DRUGS INFLUENCING THE GASTROINTESTINAL TRACT. ANTISPASTIC DRUGS.

A. Actuality. Gastrointestinal diseases associated with disruptions in the secretory function of glands, tone and motility of smooth muscles, bile formation and secretion, as well as liver functions, are prevalent in medical practice. Treating diseases and pathological conditions of the digestive tract involves utilizing a wide array of drug groups, necessitating extensive knowledge for the rational selection of effective and safe pharmacotherapy.

B. The purpose of the training: is to familiarize students with drug classes that influence gastrointestinal tract functions and the principles of selecting the appropriate drugs for specific diseases.

C. Learning objectives:

a) The students **must know:** classification, mechanisms of action, effects, indications, contraindications and side effects of drugs with influence on the functions of gastrointestinal tract.

b) The students **must be able to:** prescribe the drugs influencing the gastrointestinal tract and choose them in specific pathologies.

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

Histology. Morphological and functional characteristics of gastrointestinal tract. General principles of gastrointestinal tract structure: mucosa, submucosa and serous membranes. General characteristics of mucosa, its structure. Peculiarities of mucosa in different gastrointestinal tract regions. The pancreas: morphofunctional characteristics. Exocrine and endocrine pancreas, vascularization and innervation. The liver. Morphofunctional characteristics. The hepatic lobe as the structural unit of the liver. The structure of hepatocytes. Peculiarities of vascularization. The ability of the liver to (self) regenerate. Gall bladder, bile ducts, their structure. Bile ducts mucosal regeneration.

Human physiology. The importance of digestion. Physiological basis of gastric secretion. The composition and properties of gastric juice, its importance. Gastric juice enzymes and their action. Mechanism of gastric secretion, its regulation. Phases of gastric juice secretion. The influence of humoral factors on the stomach glands. Enterogastrin, enterogastrona. Duodenal digestion. The role of the duodenum in digestion. The composition and properties of pancreatic juice, its action on proteins, carbohydrates, lipids, nucleic acids. Enterokinase. The mechanism of smooth muscle tone and motility regulation. Physiology of the vegetative nervous system (sympathetic and parasympathetic). Regulation of the tone and motility of the internal organs (stomach, intestine, gall bladder and bile ducts). The role of bile in digestion. The mechanism of bile formation in the liver. Elimination of bile in the duodenum. Stimulants of bile secretion. Digestion in the small and large intestine. Intestinal juice. Absorption of substances in the digestive tract. The motility of the digestive tract. Antiperistaltic movements, vomiting.

Biochemistry. The main nutritive substances. Digestion of carbohydrates, proteins, lipids. Absorption. Putrefaction in the intestine. Biochemical regulatory mechanisms of digestion. Parenteral feeding.

Pathophysiology. Gastrointestinal disorders related to gastric and intestinal secretion (secretion, motility, absorption and excretion). Dysregulation of digestive function in

the duodenum due to insufficiency of pancreatic juice and bile. Diarrhea, constipation.

E. Self-training questions:

1. Classification of drugs affecting the functions of gastrointestinal tract.
2. Drugs used in gastric hyposecretion: classification, mechanism of action and principles of use.
3. Drugs for replacement therapy in pancreas hypofunction.: classification, components and mechanism of action, effects, indications, adverse reactions.
4. Drugs used in gastric hypersecretion: classification.
5. M-cholinoblockers as anti-ulcer: classification, mechanism of action, anti-ulcer effect, indications, side effects.
6. H_2-histaminoblockers as anti-ulcer: classification, mechanism of action, anti-ulcer effect, indications, side effects.
7. Proton pump inhibitors as anti-ulcer: classification, mechanism of action, anti-ulcer effect, indications, side effects.
8. Drugs with antigastrine action and somatostatin analogs as antiulcer: classification, mechanism of action, antiulcer effect, indications, side effects.
9. Antacids: classification, mechanism of action, effects, indications, side effects.
10. Gastroprotectors and cytoprotectors: classification, mechanism of action, effects and indications of sucralfate, bismuth drugs, prostaglandin analogs, herbal and synthetic drugs, vitamins.
11. Classification of antiulcer drugs.
12. Drugs that inhibit the exocrine function of the pancreas: mechanism of action, effects, indications.
13. Classification of drugs that stimulate the motility of the digestive tract.
14. Prokinetic drugs: mechanisms of action, effects, indications, side effects.
15. Laxatives and purgatives: classification. Mechanisms of action, effects, indications and side effects of volume and emollient laxatives, osmotic and irritating purgatives.
16. Antiflatulents: classification. Mechanisms of action and indications of adsorbent, surfactant, parasympathomimetic drugs, enzymes and vegetable carminatives.
17. Drugs that inhibit the motility of digestive tract: classification.
18. Antiemetics: classification by pharmacological group. Mechanisms of action and indications of neuroleptics, M-cholinoblockers, H1-antihistamines, dopaminergic and serotoninergic antagonists.
19. Antidiarrheals: classification. Mechanisms of action, effects and indications of M-cholinoblockers, opioid and like opioid drugs, astringent, adsorbent and protective drugs.
20. Hepatotropic drugs. Classification.
21. Hepatoprotectors: classification by origin, mechanisms of action, effects and indications. Hepatoprotectors by entomological origin.
22. Drugs with influence on formation, secretion and excretion of bile: classification.
23. Choleretics: classification, mechanisms of action, effects, indications.
24. Cholecystokinetics: classification, mechanisms of action, effects, indications
25. Colespasmolytics: mechanism of action, effects and indications.
26. Classification of spasmolytics.
27. Neurotropic spasmolytics: mechanism of action, indications.
28. Myotropic spasmolytics: classification, mechanism of action, indications.
29. Combined spasmolytics: classification, mechanism of action, indications.

