Pharmaceutical care of patients with disorders of digestive system functions

- Heartburn
- Constipation
Epidemiology

The diseases of digestive system are widely spread in all types of population and different age groups.

The 30-40% of the population of industrialized countries complaint on dyspepsia.
Epidemiology
(the causes of widespread)

- stress
- ecology, physical and chemical factors of external environment
- unnecessary and uncontrolled use of medicaments, which affect the microflora of the body
- poor nutrition
- reduction in immunological reactivity
Heartburn

The burning sensation in the epigastric region and the sternum associated with reflux of stomach contents into the lower esophagus.
Heartburn

The **61.7%** men and **63.6%** women meet with heartburn, with **10.3%** and **15.1%** - frequently or constantly.

The global pharmaceutical market of antacids is about **$5 billion**.

Sales volume of antacids in the U.S. is about **$900 million** a year.
Factors, which promote heartburn:

- alcohol abuse
- smoking
- sleep or rest lying down immediately after eating
- wearing of tight clothes
- hypodynamia
- obesity
- weight lifting
Heartburn can occur:

- in healthy people
- in patients with digestive system diseases
The heartburn causes in people without digestive system diseases:

- irrational, inexpedient nutrition:
  - over-nutrition
  - a quick meal "on the fly", in a stressful environment
  - abuse of rich, oily, hot and spicy food
  - consumption of large quantities of sweets and foods containing caffeine (coffee, tea, chocolate)
The heartburn causes in people without digestive system diseases:

- the individual sensitivity to some foods – citrus fruits, onion, garlic, tomato products (juice, pasta, sauces)
- pregnancy
- medicament intake (euphylline, COCs, antispasmodics, cholinergics)
The heartburn causes in people with digestive system diseases:

- gastroesophageal reflux disease
- chronic gastritis (H. pylori associated, hyperacidic, type B)
- peptic gastric and/or duodenum ulcer
- chronic cholecystitis and biliary dyskinesia
- hiatal hernia
«Threatening» symptoms of heartburn:

- permanent heartburn during some weeks
- heartburn is accompanied with abdomen pain
- permanent heartburn associated with progressive weight loss
- heartburn is accompanied with breathlessness, sweating, dysphagia
- heartburn caused with some medicaments
- heartburn is accompanied with pain behind of the breastbone and irradiation to the left arm
Threatening symptoms of heartburn:

- Heartburn is accompanied with vomiting, which has “coffee grounds” colour or mixed with blood.
- Heartburn is accompanied with dark (black, tar-like) stool.

NB! Severe complication – gastrointestinal bleeding.
The approaches of drug and non-drug treatments of heartburn

- **symptomatic therapy** – neutralization of hydrochloric acid - antacids

- **pathogenetic therapy:**
  - blockage of $\text{H}_2$-histamine receptors, the suppressing of hydrochloric acid formation
  - inhibition of $\text{H}^+\text{-K}^+-\text{ATP}$-ase, suppressing of hydrochloric acid output
  - acceleration of gastric emptying,

- **prophylactic therapy** (diet, features of taking drugs, avoiding harmful habits)
Antacids – first line drugs for symptomatic treatment of heartburn

- The pharmacological effect of antacids applies only to already secreted acid
- Antacids don’t affect the intensity of acid secretion
The mechanism of action of antacids

- Neutralization of hydrochloric acid:
  \[
  \text{Al(OH)}_3 + 3\text{HCl} = \text{AlCl}_3 + 3\text{H}_2\text{O} \\
  \text{Mg(OH)}_2 + 2\text{HCl} = \text{MgCl}_2 + 2\text{H}_2\text{O}
  \]

- Reduction of activity of pepsin and its absorption

- Binding of bile acids and lysolecithin

- Inhibition of growth of H. pylori and the binding of the products of its vital activity

- Gastroprotective action
Antacids – first line drugs for symptomatic treatment of heartburn

**Absorbable**
- NaHCO₃, CaCO₃

**Non-absorbable**
- aluminum-containing (phosphate, hydroxide), magnesium (oxide, hydroxide, trisilicate)

**Advantages**
- fast HCl neutralization
- mechanical protection of mucous coat of stomach, absence of rebound phenomena, prolonged effect

**Disadvantages**
- short effect, rebound phenomena, systemic alkalosis, constipation (Ca²⁺), sodium and water retention
- bone affection, constipation, encephalopathy (Alzheimer's disease-like), muscle weakness
### Description of components of antacids

