

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

TOPIC 17: « DRUGS AFFECTING GASTROINTESTINAL SYSTEM »

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

Medical statistics show that in recent decades, gastrointestinal pathologies have taken a leading place in the list of diseases. Specialists confirm that the majority of city dwellers to a greater or lesser extent suffer from eating disorders.

The modern rhythm of life, full of permanent stress, bad ecology, wrong and irrational nutrition lead to the fact that by the age of 30 every fourth person has in his or her anamnesis one of the GIT diseases.

It is important to remember that there is a close connection in dysfunction of different parts of GIT: stomach, intestines, liver and pancreas. It predetermines the necessity of complex treatment with the inclusion of drugs of different pharmacological groups.

Patients with GIT pathology, especially of functional character, can be met at the reception of doctors of different specializations: general practitioners, gastroenterologists, neurologists and others.

All these facts make medicines influencing gastrointestinal function a necessity in practical medicine, and their knowledge is necessary for doctors of different specializations.

Learning objective:

- formation of scientific knowledge about the classification, pharmacokinetic and pharmacodynamic properties, indications for prescription and side effects of drugs that affect gastrointestinal functions for use in medical and preventive activities.

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:

- classification and basic characteristics of drugs that affect the functions of the gastrointestinal tract, pharmacodynamics and pharmacokinetics, indications and contraindications for their use, side effects; dependence of pharmacotherapeutic effect on the properties of drugs, conditions of their use, depending on the characteristics and condition of the body;

- features of pharmacokinetics and pharmacodynamics of drugs on the topic of the class, advantages and disadvantages of different dosage forms used for the treatment of emergency conditions;

- principles of research and testing of new drugs affecting gastrointestinal functions; information and reference and search systems.

be able to:

- analyze the indicators of pharmacokinetics and features of pharmacodynamics of drugs that affect gastrointestinal functions, assess the possibility of the development of the effect when using them;

- analyze the effect of drugs on the topic of the class on the totality of their pharmacological properties and the possibility of their use for therapeutic treatment; write them out in prescriptions;

- use different dosage forms of drugs affecting the functions of the gastrointestinal tract, in the treatment of pathological conditions, based on the features of their pharmacodynamics and pharmacokinetics;

- work with scientific literature, search for information about the use and action of the studied drugs;

possess:

- skills of using basic pharmacokinetic parameters and information about the dependence of pharmacodynamics on the properties of drugs affecting gastrointestinal functions, conditions of use, features of their forms of release, dosage regime and ways of drug delivery to the body;

- rules of prescribing the studied drugs for the treatment, prevention of various diseases and pathological conditions, taking into account the indications;

- skills of choosing drugs that affect the functions of the gastrointestinal tract, for therapeutic measures for the most common diseases and conditions in the adult population and adolescents;

- skills to search, analyze and summarize information about the use and effect of drugs on the topic of the class.

Motivation for learning the topic:

The specifics of training doctors in this specialty determines the need for purposeful study of students' knowledge of the classification, pharmacokinetic and pharmacodynamic properties, indications for prescription and side effects of drugs that affect gastrointestinal functions.

MATERIAL EQUIPMENT

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

CONTROL QUESTIONS FROM RELATED DISCIPLINES

1. Anatomical and physiological features of the gastrointestinal tract.
2. Neurohumoral regulation of the digestive tract. Digestive enzymes.
3. Vomiting. Mechanisms of its development.
4. Mechanisms of the main pathological conditions of the gastrointestinal tract (gastritis, gastroduodenal ulcers, GERD, pancreatitis, etc.).

CONTROL QUESTIONS ON THE TOPIC OF THE CLASS

1. General characteristics of drugs used to correct impaired digestive functions. The main classes of drugs, mechanisms of action, pharmacological and side effects, use.

2. Drugs affecting appetite and digestive processes. Antianorexic drugs (appetite enhancers): wormwood tincture, cyproheptadine. Anorexic agents: phenylpropanolamine, dexfenfluramine. Limitations and dangers of use, side effects of anorectics.

3. Drugs to treat obesity: anorectics, oral hypo-glycemic drugs (metformin, acarbose), intestinal lipase inhibitors (orlistat), drugs that create a satiety effect (methylcellulose).

