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INTRODUCTION

This issue is the manual on pharmacology for students` practical training.

All topics in the manual have the similar structure: the name of the topic, the topicality of the subject, the theoretical questions, home tasks, class tasks and tests.

Carrying out the tasks, students learn:

- the nomenclature and classification of drugs;
- the interchangeability of drugs;
- how to find the logic connection between the mechanism of action, pharmacodynamics and indications; between the side effects, contraindications and principles of rational administration for providing the safe and effective pharmacotherapy.

This manual will assist for mastering the unit and development of pharmacological logic.
NARCOTIC (OPIOD) ANALGESICS

Topicality of the subject

Pain is a symptom of many pathologic states. It may cause mood disturbances and make the duration of disease worse. Strong pain may result in death. Thus, analgesic drugs which suppress the pain are very important for medicine.

Theoretical questions

1. The structure of nociceptive and antinociceptive systems of human body. The physiological importance of these systems.
2. The classification of poppy’s (Papaver somniferum) alkaloids according their chemical structure. The difference between the pharmacological effects of these alkaloids depending on chemical structure.
3. The mechanism of action and indications of narcotic analgesics.
4. The principles of dosage and rational administration of these drugs. The instructions concerning the administration by children.
5. The contraindications and side effects of narcotic analgesics. The treatment of poisoning with narcotic analgesics.

Home tasks

Task 1.

Write the following prescriptions:
1. Morphine hydrochloride (Morphini hydrochloridum) – sol. f/i 1% - 1 ml, amp.
2. Omnopon (Omnoponum) – sol. f/i 0,1% - 1 ml, amp.
3. Codeine phosphate (Codeini phosphas) - powder 0,015.
4. Promedol (Promedolum) – tabl. 0,01.
5. Fentanyl (Phenthanylum) – sol. f/i 0,005% – 2 ml, amp.
6. Estocin (Aesthocinum) – tabl. 0,05.
7. Pentazocine hydrochloride (Pentazocinum) – tabl. 0,05.
Task 2.

After your report about administration of narcotic analgesics answer the doctor`s questions:
1. Name the synonyms of Aethylmorphine hydrochloride, Promedol, Pentazocine.
2. What pharmacological properties of Aethylmorphine hydrochloride make the application of this substance in ophthalmology possible?
3. What drug is better to use for treatment of colics: morphine or omnopon?
4. What does neuroleptanalgesia mean? What drug has to be used for this purpose?
5. Name the drug and its medicinal form which is used more often for depression of caugh?

Task 3.

Name the pharmacological effects and indications of narcotic analgesics and fill in the table:

<table>
<thead>
<tr>
<th>Pharmacological effects</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Class tasks

Task 1.

Divide the following drugs into the natural (A), semisynthetic (B) and synthetic (C) narcotic analgesics. Write the dosage for drugs marked with “*” and underline the new drugs.

<table>
<thead>
<tr>
<th>Drugs</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Dionin</td>
<td>10. Sufentanil</td>
<td></td>
</tr>
</tbody>
</table>
Task 2.

Choose the correct mechanism of action for narcotic analgesics:

A. Bind to opiate receptors of CNS, depress the production of algogens and block the transmission of painful impulse to CNS.

B. Depress the cyclooxygenase activity, prostaglandin and thromboxane synthesis, release and activity of inflammatory mediators.

Task 3.

Choose the pharmacological effects of narcotic analgesics:

1. Analgesic.
2. Antyspasmodic.
3. Antitussive.
4. Antiemetic.
5. Depression of respiratory center.
7. Antipyretic.
8. Block of autonomic ganglia.
10. Relaxation of skeletal muscles.

Task 4.

Compare the strength of pharmacological effects of different narcotic analgesics:

<table>
<thead>
<tr>
<th>N</th>
<th>Pharmacological effect</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Omnopon</td>
</tr>
<tr>
<td>1</td>
<td>Analgesic</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Antiemetic</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antitussive</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Antyspasmodic</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Miosis</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Respiratory depression</td>
<td></td>
</tr>
</tbody>
</table>

Note: the strength of effect is: +++ - strong, ++ - moderate, + - weak, --- - absent.

Task 5.

Make the report about the peculiarities of NA pharmacokinetics and fill in the following table:
<table>
<thead>
<tr>
<th>Drug</th>
<th>The route of administration</th>
<th>The rapidity of effect onset</th>
<th>The duration of effect</th>
<th>The ability to penetrate the placenta (+, -)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine hydrochloride</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promedol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentazocine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphilong</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Drugs: Morphine hydrochloride, Promedol, Fentanyl, Pentazocine, Morphilong.

Task 6.

Inform the emergency doctors about the drugs of choice among the narcotic analgesics (morphine, fentanyl, estocin, promedol, tramadol) which have to be used in such cases:
1. Colics (renal, intestinal, hepatic).
2. Trauma of the patient with the bronchial asthma.
3. Analgesia of labor.
5. Neuroleptanalgesia.

Task 7.

Offer to patient the substitution of Sufentanil, Aethylmorphine hydrochloride, Tilidine, Pentazocine, Piritramide:
A – among the pharmacological group,
B – among the trade marks (brand names).

Task 8.

Preparing the report about narcotic analgesics pay your attention on their side effects. Fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>Side effect</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Morphine</td>
</tr>
<tr>
<td>1</td>
<td>Euphoria</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Spasm of smooth muscles</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Depression of respiratory center</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Side effect</td>
<td>Drugs</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Morphine</td>
</tr>
<tr>
<td>4</td>
<td>Miosis</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gastrointestinal disturbances</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bradycardia</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Hypotension</td>
<td></td>
</tr>
</tbody>
</table>

Note: the side effect is: + - present, --- - absent.

Task 9.

