution; balanced polyionic solutions; plasma substitutes (neorondex, dextran, polyvinylpyrrolidone and others.)
Additional agents:	
6. Antisecretory agents	*Proton pump inhibitors:* omeprazole 20 mg twice daily *Histamine H_2 receptor antagonists:* famotidine IV or 20 mg orally every 12 hours
7. Enveloping and absorbing agents	*Aluminum and magnesium hydroxide* 1 dosing spoon 30 minutes before meals and 4 times a day in the evening, etc.
8. Antienzymes	*Ovomin* IV slowly, initial dose is 1500-1800 antitrypsin units per kg; maintenance dose 750-800 antitrypsin units per kg every 6 hours
9. Antibiotics	*Ampicillin* 1 g IM every 4-6 hours, *Oxacillin* (1 g IM every 4-6 hours) and others

*For vomiting - metoclopramide IM or IV 10 mg 3-4 times daily. Duration of treatment is 3-7 days.

Antidiarrheal agents are drugs for diarrhea [1-8]

Classification	Enveloping, absorbent agents	Muscarinic antagonists	Myotropic spasmolytics	Opioid agonists
Drugs	**1. Smecta (Diosmectite)** **2. Activated carbon**	**3. Buscopan (Hyoscine butyl bromide)**	**4. Papaverine hydrochloride** **5. Drotaverine (No-spa)** **6. Mebeverine (Duspalatin)** **7. Otilonium bromide**	**8. Loperamide (Imodium)** **9. Diphenoxylate (Reasek, Lomotil)**
Mechanism of action	1. Forms polyvalent bonds with glycoproteins of mucus → ↑ the amount of mucus and improves its gastroprotective properties. Has selective sorption properties (1) 2. Adsorbs substances → prevents their absorption into the blood (2)	1. Blockage of muscarinic receptors → ↓ tone of smooth muscles of internal organs, including gastrointestinal tract, ↓ their contractile activity	1. Inhibitors of PDE → ↑ cAMP in smooth muscle cells → ↓ Ca^{2+} level → relaxation of the musculature and ↓ tone of smooth muscle organs including the stomach and intestines 2. Eliminate spasm with no effect on normal peristalsis (6)	1. Stimulate intestinal opioid recrptors → ↓ peristalsis, ↑ tone of intestinal sphincters, ↓ secretion of water and electrolytes. → ↓ promoting of intestinal contents * *Loperamide does not pass through the BBB*
Pharmacological effects	1. Adsorbing (1,2) 2. Enveloping (1) **3. Antidiarrheal**	**1. Anticholinergic** **2. Antidiarrheal**	**1. Antispasmodic** **2. Antidiarrheal**	**1. Antidiarrheal**
Indications for use	1. Acute and chronic diarrhea 2. Symptomatic treatment of heartburn, swelling, discomfort in the abdomen (1,2) 3. Flatulence 4. Intoxication	1. Irritable Bowel Syndrome 2. Spastic pain states in cholelithiasis and urolithiasis, chronic cholecystitis	1. Irritable bowel syndrome 2. Pain in the abdomen of spastic nature 3. Renal colic (4,5) 4. Biliary dyskinesia (5)	1. Acute and chronic diarrhea
Side effects	1. Constipation 2. Black stool (2)	1. Dry mouth 2. Tachycardia 3. Retention of urination	1. Nausea, constipation (4.6) 2. AB blockade (4,5) 3. Dizziness (4-6)	1. Dizziness 2. Flatulence 3. Dry mouth (8)
Contraindications	1. Intestinal obstruction (1) 2. Gastric bleeding (2) 3. The gastroduodenal ulcer (2)	1. Glaucoma 2. Prostatic hypertrophy	1. AV-blockage (4) 2. Glaucoma (4) 3. Prostatic hypertrophy (5)	1. Acute dysentery 2. Nonspecific ulcerative colitis 3. Intestinal obstruction
NB!	***Drugs for flatulence* –** are local-acting drugs that: 1. Absorb gases in the intestine and stomach *(Charcoal)*; 2. ↓ surface tension at the interface between the liquid contents of the gastrointestinal tract and gas bubbles and destroy these gas bubbles *(Simethicone, Dimethicone).* Combined drug alverine + simethicone = *Meteospasmil. Side effects:* voilate absorption of nutrients and medicinal substances at simultaneous reception with the activated coal, occasionally allergies (simethicone) and constipation (dimethicone).			