<table>
<thead>
<tr>
<th>Name</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium bicarbonate NaHCO₃</td>
<td>Very rapid onset of action</td>
<td>• Short-term action</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rebound phenomena</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Systemic alkalosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Nephrolithiasis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Arterial hypertension</td>
</tr>
<tr>
<td>Calcium carbonate CaCO₃</td>
<td>Rapid onset of action</td>
<td>• Systemic alkalosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Nephrocalcinosis</td>
</tr>
</tbody>
</table>

Intermittent use
don’t exceed the dose more than 1 g
## Description of components of antacids

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<thead>
<tr>
<th>Name</th>
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<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium oxide or hydroxide MgO or Mg(OH)&lt;sub&gt;2&lt;/sub&gt;</td>
<td>● Doesn’t cause the rebound phenomena</td>
<td>● Slow onset of action</td>
</tr>
<tr>
<td></td>
<td>● Doesn’t violate the acid-base balance</td>
<td>● Acceleration of the peristalsis of GI canal (diarrhea)</td>
</tr>
<tr>
<td></td>
<td>● Slow onset of action</td>
<td>● Neurological and cardiovascular disorders in case of chronic renal failure</td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• It’s recommended for patients with predisposition to diarrhea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• In long-term use it should be combined with calcium glycerophosphate and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>diet should contain enough amount of protein</td>
<td></td>
</tr>
</tbody>
</table>

| Aluminum hydroxide Al(OH)<sub>3</sub>     | ● Doesn’t complete neutralize of HCl                                          |                                                                                |
|                                           | ● Adsonpholipid (adsorbs bile salts)                                          |                                                                                |
|                                           | ● Enhances the PG synthesis                                                   |                                                                                |
|                                           | ● Doesn’t violate the acid-base balance                                      |                                                                                |
|                                           | ● Slow onset of action                                                       |                                                                                |
|                                           | ● Accumulation and encephalopathy in case of its long-term usage and chronic  |                                                                                |
|                                           | renal failure in history                                                     |                                                                                |
|                                           | • It’s recommended for patients with predisposition to constipation          |                                                                                |
|                                           | • In long-term use it should be combined with calcium glycerophosphate and    |                                                                                |
|                                           | diet should contain enough amount of protein                                 |                                                                                |
# Description of antacids

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphalugel</td>
<td>Aluminum phosphate ( \text{Al}_2(\text{PO}_4)_3 )</td>
</tr>
<tr>
<td>Talcid</td>
<td>Hydrotalcite</td>
</tr>
<tr>
<td>Ruracid</td>
<td>(magnesium aluminum hydrocarbonate)</td>
</tr>
<tr>
<td>Gastal</td>
<td>( \text{Mg}_6\text{Al}<em>2(\text{OH})</em>{16}\text{CO}_3 \bullet 4\text{H}_2\text{O} )</td>
</tr>
<tr>
<td>Almagel T</td>
<td>Magaldrate</td>
</tr>
<tr>
<td>Riopan</td>
<td>( \text{Al}<em>5\text{Mg}</em>{10}(\text{OH})_{31}(\text{SO}_4)_2 \bullet x\text{H}_2\text{O} )</td>
</tr>
<tr>
<td>Gelusil-Lac</td>
<td>Simaldrate ( 2\text{MgO} \bullet \text{Al}_2\text{O}_3 \bullet 3\text{SiO}_2 \bullet n\text{H}_2\text{O} )</td>
</tr>
<tr>
<td>Rennie Anre</td>
<td>Calcium carbonate, magnesium carbonate</td>
</tr>
<tr>
<td>Maalox</td>
<td>( \text{CaCO}_3, \text{MgCO}_3 )</td>
</tr>
<tr>
<td>Almagel</td>
<td>Aluminum hydroxide, magnesium hydroxide</td>
</tr>
<tr>
<td>Alumag</td>
<td></td>
</tr>
</tbody>
</table>
## Description of antacids

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almagel A</td>
<td>Aluminum hydroxide, magnesium hydroxide, benzocaine</td>
</tr>
<tr>
<td>Manti Trivin</td>
<td>Aluminum hydroxide, magnesium hydroxide, simeticon</td>
</tr>
<tr>
<td>Almagel Neo</td>
<td>Aluminum hydroxide, magnesium hydroxide, simeticon</td>
</tr>
<tr>
<td>Relcer</td>
<td>Aluminum hydroxide, magnesium hydroxide, simeticon, powder of root of licorice</td>
</tr>
<tr>
<td>Gestid</td>
<td>Aluminum hydroxide, magnesium hydroxide, simeticon</td>
</tr>
<tr>
<td>Contracid</td>
<td>Aluminum hydroxide, magnesium trisilicate, dimeticon</td>
</tr>
<tr>
<td>Digel</td>
<td>Magaldrate, simeticon</td>
</tr>
</tbody>
</table>
## Description of the OTC-drugs for heartburn treatment