Make the report about the principles of the rational combined administration of narcotic analgesics with other drugs. For this purpose fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>Narcotic analgesic</th>
<th>Drugs from other pharmacological groups</th>
<th>The result of combined administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Morphine</td>
<td>Chlorpromazine</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Promedol</td>
<td>Tubocurarine hydrochloride</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Pentazocine</td>
<td>Barbiturates</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tramadol</td>
<td>Diazepam</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fentanyl</td>
<td>Antidepressants</td>
<td></td>
</tr>
</tbody>
</table>

Task 10.

Choose the states and diseases which are the contraindications for administration of narcotic analgesics:

a) Bronchial asthma  e) Fever
b) Myocardial infarction  f) Colics
c) Mixedema  g) Pregnancy
d) Convulsions  h) Age before 2 years
Task 11.

Correct the following prescriptions:

1. Rp.: Sol. Morphini hydrochloridi 1ml
   D.t.d. № 6
   S. Per 1 ml i/m

2. Rp.: Sol. Phentanili 0,005%
   D.t.d. № 5 in amp.
   S.

3. Rp.: Promedoli 0,025 № 5
   D.S. Per 1 tablet 2 times a day.

4. Rp.: Sol. Nalorphini hydrochloridi 0,5% 1 ml
   D.t.d. № 5
   S.

5. Rp.: Tab. Aesthocini 0,005 N 5
   D.S.

Tests:

Describe the drugs using following schemes:

2. Pharmacological effects – Indications – Dosage*.

Drugs

1. Codeine* 5. Pentazocine
2. Morphine* 6. Tramadol
3. Promedol 7. Valor
4. Dionin 8. Fentanyl*
NON-NARCOTIC ANALGESICS (NNA) (or ANALGESICS-ANTIPYRETICS) AND NONSTEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDs)

**Topicality of the subject**

Inflammation is one of the main symptoms of many diseases. Inflammation is always accompanied with pain. For treatment of inflammation and pain NNA and NSAIDs are often used. According to WHO data the preparations of these groups take the second place in the world in the popularity of their applications.

**Theoretical questions**

1. The classification and nomenclature of NSAIDs and NNA.
2. The mechanisms of antiinflammatory, antipyretic, analgesic and antiaggregant effect of NSAIDs and NNA.
3. What are the differences and similarities between NSAIDs and NNA?
4. The pharmacodynamics and indications of NSAIDs and NNA.
5. The side effects and contraindications of NSAIDs and NNA.

**Home tasks**

Task 1.

Write the following prescriptions:

2. Analgin (Analginum) – sol. f/i 50% - 2ml, amp.
3. Paracetamol (Paracetamolum) – tabl. 0,2.
5. Butadione (Butadionum) – tabl. 0,15.
7. Indometacine (Indometacinum) – caps. 0,025.
Task 2.

Classify the following drugs. Match the names of pharmacological subgroups (letters) with names of drugs (numbers).
A – salicylic acid derivatives;
B – pyrazolone derivatives;
C – para-aminophenol derivatives;
D – arylcarboxylic (phenylpropionic, phenylacetic, indolacetic, anthranilic) acids derivatives;
E – combined drugs;
F – drugs from other chemical groups.

Drugs
1. Reopyrine  
6. Ascophen  
11. Indometacine
2. Ibuprofen  
7. Baralgin  
12. Sedalgin
3. Butadione  
8. Acetylsalicylic acid  
13. Voltaren
4. Ascopar  
9. Paracetamol  
14. Meloxicam
5. Citropac  
10. Analgin  
15. Pyroxicam

Task 3.

Name the synonyms for Meloxicam (1), Acetylsalicylic acid (2), Butadione (3), Indometacine (4), Brufen (5), Voltaren (6).

Class tasks

Task 1.

Indicate among the following drugs NNA (A), NSAIDs (B). Underline the drugs of the new generation and point out their dosage.

Drugs
1. Analgin  
7. Surgam  
13. Butadione
2. Aspirin  
8. Sedalgin  
14. Citramon
3. Aspisol  
9. Tempalgin  
15. Indometacine
4. Ketoprofen  
10. Movalise  
16. Ibuprofen
5. Paracetamol
6. Diclofenac sodium
11. Pyroxicam
12. Mefenamic acid

Task 2.

After learning of NNA and NSAIDs mechanism of action, match the names of drugs with their mechanism of action.

Drugs

1. Analgin
2. Aspirin
3. Indometacine
4. Voltaren
5. Meloxicam
6. Paracetamol

Mechanism of action
A – depression of thermoregulation center;
B – inhibition of pain transmission through the afferent nerves;
C – suppression of the subcortical pain centers;
D – break of the prostaglandins synthesis;
E – decrease of the inflammatory mediators activity;
F - depression of the COX-2 activity;
G – decrease of energy supply in the inflammatory focus;
H – binding to the opiate receptors, inhibition of the pain mediators release.

Task 3.

Preparing the report about pharmacodynamics of NNA and NSAIDs compare these drugs and fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>Pharmacological effect</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Analgin</td>
</tr>
<tr>
<td>1</td>
<td>Analgesic</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Antipyretic</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Antiinflammatory</td>
<td></td>
</tr>
</tbody>
</table>

Note: the effect is: +++ - strong, ++ - moderate, + - weak, --- - absent.
Task 4.

Choose the drugs which can be used for treatment of:

A – autoimmune diseases;
B – fever;
C – neuralgia, neuritis, radiculitis;
D – moderate and weak pains (non-dangerous for life);
E – diseases of locomotor system

Drugs

Write the dosage for drugs marked with asterisk.

Task 5.

Explane to the patient what composition does Reopyrin, Sedalgin, Tempalgin have?

Task 6.