Drug interactions	1. Can ↓ the rateof absorption of other drugs. It is not recommended to take drugs simultaneously with other drugs.	1.Can ↑ anticholinergic action of tricyclic and tetracyclic antidepressants, antihistamines, antipsychotic drugs, quinidine, amantadine, disopyramide, anticholinergics (for example, tiotropium bromide, ipratropium bromide, atropine-like compounds). 2. Simultaneous use with dopamine antagonists (for example, metoclopramide) leads to ↓ action on the gastrointestinal tract of both drugs. 3. Can ↑ tachycardia caused by beta-adrenergic agonists.	**1**. In simultaneous use with anticholinergics, ↑ anticholinergic effects are possible (4). 2. ↓ hypotensive effect of methyldopa (4).	1. Concomitant use with opioid analgesics or colestyramine can ↑ risk of severe constipation (8). 2. When used simultaneously with co-trimoxazole, ritonavir, ↑ bioavailability of the drug, which is due to the inhibition of its metabolism during the first pass effect in the liver (8). 3. Phenothiazines, barbiturates and tricyclic antidepressants ↑ action of the drug (9).

Laxatives are drugs that ↑ motility of the intestine and causing the elimination of semiliquid or liquid feces [1-8]

Classification	Vegetable fibers	Osmotic	Irritants of intestinal receptors (contact laxatives)	Softening feces
Drugs	**1. Methylcellulose**	**2. Magnesium sulfate (Cormagnesin)** **3. Sodium sulfate (Glauber's salt)** **4. Lactulose (Dufalac, Fortrans)**	**5. Castor oil** *Preparations of Senna, rhubarb, buckthorn, etc., containing anthraglycosides:* **6. Senadexin** *Synthetic:* **7. Bisacodyl**	**8. Vaseline oil** **9. Olive oil** **10. Sunflower oil**
Mechanism of action	1. Increase in the volume of intestinal contents → irritation of the mechano-receptors and laxative effect	1. Create high osmotic pressure in the lumen of the intestine and delay the absorption of water → ↑ content volume → mechanical stimulation of bowel function, ↑ its motor activity and accelerated evacuation * *Lactulose* acts only *in the large intestine!*	1. Is splited by lipase in the small intestine to form ricinoleic acid → it causes irritation of the intestinal receptors throughout its entire length and reflexively ↑ peristalsis (5) 2. Irritate bowel receptors → ↑ peristalsis and evacuation of intestinal contents (6,7)	1. Isn't absotbed and softens the stool (8) 2. Softens the stool and ↑ intestinal motility (9-10)
Pharmacological effects	**1. Laxative**	**1. Laxative** 2. Cholagogue, hypotensive, antiarrhythmic (4)	**1. Laxative**	**1. Laxative** 2. Cholagogue (9-10)
Indications for use	1. Chronic constipation	1. Acute poisoning 2. Preparation for colon examination (4) 3. Chronic constipation (4) 4. Prevention of encephalopathy in portal cirrhosis (4)	1. Chronic constipation 2. Preparation for colon examination (5.7) 3. After the operation of removal of hemorrhoids to prevent physical efforts in case of heart attack and stroke	1. Chronic constipation 2. After the removal of hemorrhoids (9-10)
Side effects	1. Flatulence	1. Nausea, vomiting 2. IV: sensation of heat (2) 3. IV: bradycardia (2) 4. Electrolyte disturbances (2,3)	1. Atony of the intestine when prolonged use 2. Proteinuria, hematuria (6) 3. Convulsions, muscle weakness (6,7)	1. Atony of the intestine (8) 2. Deficiency of vitamins E, A, K (8)
Contraindications	1. Intestinal obstruction 2. Severe constipation 3. Anal bleeding of unknown nature 4. Appendicitis	1. Severe bradycardia, AV blockade (2) 2. Severe chronic renal failure (2) 3. Appendicitis, intestinal obstruction 4. Galactosemia (4)	1. Hypersensitivity 2. Intestinal obstruction 3. Appendicitis, diverticulitis 4. Ulcerative colitis, Crohn's disease	1. Hypersensitivity 2. Intestinal obstruction 3. Fever (8) 4. Ulcerative colitis, Crone desease 5. Cholecystitis, biliary dyskynesia (9-10)