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Composition</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranigast 75</td>
<td>ranitidine</td>
<td>75 mg</td>
</tr>
<tr>
<td>Quamatel mini</td>
<td>famotidine</td>
<td>10 mg</td>
</tr>
<tr>
<td>Gastromax</td>
<td>famotidine, calcium carbonate, magnesium hydroxide</td>
<td>10 mg,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>800 mg,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>165 mg</td>
</tr>
<tr>
<td>TECTA Control</td>
<td>pantoprazole</td>
<td>10 mg</td>
</tr>
<tr>
<td>Omez, Gasec, Omealox</td>
<td>omeprazole</td>
<td>10 mg</td>
</tr>
</tbody>
</table>
Gastromax

successful combination of antisecretory drug and antacids

Composition

- famotidine 10 mg
- calcium carbonate 800 mg
- magnesium hydroxide 165 mg
Advantages of Gastromax

- Rapid onset of antacidic action
- Long-term effect
- Antipeptic effect
- Easy use
- OTC-drug
## Description of antacids

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Composition</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almagel</td>
<td>Al(OH)$_3$ + Mg(OH)$_2$ + + +</td>
<td>-</td>
</tr>
<tr>
<td>Alumag</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Maalox</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almagel A</td>
<td>Al(OH)$_3$</td>
<td>-</td>
</tr>
<tr>
<td>Rutacid</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Talcid</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Phosphalugel</td>
<td>Aluminum phosphate, pectin</td>
<td>+</td>
</tr>
<tr>
<td>Гелусил-лак</td>
<td>Simaldrate</td>
<td>+</td>
</tr>
<tr>
<td>Ренни Анре</td>
<td>CaCO$_3$, MgCO$_3$</td>
<td>+</td>
</tr>
</tbody>
</table>

- **It has local anesthetic action**
- **It doesn’t include sugar and can be prescribed to patient with diabetes mellitus**
- **It doesn’t include sugar and can be prescribed to patient with diabetes mellitus**
Alginate-containing antacids are drugs with different mechanisms of action

- **Gaviscon** is used more than 30 years
  It’s the leader of sales in Great Britain among OTC-antacides and \( \text{H}_2 \)-blockers)

**Composition**

**Gaviscon Mint Suspension**
- sodium alginate 250 mg/5 ml
- sodium bicarbonate 133,5 mg/5 ml
- calcium carbonate 80 mg/5 ml

**Gaviscon Mint Tablets**
- sodium alginate 250 mg
- sodium bicarbonate 133,5 mg
- calcium carbonate 80 mg

**Gaviscon Forte Mint Suspension**
- sodium alginate 500 mg/5 ml
- potassium bicarbonate 100 mg/5 ml
Alginates are natural polysaccharide polymers extracted from brown algae (kelp).

**Mechanisms of action:**

In an acidic environment, alginates form a viscous gel – raft.
- Bicarbonate (K or Ca, Na) participates in the formation of $CO_2$. Carbon dioxide bubbles convert a gel into foam, thus, provide floatation. Also bicarbonate neutralizes acid.

**Effects:**
- Provides the reflux of the alginic raft into the esophagus before gastric content.
- Coats the esophagus with rafts, which can later act as cytoprotector.
- Forms a physical barrier that prevents GERD.
- The duration of acting up to 4 hours.
The algorithm of conversation of pharmacist and customers, who complains on heartburn

Is heartburn followed with pain and heaviness in epigastric area, nausea, vomiting, bitter taste in the mouth, abdominal distention?

Yes

You need to see a doctor. For the temporary relief of symptoms you can take antacids

No

Does heartburn occur when certain foods are taken or under certain conditions?

Yes

The cause of heartburn could be:
- irrational diet
- habit to lying down after meal

No

You need to change of lifestyle and diet. To relief the symptom you can take antacids
Are you pregnant?

Yes
During pregnancy, you can occasionally take antacids. If there is necessity of its prolonged use, you should consult with obstetrician.

No
Is the occurrence of heartburn accompanied by painful difficulty of swallowing, belching, regurgitation, painful sensations in the epigastric area?

Yes
You certainly need to see a doctor. For the temporary relief of symptoms you can take antacids.