Making the report about adverse effects of NSAIDs, fill in the following table:

<table>
<thead>
<tr>
<th>Adverse effect</th>
<th>Salicylates</th>
<th>Analgin</th>
<th>Paracetamol</th>
<th>Voltaren</th>
<th>Ibuprofen</th>
<th>Idometacine</th>
<th>Meloxicam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulceration of stomach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal pains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppression of hemopoiesis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formation of methemoglobin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease of blood-clotting time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Adverse effect

<table>
<thead>
<tr>
<th>Salicylates</th>
<th>Analgin</th>
<th>Paracetamol</th>
<th>Voltaren</th>
<th>Ibuprofen</th>
<th>Indometacine</th>
<th>Meloxicam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear noise, disturbances of vestibular apparatus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allergic reactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephritis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: the effect is: present (+) or absent (-).

Task 7.

Offer the substitution of Paracetamol, Analgin, Acetylsalicylic acid, Diclofenac Sodium, Meloxicam, Phenylbutasone:
A – among the other members of this pharmacological group;
B – among the trade marks.

Task 8.

Make the report about the principles of the rational combined administration of NNA and NSAIDs with other drugs. For this purpose fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>NNA / NSAIDs</th>
<th>Drugs from other pharmacological groups</th>
<th>The result of combined administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analgin</td>
<td>Salicylates, anticoagulants</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Paracetamol</td>
<td>Sulfonamides</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Salicylates</td>
<td>Other NSAIDs</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Butadione</td>
<td>Glucocorticoids</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Indometacine</td>
<td>b-adrenoblockers</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Meloxicam</td>
<td>Diuretics</td>
<td></td>
</tr>
</tbody>
</table>

Task 9.

Give the patient the instructions concerning the correct administration of such drugs as Analgin, Paracetamol, Indometacine, Meloxicam, Voltaren, Aspirin.
The situations of rational administration:

1. Before meals
2. After meals
3. While eating
4. Take milk or alkalaine drink with the drug

Task 10.
Correct the following prescriptions:

1. Rp.: Sol. Analgini 25% 1ml
   D.S. Per 1 ml when the pain occur
   #

2. Rp.: Tab. “Citramoni” N10
   S.
   #

3. Rp.: Acidi Acethylsalicylici 0,5
   D.t.d. N10
   S. Per 1 tablet 3 times a day.
   #

4. Rp.: Tab. Diclofenaci Natrii 0,025 N10
   D.S.
   #

5. Rp.: Indometacini 0,025
   D.t.d. N10 in dragee
   S.
   #

Tests
Describe the drugs using following schemes:

2. Pharmacological effects – Indications – Dosage*.

Drugs

2. Paracetamol  7. Meloxicam
4. Ketoprofen  9. Indometacine*
5. Diclofenac sodium*  10. Mefenamic acid
ANTIPSYCHOTICS, TRANQILIZERS, SEDATIVE DRUGS

Topicality of the subject
Now many people, that especially live in the cities, have mental disturbances. That is why for pharmacists it is necessary to know the nomenclature and pharmacological properties of psychotropic drugs. These groups of preparations are widely used in therapy, neurology, surgery.

Theoretical questions
1. The classification of psychotropic drugs with depressive type of action. The definition and comparison of antipsychotic, anxiolytic, sedative effects.
2. The classification of neuroleptics (antipsychotics) depending on their chemical structure. The mechanism of action and pharmacodynamics.
3. The pharmacokinetics, indications and side effects of antipsychotics.
4. The classification of tranquilizers. The mechanism of action and pharmacodynamics.
5. The side effects, indications and contraindications of tranquilizers.
6. The pharmacological properties of sedative drugs.

Home tasks
Task 1.
Write the following prescriptions:
1. Aminazine (Aminazinum) – sol. f/i 2,5% - 1ml, amp.; 0,025, dr.
2. Haloperidol (Haloperidolum) - tabl. 0,005.
3. Droperidol (Droperidolum) – sol. f/i 0,25% - 10 ml, amp.
4. Trioxazin (Trioxazin) – tabl. 0,3.
5. Sodium bromide (Natrii bromidum) – sol. f/internal use 3% - 100 ml, vial.
7. Diazepam (Diazepam) – tabl. 0,005.
Task 2.

Preparing the information for psychiatrists compare the pharmacodynamics of neuroleptics (A), tranquilisers (B) and sedative drugs (C). Match the name of pharmacological group (letters) with pharmacological effects (numbers).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Anxiolytic</td>
<td>5. Sedative</td>
<td>8. α-adrenoblocking</td>
<td></td>
</tr>
</tbody>
</table>

Class tasks

Task 1.

Divide the following drugs into the neuroleptics (A), anxiolytics (B) and sedative drugs (C). Underline the new drugs. Point out the dosage of the drugs marked with asterisk.

Drugs

2. Sodium bromide 7. Sanosan 12. Trioxazin 17. Persen

Task 2.

Divide the following neuroleptics (I) into the derivatives of phenothiazine (A), butyrophenone (B), different chemical groups (C) and tranquilizers (II) into the derivatives of benzodiazepine (D), diphenylmethane (E), propandiol (F) and different chemical groups (G). Underline the new drugs and tick the “day” tranquilizers.

Drugs

5. Aethaperazine  10. Sultoprid

Task 3.
Learning the mechanism of psychotropic drugs action find the correct mechanism of action for neuroleptics, tranquilizers and sedative drugs. Match the letters with numbers.

Mechanism of action
1. Drugs enhance and concentrate the processes of inhibition in brain cortex, decrease the processes of stimulation in CNS.
2. Drugs decrease the excitability of brain subcortical regions and their connections with brain cortex, bind to benzodiazepine receptors, activate GABA.
3. Drugs inhibit the reticular formation, suppressing its activating influence at the cerebral cortex; block the function of dopamine, noradrenaline, acetylcholine as mediators in different regions of CNS.