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Drug interactions	No data	1. ↓ effect of oral anticoagulants, cardiac glycosides, phenothiazines (especially chlorpromazine) (2). 2. ↓ absorption of ciprofloxacin, ethidronic acid, tetracycline antibiotics (forms unabsorbed complexes with oral tetracyclines), ↓ action of streptomycin and tobramycin. Mg2 + -containing drugs should be taken 1-2 hours after the use of the above drugs (2). 3. Reduces the pH of the colon, can ↓ the effect of drugs, the release of which depends on the pH in the environment of the colon (3). 3. It has a synergistic effect with neomycin in the treatment of hepatic encephalopathy (3). 4. Long-term use of large doses of the drug can cause ↓ serum potassium concentrations, which can lead to ↑ action of cardiac glycosides (3). 5. The drug ↓ absorption of any oral drugs. Therefore, while taking the drug, other drugs should not be taken orally (4).	1. ↓ absorption of fat-soluble vitamins A, D and K. In doses up to 4 g / day ↑ absorption of fat-soluble drugs (extract of male fern, mebendazole, griseofulvin, probucol). Salt laxatives: ↑ laxative effect is possible (5). 2. Muscarinic antagonists (atropine sulfate, platifilin, pirenzepine), antispasmodics (papaverine, drotaverin) ↓ action of the drug (5). 3. Anticholinesterase agents (neostigmine, pyridostigmine, rivastigmine) and glycerin ↑ laxative effect of the drug (5). 4. ↑ action of agents that stimulate the contractile activity of the myometrium (methylergometrine, ergometrine, oxytocin, prostaglandins) up to the risk of uterine rupture in childbirth (5). 5. Prolonged use in high doses: ↑ action of cardiac glycosides and the effect on the action of antiarrhythmic drugs in connection with the possibility of hypokalemia may occur. Thiazide diuretics, glucocorticosteroids, licorice root preparations ↑ risk of hypokalemia (6). 6. It is not recommended to use it simultaneously with drugs that can cause the development of arrhythmias such as torsades de pointes (7): antiarrhythmic drugs (amiodarone, bretilium, disopyramide, quinidine, sotalol) and other drugs (astemizole, bepridil, erythromycin for iv administration, halofantrine, pentamidine, sultopride, terfenadine, vincamine).	1. Vaseline oil enhances the side effects of fat-soluble anthelmintic drugs.

Drugs that regulate intestinal microbiocenosis [1-8]