4. Digestive agents: pepsin, pancreatin, tilactase, diluted hydrochloric acid.

5. Means used for the treatment of gastric and duodenal ulcers. Drugs that reduce the activity of acid-peptic factor: Antacids and simethicone (aluminum and magnesium hydroxides, sodium hydrocarbonate, aluminum-magnesium complexes, combined antacids with simethicone and sodium alginate), neutralizing activity, speed and duration of action of antacids; proton pump blockers (omeprazole, lansoprazole, esomeprazole); histamine H₂-receptor blockers (famotidine, ranitidine); selective M₁-cholinoblockers (pirenzepine); gastrin receptor blockers (proglumide). Drugs that have a protective effect on the mucous membrane of the stomach and intestine (gastroprotectors): bismuth tricalium dicitrate, sucralfate, misoprostol. Means for eradication of *Helicobacter pylori*: omeprazole, bismuth preparations, metronidazole, clarithromycin, amoxicillin.

6. Vomiting agents (apomorphine). Mechanisms of action and peculiarities of use.

7. Antiemetics: ondansetron, granisetron, metoclopramide, dom-peridone, promethazine, hyoscine hydrobromide (for sea air illness), beta-histine (for Meniere's syndrome), nabilon, aprepitant. Selection of an antiemetic depending on the cause and mechanism of vomiting.

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. Phytotherapy of gastrointestinal diseases.
2. Peculiarities of *Helicobacter pylori* eradication in the Republic of Belarus.

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

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Orexigenics (appetite stimulants) are drugs increasing appetite.

Classification	Reflex action	Central action	Anabolics
Drugs	<ol style="list-style-type: none"> 1. Wormwood tincture 2. Infusion of Centaurium herb 3. Infusion of trefoil water 4. Juice of plantain 	<ol style="list-style-type: none"> 5. Cyproheptadine (Peritol) 	<ol style="list-style-type: none"> 6. Insulin (small doses) 7. Apilac 8. Retabolil (Deca-Durabolin)
Mechanism of action	<ol style="list-style-type: none"> 1. Irritate taste receptors of the tongue and oral mucosa → reflex activation of brain centers and ↑ secretion of gastric juice for food intake 	<ol style="list-style-type: none"> 1. Central H1-antihistaminic and antiserotonin action → depression of the feeding center, stimulation of the hunger center 	<ol style="list-style-type: none"> 1. It facilitates the transport of glucose through cell membranes and its assimilation by peripheral tissues, promotes the conversion of glucose into glucose-6-phosphate and into glycogen in the liver, and ↓ its "release" from the liver → ↓ blood glucose level (6) 2. Promotes assimilation of carbohydrates, proteins and fatty acids by tissues, ↑ synthesis of proteins and fatty acids and ↓ release of the latter from fat stores (6,8) 3. Stimulates cellular metabolism, regenerative processes, improves trophism of tissues (7) 4. Delays nitrogen, calcium, phosphorus, sodium, potassium, chlorides, water in the body (8)
Pharmacological effects	<ol style="list-style-type: none"> 1. ↑ secretion of gastric juice 2. ↑ appetite, improvement of digestion 	<ol style="list-style-type: none"> 1. ↑ appetite 2. Antihistamine effect 3. Sedative effect 4. Holinolytic effect 	<ol style="list-style-type: none"> 1. Anabolic effect 2. Hypoglycemic effect (6) 3. Antifatigue effect (7)
Indications for use	<ol style="list-style-type: none"> 1. Hypoacid and chronic atrophic gastritis 2. Anorexia nervosa 3. Postoperative period 	<ol style="list-style-type: none"> 1. Neurogenic anorexia 2. Constitutional thinness 3. Urticaria, vasomotor rhinitis 4. The period of convalescence 	<ol style="list-style-type: none"> 1. Dysfunction in convalescents, cachexia, anorexia 2. Diabetes mellitus (6) 3. Atony of the stomach (6) 4. Neurotic disorders (7) 5. Lactation in the postpartum period (7) 6. Chronic kidney diseases accompanied by loss of protein (8)
Side effects	<ol style="list-style-type: none"> 1. Allergic reactions 2. Dyspeptic disorders 	<ol style="list-style-type: none"> 1. Somnolence 2. Dry mouth 3. Nausea 	<ol style="list-style-type: none"> 1. Hypoglycemia (6) 2. Allergic reactions 3. Sleep disorder (7) 4. Dyspeptic disorders (8) 5. Impairment of liver function (8)
Contraindications	<ol style="list-style-type: none"> 1. Hyperacidic gastritis 2. Gastroduodenal ulcer 3. Reflux-esophagitis 	<ol style="list-style-type: none"> 1. Glaucoma 2. Prostatic hypertrophy 3. Urinary retention 4. Predisposition to edema 5. Pregnancy 	<ol style="list-style-type: none"> 1. Hypoglycemia (6) 2. The gastroduodenal ulcer (6) 3. Addison's disease (7) 4. Breast and prostate cancer (8) 5. Hypercalcemia (8)