Drugs
2. Trioxazin  5. Gidazepam  8. Corvalol

Task 4.
Preparing the report for doctors about the peculiarities of antipsychotic drugs pharmacodynamics fill in the table concerning the comparative characteristic of these preparations.
### Table.

<table>
<thead>
<tr>
<th>N</th>
<th>Pharmacological effects</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Aminazine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluene-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>zine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Droperidol</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Antipsychotic</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sedative</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Potentiative</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Antiemetic</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Stimulative</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Antidepressive</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Cataleptic</td>
<td></td>
</tr>
</tbody>
</table>

Note: the effect is: +++ - strong, ++ - moderate, + - weak, --- - absent.

**Task 5.**

Choose the pharmacological effects of tranquilizers (A) and sedative drugs (B).

**Pharmacological effects**

1. Antipsychotic  
2. Hypothermic  
3. Potentiative  
4. Muscle relaxant  
5. Antiemetic  
6. Anticonvulsive  
7. Hypnotic  
8. Analgesic  
9. Sedative  
10. Anxiolytic

**Task 6.**

Preparing the information for doctors pay your attention at the peculiarities of pharmacodynamics of several tranquilizers and sedative drugs. Choose the correct pharmacodynamics for following preparations and match letters with numbers.
Drugs
1. Diazepam
2. Trioxazin
3. Amizil
4. Novo-passit

Pharmacological effects
1. Anxiolytic, moderate potentiative effect; absence of hypnotic, anticonvulsive and muscle relaxant effects.
2. Anxiolytic, potentiative, central and peripheral M-cholinoblocking, antitussive, moderate antihistaminic, anesthetic and antiserotonin effects.
4. Sedative, moderate anxiolytic, anticonvulsive and antispasmodic effects.

Task 7.

Choose the correct indications and side effects for Aminazine (A), Diazepam (B), Sodium bromide (C), Haloperidol (D), Trioxazin (E), Antares (F).

Indications
1. Neurosis, increased irritability
2. Spasms of smooth muscles
3. Insomnia
4. Psychosis
5. Neurogenic diseases
6. Anesthesia, premedication
7. Withdrawal syndrome
8. Intractable vomiting
9. Hypertensive crisis
10. Neuroleptanalgesia
11. Epilepsy
12. Combined therapy of hypertension, peptic ulcer

Side effects
a. Skin eruption, inflammation of mucous membranes (rhinitis, conjunctivitis, cough), general lethargy, decrease of memory, apathy. Drug cumulates.
b. Skin allergic reactions, the yellow coloration of skin may occur (in case of long-term administration).
c. Irritation of skin and mucous membranes, orthostatic collapse, extrapyramidal disorders, galactorrhea, dyspepsia, dysfunction of liver and kidneys, change of STH and TTH secretion.

d. Disorders of memory, attention; sleepiness, muscular weakness; teratogenisity.

e. Akinesia, tremor, increase of skeletal muscle tone, dyskinesia. During the long-term administration galactorrhea, catalepsy may occur.

Task 8.

Answer the doctors' questions:

1. Why is combined administration of tranquilizers and other drugs depressing the CNS not recommended in the outpatient setting?

2. What people are not allowed to administrate the tranquilizers which have hypnotic and muscle relaxant effects?

3. Why is the quick treatment cessation with diazepam not recommended?

4. Why does combined administration of phenothiazines and inhibitors of ACE cause the orthostatic hypotension?

Task 9.

Choose the situations when the administration of Aminazine is the most rational:

1. In case of oral administration: a) before eating, b) after eating, c) during eating.

2. In case of intramuscular injection: a) to add the Novocaine solution, b) do not add the Novocaine solution.

3. In case of intravenous injection: a) to dissolve in 5% Glucose solution, b) do not dissolve in 5% Glucose solution.

Task 10.

Offer the substitution for Chlorpromazine, Sulpirid, Diazepam, Trimetozine, Hydroxyzine, Corvalol:
A – among the other members of the pharmacological group;
B – among the trade marks.

Task 11.

Correct the following prescriptions:

1. Rp.: Corvaloli 15.0
   D. S.: Per 5 drops 3 times a day.

2. Rp.: Aminazini 2.5% - 1 ml
   D. S.: Per 5 ml i/m.

3. Rp.: Trioxazini 0.3
   D. t.d. № 10 in tabulettis
   S.: Per 1 tablet 3 times a day before eating

4. Rp.: Droperidoli 0.25% - 10 ml
   D. t. d. in ampullis
   S.: Per 1 ml i/m

5. Rp.: Sibazoni 0.005 № 20
   S.: Per 1 tablet in the evening.

Tests

Describe the drugs using following schemes:

2. Pharmacological effects – Indications – Dosage*.

1. Aminazine*
2. Droperidol*
3. Trioxazine*
4. Sodium bromide*
5. Diazepam*
6. Alprazolam
HYPNOTIC, ANTICONVULSIVE AND ANTIPARKINSONIC DRUGS

Topicality of the subject

The sleep is the general protective inhibition of CNS. If the person does not sleep in 5-6 days, such a person will die.

About 1% of mankind have epilepsy. The anticonvulsive drugs play an important role in the therapy of this disease.

The Parkinson`s disease is a widespread disorder of elderly people and the Parkinson`s syndrom may occur as side effect of antipsychotic drugs.

That`s why it is necessary to know the nomenclature, classification and pharmacological properties of hypnotic, anticonvulsive and antiparkinsonic drugs.

Theoretical questions

1. The definition of sleep disorders (insomnia). The classification, mechanism of action and pharmacodynamics of hypnotic drugs.
2. The indications and side effects of hypnotics. The characteristic of “the best hypnotic agent”.
3. The classification, mechanism of action and pharmacological properties of drugs for treatment epilepsy and Parkinson`s disease.
4. The peculiarities of dosing of hypnotic, anticonvulsive and antiparkinsonic drugs.