Classification	**Probiotics** - living microorganisms, which, when administered in adequate amounts, have a positive effect on the health status of the host	**Prebiotics** - selectively fermented ingredient, which is formed upon specific changes in the composition and / or activity of the gastrointestinal microbiota, and has a positive effect (s) on the health status of the host	**Synbiotics** - an appropriate combination of prebiotics and probiotics.	**Lactic acid bacteria (LAB)** - non-pathogenic, non-toxigenic, Gr + enzymatic bacterium, which is associated with the production of lactic acid from carbohydrates, which makes them suitable for food fermentation
Drugs	**1. Lactobacillus** **2.Bifidobacterium** **3.Saccharomyces boulardii** **4.E. coli** **5.Bacillus.** **6.Clostridium butyricum.**	1. Oligofructose 2.Inulin 3.Galacto-oligosaccharides 4. Lactulose 5. Oligosaccharides of breast milk 6. Para-aminobenzoic acid (PABA).	**1.Maxilac** **2. Lactiale** **3. Bifilis** **4. Bilactin** **5. Filtrum;** **6. Bifidobak;**	**1.Lactobacillus** **2.Lactococcus** **3.Streptococcus thermophilus.**
Mechanism of action	↑ growth and / or metabolic activity of native microflora.	↑ microbial cell metabolism → growth and development of its own microflora.	Probiotic + prebiotic → mutual enhancement of effect	↑ inhibition of pathogenic and opportunistic microorganisms
Pharmacological effects	1. Normalization of intestinal microflora 2. Immunostimulating effect 3. ↑ production of vitamin K, biotin, niacin and folic acid. 4. ↓ cholesterol concentration 5. Antidiarrheal effect	1. ↑ number of bifidobacteria in the colon 2. ↑ calcium absorption 3. Hypolipidemic effect 4. Laxative effect.	See the effects of pro- and prebiotics.	1. Normalization of intestinal microflora 2. Immunostimulating effect 3. Antidiarrheal effect 4. Laxative effect.
Indications	1.Dysbacteriosis. 2. Irritable bowel syndrome 3. Prevention of antibiotic-associated diarrhea. 4. Prevention and treatment of hepatic encephalopathy (1).	1. Chronic constipation. 2. Prevention and treatment of hepatic encephalopathy (4) 3. Atherosclerosis. 4. Dysbacteriosis. 5. Chronic colitis, cholecystitis, chronic hepatitis. 6. Hyperlipidemia.	See the pro- and prebiotics.	1.Dysbacteriosis. 2. Irritable bowel syndrome. 3. Prevention and treatment of hepatic encephalopathy.
Side effects	1. allergic reactions	1. Hypernatremia. 2. Gastrointestinal disorders. 3. Water and electrolyte disturbances	See the pro- and prebiotics.	1. allergic reactions

Contraindications	1. galactosemia (1).	1. Galactosemia (4) 2. bowel obstruction 3. Rectal bleeding 4. Colostomy / ileostomy	1. Galactosemia (4) 2. bowel obstruction 3. Rectal bleeding 4. Colostomy / ileostomy	1. galactosemia
Drug interactions	1. Studies on the interaction with other drugs have not been conducted. 2. Under the influence of antacid preparations, neutralization of lactic acid is possible (1). 3. Do not take together with antifungal drugs (3).	1. Studies on the interaction with other drugs have not been conducted. 2. Under the influence of antacids, neutralization of lactic acid, which is part of some drugs, is possible. 3. Ethyl alcohol reduces the concentration of PABA, since the vitamin enters the neutralization reaction and is consumed more intensively. PABA reduces the effectiveness of penicillin	1. Studies on the interaction with other drugs have not been conducted. 2. Under the influence of antacids, neutralization of lactic acid, which is part of some drugs, is possible.	1. Studies on the interaction with other drugs have not been conducted. 2. Under the influence of antacids, neutralization of lactic acid, which is part of some drugs, is possible.

Clinial cases and test control

Task №1

An active duodenal ulcer was found in the patient during FGDS. A significant increase in basal and stimulated secretion was noted; it was detected despite the 1st-line anti-Helicobacter therapy a year ago. The physician prescribed ranitidine. During treatment, an improvement in the patient's condition was noted, but ulcer did not heal completely.

a. which drug that suppresses Helicobacter pylori and at the same time protects the surface of the ulcer from irritation should be prescribed to the patient.

b. what else should be added for eradication of Helicobacter pylori?

Task №2

An elderly patient came to the clinic with complaints of burning and discomfort in the epigastrium, mainly after eating. From the anamnesis it is known that a patient takes NSAIDs for a long time because of rheumatoid arthritis.

a. what preliminary diagnosis and what examinations are necessary to clarify the diagnosis;

b. what is the tactics of managing the patient.

Task №3

A patient came to the clinic with complaints of heartburn, a sensation of a sour taste in the mouth, belching of food eaten. During the examination, a diagnosis of gastroesophagoreflux disease was made.

a. prescribe the necessary treatment.

Solving:

Task №1

a) the patient must be prescribed a bismuth drug - tricali dicitrate bismuthate (Denol), which combines gastroprotective and antibacterial action;

b) for the eradication of Helicobacter pylori, it is also necessary to prescribe metronidazole and one of the β-lactam antibiotics (amoxicillin or clarithromycin).