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

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

1. Pancreatin. 2. Creon. 3. Famotidine. 4. Omeprazole. 5. Almagel. 6. Sucralfate. 7. Bismuth subcitrate. 8. Regesan. 9. Aprotinin. 10. Metoclopramide. 11. Simethicone. 12. Magnesium sulfate. 13. Bisacodyl. 14. Sodium picosulphate. 15. Thyethylperazine. 16. Ondansetron. 17. Lactulose. 18. Macrogol. 19. Loperamide. 20. Enterol. 21. Bactisubtil. 22. Essentiale. 23. Ademetionine. 24. Silymarin. 25. Ursodeoxycholic acid. 26. Holosas. 27. Papaverine hydrochloride. 28. Drotaverine. 29. Atropine sulfate. 30. Platiphylline. 31. Baralgin.

Nr.	***The name of the drugs***	***Delivery forms***
1	**Ursodeoxycholic acid**	Tablets / Capsules 0.1; 0.25 Suspension 5% - 250ml in vials
2	**Ademetionine**	Tablets 0.4 Lyophilized powder 0.4 in vials (i/v)
3	**Atropine sulphate**	Tablets 0.0005 Sol. 0.05%; 0.1% - 1ml in ampoules Sol. 0.1% - 10ml in vials (internally)
4	**Bactisubtil**	Capsules 0,035
5	**Baralgin**	Tablets Nr. 20 Sol. 5ml in ampoules
6	**Bisacodyl**	Tablets / Dragees 0.005 Rectal suppositories 0.01
7	**Holosas**	Syrup 140 ml in bottles
8	**Drotaverine**	Tablets 0.04 Sol. 2% - 2ml in ampoules
9	**Enterol**	Capsules 0,25
10	**Essentiale**	Capsules Nr. 30 Sol. 5ml in ampoules
11	**Loperamide**	Tablets / Capsules 0.002 Sol. 0.02% - 100ml in bottles
12	**Magnesium sulfate**	Powder 10.0; 20.0 in sachets Sol. 10%; 25% - 5ml in ampoules
13	**Metoclopramide**	Tablets 0.005; 0.01 Sol. 0.1% - 100ml in bottles Sol. 0.5% - 2ml in ampoules Aerosol 20% - 2ml; 40%-4ml (intranasal)
14	**Ondansetron**	Tablets 0.004; 0.008 Rectal suppositories 0,004; 0,008 Syrup 0.8% - 50ml in bottles Sol. 0.2% - 2ml in ampoules
15	**Papaverine hydrochloride**	Tablets 0.02; 0.04 Sol. 2% - 2ml in ampoules Rectal suppositories 0.2

16	**Platiphylline**	Tablets 0.005 Sol. 0.2% - 1ml in ampoules Rectal suppositories 0.01
17	**Silymarin**	Tablets / Capsules / Dragees 0.07; 0.14
18	**Simethicone**	Tablets / Capsules 0.04 Emulsion 10% - 50ml in bottles
19	**Thyethylperazine**	Dragees 0.0065
20	**Lactulose**	Syrup 66.7%-200, 500ml in bottles Syrup 66.7% - 15ml in sachets
22	**Macrogol**	Powder 4.0 in sachets
22	**Sodium picosulfate**	Sol. 0.75% - 15ml in vials (for internal use) Tablets 0.0075
23	**Almagel**	Suspension 170ml and 200ml
24	**Aprotinin**	Lyophilized powder 10000 AU in vials Sol. (10000 AU/1ml) 10ml in ampoules
25	**Famotidine**	Tablets 0.02; 0.04 Lyophilized powder 0.02 in vials
26	**Creon**	Dragees N.50
27	**Omeprazole**	Tablets / Capsules 0.02; 0.04 Lyophilized powder 0.04 in vials
28	**Pancreatin**	Tablets / Dragees 8000UA
29	**Regesan**	Oil in bottles 50ml; 100ml
30	**Bismuth subcitrate**	Tablets 0,12
31	**Sucralfate**	Tablets 0.5; 1.0 Granules 0.5/1.0 in sachets Gel 20% - 5ml (internal) Suspension 250ml (0.5/5ml) in bottles (internal)