Home tasks

Task 1.

Write the following prescriptions:

1. Nitrazepam (Nitrazepamum) – tabl. 0,005.
2. Phenobarbital (Phenobarbitalum) – tabl. 0,1.
3. Zopiclon (Zopiclonum) – powd. 0,01.
4. Carbamazepine (Carbamazepinum) – tabl. 0,2.
5. Valproic acid (Acidum valproicum) – tabl. 0,2.
Task 2.

The patient has the disorder of falling asleep. Choose the drugs for such a patient among following ones.

**Drugs**

1. Phenobarbital  
2. Nitrazepam  
3. Chloral hydrate  
4. Zopiclon  
5. Metacvalon

What similarities do pharmacodynamics of hypnotics and tranquilizers have?

Task 3.

What drugs have the hypnotic effect and may be used for treatment major epilepsy? Choose the numbers of such agents.

**Drugs**

1. Phenitoin  
2. Phenobarbital  
3. Primidon  
4. Carbamazepine  
5. Valproic acid  
6. Diazepam

**Class tasks**

Task 1.

Divide the following drugs into hypnotic (A), anticonvulsive (B) and antiparkinsonic (C) drugs.

**Drugs**

1. Phenobarbital  
2. Nitrazepam  
3. Diphenin  
4. Levodopa  
5. Benzonal  
6. Bromocriptin  
7. Carbamazepine  
8. Cyclobarbital  
9. Chloral hydrate  
10. Gludantan  
11. Reladorm  
12. Norakin  
13. Madopar  
14. Brotizolam  
15. Chlorakon  
16. Zolpidem  
17. Clonazepam  
18. Donormil  

25
Task 2.

Divide the hypnotic agents into the following groups:

A - derivatives of barbituric acid  
B - derivatives of benzodiazepine  
C – derivatives of cyclopirrolone  
D - derivatives of different chemical groups

Drugs

1. Zopiclon  
2. Nitrazepam*  
3. Metacvalone  
4. Phenobarbital*  
5. Midazolam  
6. Zolpidem*  
7. Cyclobarbital  
8. Triazolam  
9. Reladorm*  
10. Doxilamin

Underline the new drugs and point out the dosage of the marked with asterisk ones.

Task 3.

Learning the mechanism of action of hypnotic, anticonvulsive, antiparkinsonic drugs match the names of drugs with their mechanism of action.

Mechanism of action

A. Depression of the activity of cortical and subcortical motor parts in CNS; decrease of the stimulative effect of aminoacids on CNS (glutamate, aspartate); increase of the GABA content in CNS.

B. Increase of the dopamine content in CNS; stimulation of the dopamine receptors in CNS; increase of their sensitivity to dopamine.

C. Depression of the polisynaptic regions of brain; decrease of the stimulative impulses from reticular formation to brain cortex; increase of GABA functions.

D. The block of central and peripheral cholinceptors.

Drugs

1. Tropacine  
2. Phenobarbital  
3. Levodopa  
4. Tropacine  
5. Norakin  
6. Gludantan  
7. Nitrazepam  
8. Triazolam  
9. Diphenin  
10. Valproic acid  
11. Cyclobarbital

Task 4.

Make the report about pharmacodynamics of hypnotic drugs. Fill in the table concerning the comparative description of this pharmacological group.

<table>
<thead>
<tr>
<th>N</th>
<th>Drugs</th>
<th>Influence on sleep structure</th>
<th>Pharmacological effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fast sleep</td>
<td>Slow sleep</td>
</tr>
<tr>
<td>1</td>
<td>Phenobarbital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cyclobarbital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nitrazepam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Brotizolam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Zopiclon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Metacvalone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Donormil</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: the effect is: + - present, - - absent.

Task 5.

For improving the results of pharmacotherapy with hypnotic drugs indicate their peculiarities and fill in the following table:

<table>
<thead>
<tr>
<th>N</th>
<th>Drugs</th>
<th>The onset of effect</th>
<th>Duration of action</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phenobarbital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cyclobarbital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Metacvalone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Nitrazepam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Triazolam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Zopiclon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Flunitrazepam</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tick the drugs which can be used in pediatry.
Task 6.

Divide the anticonvulsive drugs into the preparations which can be used for treatment the major epilepsy (grand mal) (I) and the minor epilepsy (petit mal) (II). Pay the attention at side effects of anticonvulsive drugs that often occur due to long-term therapy. Choose the side effects for each drug.

Drugs
1. Phenobarbital
2. Aethosuximid
3. Flunitrazepam
4. Carbamazepine
5. Diphenin
6. Zopiclon
7. Lamotrijin

Side effects
1. Skin eruption, dysfunction of liver and kidneys, nystagmus, speech disorders, accumulation, drug dependence, night awakenings.
2. Vertigo, fever, vomiting, tremor, skin eruption, complications of respiration, gingival hyperplasia.
3. Gastrointestinal disorders, headache, skin eruption, photofobia, orthostatic hypotension, arrhythmia, dyskinesia, redness and pain of arms and/or legs.
4. Bitter or metallic taste in the mouth, nausea, vomiting, irritability, depressed mood.
5. Vestibular disorders, ataxia, irritability, depression, sleepiness, tolerance.
6. Insomnia, dyspepsia, leukopenia, agranulocytosis.
7. Headache, vertigo, sleepiness, diplopia, photosensitivity, pain in joints and muscles.

Task 7.