Task №2

a) NSAID gastropathy;

b) eradication of H. pylori (if any), prescription of antisecretory drugs with a therapeutic and then ─ prophylactic purpose.

Task №3

a) the main groups of drugs

- antisecretory drugs
- prokinetic drugs
- cholestyramine or ursodeoxycholic acid (if bile reflux is proven)

Task № 1

A patient with a diagnosis of coma of unspecified etiology was delivered to the admission department of the clinic. It is known that the patient had repeated vomiting during the day. From the anamnesis it is known that he suffers from duodenal ulcer for a long time. On examination dry skin, a decrease in its turgor, pointed features, sunken eyes, severe tachycardia, blood pressure 60/30 mm RT present. When examining the abdomen,

increased peristalsis, the presence of splashing noise and a low location of the border of the stomach were found.

a. formulate a diagnosis;
b. identify the possible cause of the development of this condition;
c. make a plan for the necessary examination to clarify the diagnosis;
d. determine the tactics of management and treatment of this patient.

Task № 2

Make tactics of management and treatment of a patient with a diagnosis of mainly fundic atrophic gastritis with intestinal metaplasia, possibly autoimmune.

a. make an examination plan;
b. determine the tactics of management and treatment of this patient.

Task № 3

Determine the management and treatment tactics of the patient with a diagnosis of Helicobacter pylori gastritis, active, mainly antral.

Task № 4

Determine the tactics of management and treatment of a patient with a diagnosis of ulcerative colitis, acute form, severe course, total damage to the colon, severe inflammation, toxic dilatation of the colon.

Test control:

1. For cimetidine, the following statements are characteristic:

1. is 2-generation H2 histaminolytic;
2. reduces the secretion of hydrochloric acid and pepsin in response to distention of the stomach;
3. weakly suppresses nocturnal gastric secretion;
4. effective in the treatment of Zollinger-Ellison syndrome;
5. simultaneous combination of the drug with antacids is irrational;
6. there is a synergy of action when combined with pirensepin.

2. Almagel has the following effect:

1. antacid;
2. absorbent;
3 enveloping;
4. choleretic;
5. carminative.

3**. Licorice root preparations that activate mucosal regeneration are:**

1. carbenoxolone-Na;
2. liquiryton;
3. oxyferriscorbone - Na;
4. glycyram;
5. caleflon;
6. sucralfate.

4. The effects of metoclopramide are:

1. has a stimulating effect on central dopaminoreceptors;
2. eliminates a spasm of the esophageal-gastric sphincter;
3. increases the motor activity of the pyloric stomach;

4. has an antiemetic effect;
5. slows down the progression of the chyme in the small intestine;
6. All answers are correct.

5. Non-selective peripheral and central muscarinic receptor blockers are all except:
1. metacin;
2. aprofen;
3. atropine;
4. troventol;
5. Platifillin;
6. pirencepin.

6. The following statements are characteristic of ranitidine:
1. The average daily dose is 750 mg;
2. able to enhance enzyme-mediated inactivation of histamine;
3. does not change the activity of microsomal liver enzymes;
4. has a pronounced antiandrogenic activity;
5. Does not require dose adjustment in case of impaired renal excretory function.

7.Vicalin has effects:
1. antacid;
2. astringent;
3. laxative;
4. anti-inflammatory;
5. antispasmodic.

8. The effects of a biogastron are all except:
1. stimulates mucus secretion by mucocytes;
2. prevents the back diffusion of H + ions into the mucous membrane;
3. promotes the development of hyperkalemia;
4. Causes water retention in the body;
5. has a hypotensive effect.

9. Indications for metoclopramide are all except:
1. reflux esophagitis;
2. hypotonic form of biliary dyskinesia;
3. spasm of the cardio-esophageal sphincter;
4. duodenal gastric reflux;
5. postoperative intestinal atony.

10. Contraindications for atropine are all except:
1. paroxysmal supraventricular tachycardia;
2. glaucoma;
3. pylorospasm;
4. AV blockage;
5. hypotension of the gallbladder.