Anorectics (anorexigenics) are appetite suppressors.

Drug, substance	Mechanism of action	Major side effects	Allowed to use			FDA pregnancy categories
			Russia	USA	EU	
Orlistat (Xenical)	Inhibits gastrointestinal lipases → Inactivated enzymes are not capable of hydrolyzing food fat triglycerides into absorbable free fatty acids and monoglycerides → Undigested fats are not absorbed → Calorie deficit → mobilization of fat from the depot	1. Oily rectal discharge 2. Flatulence 3. Frequent bowel movements, mandatory defecation urges, stool incontinence	+	+	+	X
Lorcaseril (Belvik)	Antagonist of serotonin 5-HT _{2C} receptors; blocks the sense of hunger	1. Nausea, dry mouth, constipation 2. Headache, dizziness, fatigue	-	+ 2012	-	X
Phentermine (Fastin, Suprenza)	Sympathomimetic: ↑ noradrenaline release from the endings of adrenergic fibers → ↓ appetite	1. Dry mouth, constipation 2. Dizziness, moderate ↑ blood pressure, tachycardia, insomnia	-	+	-	X
Amfepramone (Diethylpropion)			-	-	-	B
Mazindol (Tenorak)		1. Dry mouth, nausea 2. Headache, sleep disorders, ↑ BP 3. Retention of urination 4. Sweating, allergic skin rash	-	- 1980	-	N
Sibutramine (Meridia, Lindax)	Inhibits reuptake of neurotransmitters (serotonin and noradrenaline) in the synaptic cleft → ↑ feeling of satiety, ↓ food demand	1. Somnolence, headache 2. Dry mouth, indigestion 3. Palpitation, tachycardia, increased blood pressure, hyperemia of the skin 4. Sweating, itchy skin 5. Grippopodobny syndrome, rhinitis	-	- 2010	- 2010	C
Rimonabant (Zimulti)	Cannabinoid receptor antagonist	1. Nausea, vomiting 2. Neurological and psychiatric disorders, convulsions, depression, anxiety, insomnia, aggressiveness, suicidal thoughts	- 2009	- 2007	- 2008	N
Fenfluramine (Minifage) Dexfenfluramine (Isolipan)	↑ serotonin level in the central nervous system → ↑ feeling of satiety	1. Pulmonary hypertension and valvular heart disease 2. Dizziness, headache 3. Asthenia, irritability, insomnia, somnolence, nightmares, depression 4. Dry mouth, nausea, diarrhea, frequent urination	-	- 1997	-	C
Fluoxetine (Prozac)	Antidepressant, selective serotonin reuptake inhibitor	1. Diarrhea, indigestion 2. Headache, dizziness, insomnia, hot flashes, atrial flutter, tremor, neurosis, ↓ libido 3. Frequent urination, gynecological bleeding 4. Skin rash 5. Hypotension, dysphagia	+	+	+	C