Preparing the report about pharmacodynamics of anticonvulsive and antiparkinsonic drugs match the pharmacological effects with the names of drugs.
Drugs

Pharmacological effects
1. Central (preferably) and peripheral M-cholinolytic effect. Decrease of tremor, salivation, rigidity of muscles, sweating and secretion of sebaceous glands.
2. Potent hypnotic, anticonvulsive effects; moderate anxiolytic, spasmylytic effects; induction of liver microsomal enzymes; tolerance, dependence, euphoria, withdrawal syndrome.
3. Anticonvulsive and moderate antidepressive, thymoleptic, analgesic effects.
4. Anticonvulsive, membranostabilizing, antiarrhythmic effects.
5. Dopaminergic effect, decrease of the prolactin, somatotropic hormone and glucocorticoids secretion.
6. Anticonvulsive, hypnotic, antitussive effects.

Task 8.
Inform the patient about the dosing regimen of several drugs. Choose for each preparation the rational dosing regimen. Substantiate your recommendations.

Dosing regimens
1. Per 1 tablet in the evening (20 minutes before sleeping).
2. Drug is administered after meals. The dose must be increased gradually (during 2-3 months).
3. Per 1 tablet 2-3 times a day after meals.
4. Per 0.5-1 tablet 2-3 times a day after meals. If it is necessary the dose may be increased up to 3-4 tablets.
5. Per 1-2 tablets during eating, gradually increasing the dose up to 3-4 tablets a day.

Drugs
1. Phenobarbital  4. Levodopa
2. Bromocriptine
3. Diphenin
4. Zopiclon
5. Nitrazepam
6. Phenitoin
7. Levodopa
8. Trihexiphenidil

Task 9.
Offer the substitution of Aethosuximide, Zopiclon, Nitrazepam, Phenitoin, Levodopa, Trihexiphenidil:
A – among the other members of this pharmacological group;
B – among the trade marks.

Task 10.
Answer the following doctors’ questions:
1. Why is not it recommended to combine the barbiturates with cardiac glycosides?
2. What complications does hypnotic drug abuse cause? Is the rapid discontinuation of therapy with hypnotics possible? Is it correct?
3. Midantan has to be used with cautions by the patients with psychic diseases. Why?
4. Phenobarbital decreases the efficacy of antidepressants, anticoagulants, Paracetamol in case of combined administration. Why?

Task 11.
Correct the following prescriptions:
1. Rp.: Phenobarbitalum № 10
   D. S. Per ½ tablet in the evening.
   #

2. Rp.: Carbamazepini 0,2 № 50
   S.: Per 2 tablets 2 times a day.
   #

   S.: Per 1 tablet in the evening.
   #
4. Rp.: Diphenini № 20
   S.: per 1 tablet 3 times a day during eating.
   
5. Rp.: Tab. Bromocriptini 0,01
   D. t. d. № 20
   S.: per 1 tablet 3 times a day.
   
Tests

Describe the drugs using following schemes:

2. Pharmacological effects – Indications – Dosage*.

1. Phenobarbital* 4. Zopiclon*
2. Cyclodol* 5. Bromocriptine
3. Nitrazepam* 7. Clonazepam
ANALEPTICS, PSYCHOSTIMULANTS, ANTIDEPRESSANTS, NOOTROPICS, ADAPTOGENS

Topicality of the subject

CNS stimulants act as pathogenetic and stimulative agents. They are widely used in medicine when the inhibition of spinal cord or brain functions occur.

CNS stimulants include several pharmacological groups such as:
1. Analeptics (drugs for emergency which stimulate the respiratory and vasomotor centers).
2. Psychostimulants (they stimulate memory, psychic and physical activity).
3. Antidepressants (for treatment depressive syndrome).
4. Nootropics (drugs that improve memory, mental functions, metabolism in the brain).
5. Adaptogens (natural preparations which cause general stimulation of CNS and other functions of human body).

Theoretical questions

1. The classification, mechanism of action and pharmacodynamics of analeptics. Their side effects and indications.
2. The classification of psychostimulants. Pharmacological properties of drugs. Indications. Adverse effects that limit the clinical usefulness of psychomotor stimulants.
3. The mechanism of action, central and peripheral pharmacological effects of Caffeine.
4. The classification, mechanism of action, pharmacodynamics and side effects of antidepressants.
5. The mechanism of action, pharmacodynamics, indications, side effects of nootropics.
6. The pharmacological characteristic of adaptogens.
7. The similarities and distinctions between different groups of CNS stimulants.
Home tasks

Task 1.

Write the following prescriptions:
1. Bemegrid (Bemegridum) – sol. f/i 0.5% - 1ml, amp.
3. Caffeine (Coffeinum-natrii benzoas) – sol. f/i 10% - 1ml, amp.
4. Sulfocamphocaine (Sulfocamphocainum) – sol. f/i 10% - 1ml, amp.
5. Cordiamine (Cordiaminum) – liquid 15 ml, vial.
6. Pantocrin (Pantocrininum) liquid 50 ml, vial.

Task 2.

Divide the following drugs into the analeptics (A), psychostimulants (B), antidepressants (C), nootropics (D), adaptogens (E):
1. Nialamid
2. Caffeine
3. Pyracetam
4. Strychnine
5. Lobeline
6. Amitriptyline
7. Bemegrid
8. Sidnophen
9. Pantocrin
10. Fluoxetine
11. Mianserin
12. Sidnocarb
13. Sulfocamphocaine
14. Cititon
15. Piriditol
16. Cordiamine
17. Pyrasidol
18. Aminalone
19. Ethimisol
20. Imipramine
21. Phenamine
22. Ginseng roots
23. Sodium oxybutirate

Task 3.

Compare the pharmacodynamics of different groups of CNS stimulants.
Choose the pharmacological effects of analeptics (A), psychostimulants (B), antidepressants (C), nootropics (D) and adaptogens (E).