No
If after 3 days of self-treatment the heartburn will not disappear or reduce you need to seek immediate medical care!

Is your condition:
- connected with stress
- followed by sensation of lump in the throat
- followed by sleeplessness

Yes
Perhaps your condition is associated with chronic stress. Consult with physician. To eliminate acid reflux you can take antacids.
Basic approaches to the symptomatic treatment of heartburn

- Antacids are used only when it necessary (in case of heartburn occurrence).
- It is necessary to exclude dietary factors that provoke the development of acid reflux.
- OTC drugs, which contain low doses of H₂-blockers (ranitidine, famotidine) possess antisecretory activity.
- For pregnant women for short-term/occasionally use the drugs of choice are Rennie, Anré, Talcid, Rutacid, Phosphalugel.
- Long-term use of aluminum-containing antacids is not recommended for elderly people (risk of Alzheimer's-like disease).
Pharmaceutical care when treating heartburn

- Do not take horizontal or flexed position after meals
- Do not eat late at night or just before bedtime
- Eat slowly, carefully chewing
- For patients who are overweight the weight loss is recommended
- Cigarette cessation
- Do not wear tight clothes
Pharmaceutical care when treating heartburn

- The use of products that contribute to gas formation (a sweet pastries, soufflés, carbonated drinks) should be limited
- Excess of aluminum due to prolonged intake of high doses can result in renal failure
- Nonabsorbable antacids should be intake up to 2 hours before or 2 hours after administration of other drugs
With prolonged use of antacids there is a tendency to infections of the digestive tract due to reduce of the protective role of hydrochloric acid.

Patients with stone disease should not take antacids containing silicon (magnesium trisilicate). While going out in the urine, trisilicate promotes the formation of stones.

All nonabsorbable antacids violate the absorption of concomitant medications (antibiotics, NSAIDs, glucocorticoids, etc.)

Patients with hypertension, chronic heart failure is contraindicated for reception of absorbable antacids.
Control question

What medicament are not recommended for symptomatic treatment of heartburn for patient with stone disease?

- Maalox
- Alumag
- Contracid
- Rutacid
- Talcid
Control question

What antacid is contraindicated for patients with arterial hypertension, chronic heart failure?

- Maalox
- Sodium bicarbonate
- Almagel
- Gelusil-Lac
- Talcid
Control question

What medicament can cause the heartburn in people with predisposition?

- Euphyllin
- Enterosgel
- Smekta
- Rennie
- Ranitidine
Constipation

disorder of intestine function, is characterized by an increase in the intervals between acts of defecation (more than 48 hours, compared to the individual physiological norm) or systematic lack of bowel movements.
Factors, which promote constipation

- Inactive, sedentary lifestyle
- Pregnancy (second part)
- Peculiarities of the profession, life habits (psychogenic constipation)
- Long-term immobilization
- Abuse of cleansing enemas
- Long-term use of laxatives
Causes of constipation

- Gastrointestinal canal diseases:
  - colitis
  - hemorrhoids
  - anal fissures
  - megacolon
  - intestinal polyposis
  - Crohn's disease
  - chronic gastritis type B
  - peptic ulcer of the duodenum
Causes of constipation

- Feeding features:
  - abrupt change of diet
  - lack of fiber in the diet
  - excess fat in the diet
  - inadequate fluid intake
  - excess iron in the diet
  - folic acid deficiency
Causes of constipation

- Medicaments intake:
  - aluminum-containing antacids
  - calcium-containing and iron-containing medicaments
  - calcium channel blockers
  - antispasmodics
  - opiates
  - cytostatics
  - neuroleptic drugs, psychotropics, antidepressants
  - antibacterial drugs
Causes of constipation

- Metabolism disorders:
  - dehydration
  - hypothyroidism
  - hypofunction of adrenal glands
Threatening symptoms of constipation:

- temperature rise
- blood in the stool
- severe abdominal pain
- sharp abdominal distension
- nausea, vomiting
- unmotivated weight loss
1. Stimulating the motor function of the intestine (chemical stimulants):

- **Anthraquinone glycosides**
  - senna-containing products (*Regulax, Senalex, Xena, Senade, Senadex, Senadexin, Senade, leaves of senna)*
  - Frángula álnus - buckthorn products (*bark of buckthorn, buckthorn syrup*)
  - Ononis arvensis L. (*Tinktura Ononidis arventis*)