Topiramate (Топамакс)	Activation of GABAergic systems and blockade of glutamatergic receptors	1. Anorexia, nausea, abdominal pain, increased fatigue 2. Ataxia, confusion, impaired concentration, emotional lability, dizziness, paresthesia, amnesia, depression 3. Impairment of vision or speech, conjunctivitis, nystagmus, perversion of taste sensations 4. Chills, leukopenia, dyspnoea, swelling, nosebleed 5. Nephrolithiasis, hematuria, dysmenorrhea, weakening of libido	+	+	+	D
Metformin (Глюкофаж, Сиофор)	↑ sensitivity of tissues to insulin, ↑ peripheral glucose uptake, ↑ oxidation of fatty acids, ↓ glucose absorption in the gastrointestinal tract	1. Metallic taste in the mouth 2. Anorexia, diarrhea, nausea, vomiting, flatulence, abdominal pain decreasing during meals	+	+	+	B
Liraglutide (Виктоза)	It binds to the glucagon-like peptide-1 receptor → ↑ insulin production and ↓ glucagon production (if hyperglycemia) / ↓ insulin production (if hypoglycemia) and does not affect glucagon	1. Pancreatitis, gallbladder disease, impaired renal function 2. Suicidal depressions 3. ↑ heart rate, headache 4. Nausea, diarrhea, vomiting, constipation 5. Hypoglycemia	-	+ 2014	-	C
Bupropion (Веллбутрин)	Inhibits the reuptake of norepinephrine + is an antagonist of nicotinic acetylcholine receptors	1. Dry mouth, dyspeptic disorders 2. Visual disorders, ringing of the ears 3. ↑ blood pressure, rash, itchy skin, sweating, fever, chest pain, asthenia, tachycardia	+	+	+	C
Venlafaxine (Велаксин)	Inhibits reuptake of neurotransmitters (serotonin and noradrenaline) in the synaptic cleft → ↑ feeling of satiety, ↓ food demand	1. Dizziness, asthenia, weakness, insomnia, nightmares, increased nervous excitability 2. Paresthesia, muscle hypertension, tremor, sedation, ↑ blood pressure, skin flushing, decreased appetite, nausea, vomiting 3. ↓ libido, erectile dysfunction and / or ejaculation, menorrhagia, urination disorder 4. Disturbance of accommodation, mydriasis, impaired vision	+	+	+	C
Lisdexamfetamine (Виванс)	Psychostimulant: promotes the release of norepinephrine and dopamine	↓ appetite, insomnia, abdominal pain, headache and irritability	-	+	+	C

Indications for use

1. Alimentary obesity with body mass index (BMI) from 30 kg / m² and more
2. Alimentary obesity with a BMI of 27 kg / m² and risk factors associated with excess weight (dyslipoproteinemia, diabetes)

Fluoxetine – for patients with obesity and sleep apnea, or night meals, or bulimia; *Topiramate* – for patients with obesity and bipolar disorders; *Метформин* – for patients with obesity and diabetes, obese women with polycystic ovaries, as well as for obese patients receiving antipsychotic drugs leading to insulin resistance; *Bupropion* – for smoking patients; *Venlafaxine* – for patients who eat at night; *Lisdexamfetamine* – for the treatment of psychogenic overeating in adults.

Emetics and antiemetics

Classification	Emetics	Antiemetics		
		Serotonin antagonists	Dopamine antagonists	Substance P antagonists
Drugs	<i>Central action:</i> 1. Apomorphine <i>Reflex action:</i> 2. Syrup of Ipecacuanas 3. Copper sulphate, zinc sulphate	4. Ondasetron (Vero-ondasetron, Emetron) 5. Granisetron (Citril), 6. Tropisetron (Novoban)	<i>Central:</i> 7. Metoclopramide (Raglan, Cerucal) <i>Peripheral:</i> 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-HT ₃ -serotonin receptors	1. Depresses the emetic center and chemoreceptor trigger zone of the medulla oblongata (7) 2. Blocks dopamine (D ₂) and serotonin (5-HT ₃) 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. Extrapyrarnidal disorders 5. Bronchospasm, allergic reactions	1. Extrapyrarnidal 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.			