Pharmacological effects
1. ”Awakening” (analeptic) effect in cases when there is danger for life.
2. Decrease of fatigue, sleepiness; short-term increase of psychic and physical activity.
3. Decrease of effects caused by hypnotics and narcotic analgesics.
4. Decrease of symptoms of depression (inhibition of thought, mood).
5. Improvement of memory, mental activity, metabolic processes in the brain. Antihypoxic effect.
6. Increase of human body resistance to adverse exogenic factors; mild stimulation of psychic and physical activity.
7. Stimulation of respiratory and vasomotor centers.
8. Increase of reflex excitability of spinal cord.

Task 4.
Name the drugs that may be used for emergency. Fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>Indications</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shock, collapse</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Asphyxia</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Respiratory stoppage</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Poisoning with hypnotics, narcotic analgesics</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Depression of respiration and blood circulation in infectious diseases</td>
<td></td>
</tr>
</tbody>
</table>

Class tasks
Task 1.
Divide the following drugs into the analeptics (A), psychostimulants (B), antidepressants (C), nootropics (D), adaptogens (E). Point out the dosage for agents marked with asterisk.

Drugs
Task 2.

Classify the following antidepressants into the reversible MAO inhibitors (A), irreversible MAO inhibitors (B), nonselective inhibitors of neurotransmitters` re-uptake (C), selective inhibitors of serotonin re-uptake (D), plant origin drugs (E), combined drugs (F). Underline the new drugs.

1. Nialamid
2. Mianserin
3. Pyrasidol
4. Sertralin
5. Imipramine
6. Fluoxxetin
7. Amitriptyline
8. Hypericin
9. Amixid
10. Tianeptin
11. Tincture of Ginseng roots
12. Fluoxetin
13. Mianserin
14. Imipramine
15. Camphor
16. Citizine
17. Sidnocarb
18. Sodium oxybutirrate
19. Tincture of Schizandra

Task 3.

Choose for each drug its mechanism of action. Match letters with numbers.

Mechanism of action

1. Drug blocks the adenosine receptors. In high doses it also blocks the phosphodiesterase, causes the accumulation of AMP and increase of glycogenolysis.

2. Drug assists the release of noradrenaline and dopamine from the presynaptic vesicles, inhibits the re-uptake of neurotransmitters and their inactivation by MAO. It increases the processes of stimulation in brain.

3. Drug stimulates the respiratory and vasomotor centers in medulla oblongata.
4. Drug increases the synthesis of macroergic phosphates, proteins, RNA; improves the carbohydrate metabolism.

5. Drug concentrates the processes of stimulation in CNS, improves metabolism and stimulates the protective mechanisms of human body (nonspecific resistance).

**Drugs**

1. Pyracetam
2. Caffeine
3. Nicetamid
4. Phenamine
5. Pantocrin

**Task 4.**

Preparing the information for doctors about the pharmacological properties of antidepressants:

1. Fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>Drugs</th>
<th>Mechanism of action</th>
<th>Pharmacodynamics</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amitriptyline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nialamid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Imipramine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Pyrasidol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fluoxetin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hypericin</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Pay the attention at the side effects and contraindications of antidepressants that are connected with their pharmacokinetics. Fill in the following table:

<table>
<thead>
<tr>
<th>N</th>
<th>Drugs</th>
<th>Half-life time</th>
<th>Side effects</th>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amitriptyline</td>
<td>17-30 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nialamid</td>
<td>Up to 24 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Imipramine</td>
<td>9-24 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Drugs</td>
<td>Half-life time</td>
<td>Side effects</td>
<td>Contraindications</td>
</tr>
<tr>
<td>---</td>
<td>--------</td>
<td>------------------</td>
<td>--------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>4</td>
<td>Pyrasidol</td>
<td>Up to 48 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fluoxetin</td>
<td>1-3 days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Answer the question: “Why is it recommended to administrate the antidepressants in combination with nootropics?

4. Answer the question: ”What does “cheese syndrome” mean? Name the symptoms of this complication and the drug which can cause such a situation. Why does “cheese syndrome” occur?

**Task 5.**

Compare the pharmacodynamics of analeptics and fill in the following table:

<table>
<thead>
<tr>
<th>N</th>
<th>Pharmacological effects</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bemegrid</td>
</tr>
<tr>
<td>1</td>
<td>Stimulation of respiration</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cardiostimulative effect</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Increase of blood pressure</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Increase of skeletal muscles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tone</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Increase of ACTH secretion</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Potentiation of sensations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(vision, hearing, olfaction,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>touch)</td>
<td></td>
</tr>
</tbody>
</table>

Note: the effect is: potent - ++, moderate - +, absent - ---. 
Task 6.

Preparing the information for doctors about Caffeine’s pharmacodynamics choose the pharmacological effects of this drug and divide them into the central (A) and peripheral (B).

Pharmacological effects

1. Central adrenomimetic effect.
2. Increase of mental and physical activity, decrease of fatigue and sleepiness (psychostimulative effect).
3. Increase of blood pressure and stimulation of respiration (analetic effect).
4. Cardiostimulative effect.
5. Spasmolytic effect.
6. Constriction of skin and abdominal vessels.
7. Dilatation of vessels of skeletal muscles, heart, lungs, kidneys, brain.
8. Improvement of brain blood circulation, decrease of passive venous congestion and intracranial pressure.
10. Increase of filtration in kidneys and increase of diuresis (diuretic effect).
11. Decrease of platelet aggregation (antiaggregant effect).

Task 7.

Pay your attention at the peculiarities of pharmacological properties of nootropics and adaptogens. Match the names of drugs with their pharmacological effects.