- **Chemical stimulants**
  - bisacodyl (*Stadalax, Laxbene*)
  - sodium picosulfate (*Guttalax, Picolax, Laxigal, Regulax pico drops*)
  - castor oil
Laxatives

2. Lubricants and stool softeners
   - liquid paraffin
   - plant oils

3. Bulk laxatives
   - **Plant fibre**
     - Sterculia platanifolia products - Normacol (microclyster, granules)
     - Plantago maior (psyllium) seeds products – Mukofalk orange
   - **Osmotic agents**
     - lactulose (Normaze, Dufalak)
     - macrogol (Forlax, Fortrans)
     - inorganic salts (magnesium sulfate, sodium sulfate, sodium phosphate)
     - sodium docusate/C\textsubscript{20}H\textsubscript{37}NaO\textsubscript{7}S (Norgalax)
Basic approaches to the symptomatic treatment of constipation

- Laxatives of the same group should not be taken more than 2 weeks.
- It’s necessary to alternate laxatives with different mechanisms of action.
- The most safety laxatives for pregnant women are bulk laxatives with plant fibers (excluding Laminaria) or lactulose.
Basic approaches to the symptomatic treatment of constipation

- The lactulose is the drug of choice for children, children 5-7 years old can take bulk laxatives, sodium picosulphate isn’t indicated for newborns
- Osmotic laxatives are indicated for poisoning treatment, preparation for diagnostic procedures
- The use of drugs stimulating the motility of the intestine are absolutely contraindicated for pregnant women and patients with spastic constipation
The algorithm of conversation of pharmacist and customers, who complains on constipation

Is defecation absent more than 48 hours?

Yes

Do following symptom exit:
- fever
- trace of blood in feces
- severe pain in abdomen (spastic pain)
- nausea, vomiting
- sharp abdominal distension
- weight loss
- pain during defecation
- occupational hazards (work with lead, mercury, etc.)?

Yes

No

One defecation in 2 days is physiological

Yes

No
The algorithm of conversation of pharmacist and customers, who complains on constipation

To obtain more accurate diagnosis you need immediately to see a physician.

The violation of the intestinal activity may occur at the early stages of pregnancy. You need to increase physical activity, increase the liquid and fiber consumption in the diet, dairy products. Laxatives is possible after consultation with the doctor only.

Are you pregnant?

Are you currently taking any medications:
- aluminum-containing antacids
- blockers of H₂-receptors
- antidepressants
- neuroleptics
- calcium channel blockers
- iron- and calcium containing drugs
- opiates (codeine) etc.?
The algorithm of conversation of pharmacist and customers, who complains on constipation

Is constipation bothering you constantly (chronic constipation)?

- **No**
  - You can intake any laxatives

- **Yes**
  - Intake of these drugs can cause a "medical" constipation. You need to see your doctor

If after 3 days of self-treatment the constipation will not disappear or reduce you need to seek immediate medical care!
The success of the treatment of chronic constipation depends on:

- the completeness of identification of causes of defecation delay and its elimination
- the patient's willingness to change lifestyle, eating habits, to follow recommendations of the physician or pharmacist (compliance)
- qualification of a doctor and pharmacist
Pharmaceutical care when treating constipation

- It is recommended to increase physical activity
- It is recommended to change the diet (intake food, which is rich with fiber - fruits, vegetables, whole-grain bread, bran, cereals, dairy milk products)
- The adequate water regime – at least 1.5-2 liters per day – is recommended (in case of absence of arterial hypertension, chronic heart failure, chronic renal failure)
Pharmaceutical care when treating constipation

- The anthraglycoside-containing laxatives act in 8-12 hours
- The effect of osmotic laxatives develops in 2-4 hours
- The laxative effect of castor, paraffin oil appears in 5-6 hours
- The use of sodium picosulphate in newborns, babies is ineffective
Pharmaceutical care when treating constipation

- During the application of bulk laxatives the patient should consume at least 1.5-2 liters of fluid a day.
- During long-term use of paraffin oil the malabsorption of vitamins A and D decreases and the risk of formation of malignant tumors of the gastrointestinal tract increases.
Control question

The constipation is common for:

- Acute gastritis
- Chronic atrophic gastritis (type A)
- Chronic non-atrophic gastritis (type B)
- Enterocolitis
- All mentioned
Control question

What laxative is ineffective in newborn?

- Lactulose
- Sodium picosulfate
- Castor oil
- Paraffin oil
- Plantex
Control question

What laxative is contraindicated in pregnancy?

- Lactolose
- Macrogol
- Glycerol suppositories
- Senna
- All mentioned