Antiulcer drugs: agents that inhibit the system of aggression factors

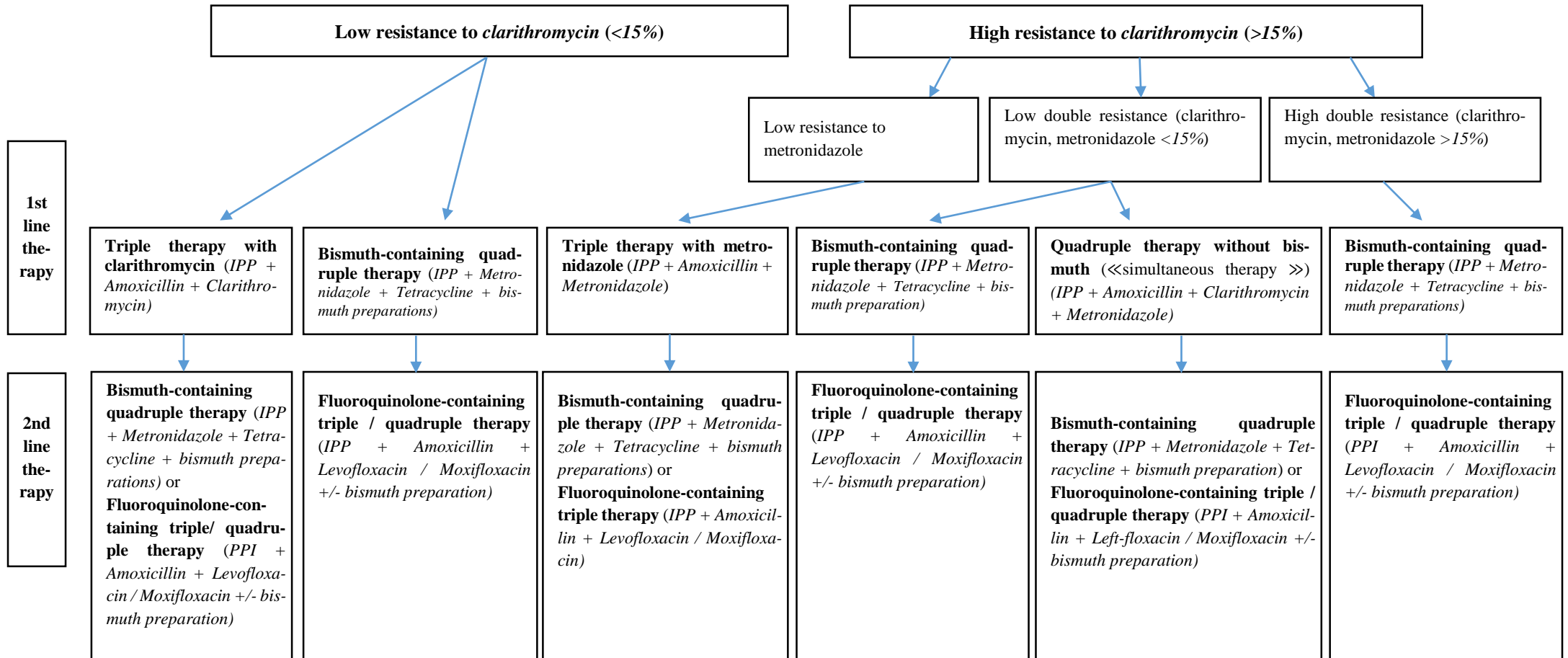
Classification	Antacid agents			Antisecretory agents		
	Systemic	Non-systemic	Astringents	Selective muscarinic (M1) antagonists	Proton pump inhibitors (PPI)	Histamine (H2) antagonists
Drugs	1. Sodium bicarbonate 2. Calcium carbonate 3. Sodium citrate	4. Magnesium oxide 5. Magnesium hydroxide 6. Aluminum hydroxide-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 (Dexylo-lanth) 18. Dexrabeprazole	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 H ₂ -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 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 7. ↑ risk of Clostridium difficile-associated diarrhea	1. Headache 2. Nausea, constipation 3. Skin rash 4. Liver dysfunction 5. Tachycardia 6. ↓ libido
Contraindications	1. Alkalosis 2. Hypercalcemia, nephrourolithiasis, 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.					

Antiulcer drugs: agents that activate defense factors

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 <i>Helicobacter pylori</i> (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)

IHD – ischemic heart disease, AH – arterial hypertension

H.pylori eradication («Maastricht-V», 2015)



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.