11. Indicate the side effects of cimetidine:
1. bronchospasm;
2. reduced production of gonadotropins;
3. increased activity of hepatic transaminases;
4. hypergastrinemia;
5. exacerbation of skin manifestations of SLE;

6. hemolytic anemia.

12. Almagel A is characterized by the following statements:

1. has an antacid and adsorbing effect;
2. has a choleretic effect;
3. ineffective for gastralgia;
4. Contraindicated in concomitant diabetes mellitus;
5. Promotes the development of hyperphosphatemia.

13. The effects of enprostil are all except:

1. suppression of the secretion of hydrochloric acid;
2. antipepsin activity;
3. increased secretion of buffer bicarbonates;
4. Normalization of microcirculation in the mucous membrane;
5. Reducing the back diffusion of H + ions into the mucous membrane;
6. tocolytic activity.

14. Drugs for gastroparesis:

1. platyphyllin;
2. metoclopramide;
3. metacin;
4. cisapride;
5. domperidone;
6. pirenzepine.

15. Eglonil has the following effects:

1. inhibits the secretion of hydrochloric acid;
2. inhibits the release of gastrin;
3. increases the tone of the pyloric sphincter;
4. has a neuroleptic effect;
5. improves blood flow in the abdominal organs.

16. Famocide is characterized by the following statements:

1. refers to H-2 histaminolytics of the 4 generations;
2. increases the activity of microsomal liver enzymes;
3. The average daily therapeutic dose in the treatment of peptic ulcer 12 p.k. 40 mg;
4. ineffective in the treatment of erosive and reflux esophagitis;
5. Able to reduce appetite.

17. Side effects of almagel are:

1. Hypotension of the gallbladder;
2. hypophosphatemia;
3. osteomalacia;
4. constipation;
5. violation of taste;
6. All answers are correct.

18. Relaxation of the smooth muscles of the gastrointestinal tract can be caused by:

1. metoclopramide;
2. drotaverine;
3. pirencepin;
4. probantine;
5. coordinax;

6. Fubromegan.

19. The effects of dalargin are:

1. antisecretory activity (HCl, pepsin);
2. analgesic effect;
3. sedative effect;
4. decrease in somatostatin production;
5. hypotensive effect.

20. Nizatidine:

1. does not affect the activity of pepsin in the gastric juice;
2. causes moderate hyperprolactinemia;
3. antacids can cause a violation of the absorption of nizatidine;
4. increases the level of hepatic transaminases in the blood serum;
5. ineffective in symptomatic gastric ulcers.

21. Indicate the effects of de-nol:

1. stimulates the secretion of bicarbonates of gastric juice;
2. has a bactericidal effect against H. pylori;
3. is a cytoprotector;
4. inhibits the synthesis of Pg E;
5. With prolonged use may cause neurotoxic reactions.

22. Non-systemic antacids are:

1. aluminum hydroxide;
2. bismuth nitrate;
3. sodium citrate;
4. magnesium trisilicate;
5. sodium bicarbonate.

23. Side effects of cerucal are:

1. galactorrhea;
2. parkinsonism;
3. duodeno-gastric reflux;
4. gynecomastia;
5. nausea, vomiting.

24. Atropine:

1. suppresses the secretion of bronchial glands, but stimulates the secretion of sweat glands;
2. suppresses the function of cardiac automaticity;
3. increases intraocular pressure;
4. eliminates the spasm of the ureters and the intestine;
5. may cause a moderate increase in blood pressure;
6. All answers are correct.

Correct answers: 1-2,4,5,6; **2-**1,2,3,4,5; **3-**1,2,4; **4-**3,4; **5-**4,6; **6-**2,3; **7-**1,2,3,4,5; **8-**3; **9-**5,3; **10-**3,4; **11-**1,2,3,5,6; **12-**1,2; **13-**6; **14-**2,4,5; **15-**1,2,4,5; **16-**3,5; **17-**2,3,4,5; **18-**2,3,4,6; **19-**1,2,3,5; **20-**3,4; **21-**1,2,3,5; **22-**1,2,4; **23-**1,2,4; **24-**3,4,5.