2) List the groups and drugs used in (for): replacement drugs in hypoacid gastritis; antisecretory drugs in reflux esophagitis; antisecretory drugs in Zollinger-Ellison syndrome; antisecretory drugs in gastric and duodenal ulcers; antacids in duodenal ulcer; proteolytic enzymes inhibitor in acute pancreatitis; substitution drugs in chronic pancreatitis; enzymatic drugs in food abuse; gastroprotective in gastric and duodenal ulcers; gastric hypomotility; flatulence after surgery; flatulence and intestinal distention; flatulence in disorders of intestinal digestion; flatulence in functional disorders of the digestive tract; antiflatulents for radiological and ultrasonographic examination of digestive tract; laxatives in chronic functional constipation; laxatives in hepatic encephalopathy; purgatives for radiological and endoscopic examination of digestive tract; purgatives for preparation for surgery; purgatives in drug or food poisoning; vomiting induced by drugs; vomiting in motion sickness; vomiting induced by antitumor drugs; postoperative vomiting; vomiting of

pregnant women; vomiting in digestive tract diseases; acute non-specific diarrhoea, toxic hepatitis; chronic diseases of biliary tract; cholelithiasis; biliary colic; intestinal colic.

3)Tables (knowledge consolidation)

Table 1

Characteristic of spasmolytics

Spasmolytic groups	Mechanism of action	Indications
Neurotropic spasmolytics		
Myotropic spasmolytics		
Combined spasmolytics		

Table 2

Comparative characteristic of antacids

Drugs	Mechanism of action	Antiulcer effect	Indications	Side effects
Systemic				
Non-systemic - magnesium drugs				
Non-systemic – aluminum drugs				

Table N3

Comparative characteristics of gastric antisecretory drugs

Drugs	Mechanism of action	Antiulcer effect	Indications	Side effects
M-cholinoblockers				
H_2-histaminoblockers				
Proton pump inhibitors				
Gastrin antagonists				
Somatostatin analogs				

Table N4

Comparative characteristics of gastro- and citoprotective drugs

Drugs	Mechanism of action	Antiulcer effect	Indications	Side effects
Bismuth drugs				

Aluminium drugs				
Prostaglandine analougs				
Vegetable oils				
Synthetic drugs				

Table N5

Indications of antiemetic drug

Pharmacological group of drugs	Motion sickness	Postoperative vomiting	Vomiting in actinic disease	Chemotherapy - induces vomiting
M-cholinoblokers				
H_1-antihistamines				
Dopaminoblockers				
Neuroleptics				
Antiserotoninics				

Note: Sign the presence of the effect with "+"

Table N6

Comparative characteristic of laxative and purgative drugs

Group of drugs	Mechanism of action	Onset of action (hours)	Indications
Volume (bulk) laxatives			
Emollient laxatives (stool softeners)			
Osmotic (saline) purgatives			
Irritant purgatives acting on the small intestine			
Irritant purgatives acting on the large intestine			
Purgatives for rectal use			

Table N7

Characterization of choleretics and cholecystokinetics

	Choleretics containing bile acids	Choleretics of vegetal origin	Synthetic cholecystokinetics	Cholecystokinetics of vegetal origin

Drugs				
Mechanism of action				
Effects				
Indications				

4) Problems of situation:

1. Acute intoxication was simulated in two animals. The toxicant was administered intraperitoneally (equivalent to intravenous administration). One animal served as a control (received no treatment), while the second animal was internally administered a powdered drug. The untreated animal died, whereas the treated one survived.

Identify the group and specify the drug that contributed to survival.

Discuss the mechanisms of action of the drug that contributed to survival.

2. In experimental conditions, two scenarios of smooth muscle spasm in the biliary tract were simulated. In situation A, the spasm was induced by administering aceclidine, while in situation B, an inflammatory process was simulated. In both situations, drugs M (monocomponent) and N (combined) were employed to alleviate the spasm. Drug M proved most effective in situation A, while drug N was effective in both situations.

Identify the groups and specify the drugs M and N.

Explain the mechanisms of action of drugs M and N.

3. In experimental conditions, gastric ulcers were induced through three methods:

A) Stimulation of the vagus nerve

B) Administration of non-steroidal anti-inflammatory drugs (NSAIDs)

C) Modeling Zollinger-Ellison syndrome

Identify the groups and specify the drugs for treatment.

Explain the mechanism of action for each identified drug.

5)Tests for self-training (Guidelines for Laboratory Work in Pharmacology).

G) Interactive activity

1. Experimental and virtual didactic movie (elaboration of minutes, conclusions).

2. Clinical case (Guidelines for Laboratory Work in Pharmacology).

3. Virtual situations (Guidelines for Laboratory Work in Pharmacology).