Drugs

1. Piriditol
2. Sodium oxybutirate
3. Schizandra tincture
4. Ginseng tincture
5. Pantocrin
6. Pyracetam

Pharmacological effects

1. Potent antihypoxant, antishock, sedative, central muscle relaxant, hypnotic, general anesthetic (high doses) effects.
2. Stimulation of psychic and physical activity, inhibition of thirst and fatigue, improvement of respiration and cardiovascular activity.
3. Antihypoxant, moderate antidepressant effects.
4. Antihypoxant effect. Improvement of integrative function of brain, ability to learn, memory consolidation.
5. Adaptogenic effect. Stimulation of memory, mental functions, immunity; decrease of heart rate, increase of myocardial contractility; improvement of gas exchange and stimulation of bile secretion.

Task 8.

Choose the drugs among the different groups of CNS stimulants for treatment following pathologic states and fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>Indications</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Collapse, shock, hypotension</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Disorders of memory and attention</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Intoxication with barbiturates and alcohol</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Asphyxia</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Decrease of heart functions</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sleepiness</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Craniocerebral injury</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Infectious diseases, recovering period</td>
<td></td>
</tr>
</tbody>
</table>

Task 9.

Preparing the report about the CNS stimulants pay your attention at their side effects. For this purpose choose for each drug its side effects and match the letters with numbers.
Drugs
A. Phenamine  
B. Pyracetam  
C. Bemegrid  
E. Schizandra tincture

Side effects
1. Bradycardia, hypotension, stimulation of emetic center (high doses), convulsions.
2. Insomnia (in case of administration in the evening); diarrhea, tachycardia, general excitement, aggressiveness; tolerance; euphoria, psychic and physical dependence.
3. Excitement, insomnia, headache, hypertension.
4. Irritability, anxiety, sleep disorders; dyspepsia. Exacerbation of coronary insufficiency (among elderly people).

Task 10.
Answer your colleagues’ questions:
1. Why is it dangerous to administrate the nootropic drugs for memory and learn improvement for a long time?
2. Why is Phenamine sold in drug-store (apothecary) according to the same rules as narcotic analgesics are? Name the principles of rational administration of this drug (age of patient; in the morning or in the evening).
3. Why is it better to administrate Amitriptyline, Melipramine, Nialamid after meals?
4. Why are Caffeine and Strychnine not prescribed for infants (younger than 2 years)?
5. Why is combined administration of Pyracetam with Vitamin B$_6$ not recommended?
6. Why is combined administration of Nialamid with tricyclic antidepressants and other MAO inhibitors not recommended?
Task 11.

Inform the patient about the principles of rational drug (CNS stimulants) administration. Match the letters with numbers. Substantiate your recommendations.

Principles of administration (Dosing regimens)
1. 1 tablet (after meals) 3-4 times a day increasing the dose. The term of administration is 4-6 weeks, then the dose is getting smaller up to 1 tablet 1-4 times a day (the maintaining dose).
2. 2 tablets 2-3 times a day (in 15-30 min after meals) during 1-3 months (for adults up to 6-8 months). The next course of therapy may be prescribed after 1-6 months.
3. 25-40 drops of water-alcohol extract (oral administration) before meals (30 min) 2-3 times a day during 3-4 weeks.
4. 1 tablet 2-3 times a day in the morning before meals. The dose must be chosen individually.
5. 1-3 ml 1-3 times a day subcutaneously (not into the blood vessels). The solution must be heated (up to body temperature) before injection.

Drugs
1. Camphor
2. Piriditol
3. Sidnocarb
4. Pantocrin
5. Imipramine

Task 12.

Offer the substitution of Nialamid, Sidnocarb, Pyracetam, Nicetamid, Citrulline:
A – among the other members of pharmacological group;
B – among the trade marks.
Task 13.
Correct the following prescriptions:
Rp.: Sol. Coffeini natrii-benzoatis 0,1
D.S.
#
Rp.: Cordiamini 15ml
D.S.
#
Rp.: T-rae Ginsengi 50 ml
D.S.
#
Rp.: Tab. Nialamidi 0,025
D.S.
#

Tests
Describe the drugs using following schemes:
2. Pharmacological effects – Indications – Dosage*.
1. Nicetamid
2. Caffeine* 
3. Pyracetam
4. Ethimisol
5. Pantocrin*
6. Amitriptyline
INTRODUCTION INTO THE CHAPTER “DRUGS AFFECTING THE AUTONOMIC NERVOUS SYSTEM”. CHOLINERGIC AGENTS

Topicality of the subject

The mediator acetylcholine transmits the nerve impulse in cholinergic synapses. The drugs which act as this mediator or in the contrast are widely used for treatment many functional disorders of human body. For example, cholinergic agents are the main drugs for treatment glaucoma.

Theoretical questions

1. The anatomic and physiologic peculiarities of sympathetic, parasympathetic and somatic parts of peripheral nervous system.
2. The structure of the synapse. Cholino-, adrenoceptors and their localisation. What physiologic effects may occur if the mediator interacts with receptors?
3. The classification of drugs which affect the autonomic nervous system.
4. The classification, mechanism of action, pharmacodynamics, indications and side effects of direct-acting cholinomimetics.
5. The inhibitors of acetylcholinesterase. Mechanism of action, pharmacodynamics, indications, side effects of these drugs.

Home tasks

Task 1.

Write the following prescriptions:
1. Carbacholine (Carbacholinum) sol. 1% - 10 ml, eye drops.
2. Pilocarpine (Pilocarpinum) sol. 2% - 10 ml, eye drops.
3. Proserine (Proserine) sol. f/i 0,5% - 1 ml, amp.
4. Aceclidine (Aceclidinum) sol. f/i 0,2% - 1 ml, amp.
5. Galanthamine (Galanthaminum) sol. f/i 0,1% - 1 ml, amp.
6. Armin (Arminum) sol. 0,01% - 10 ml, eye drops.
Task 2.

Explain to your college what do following definitions mean? Match the letters with numbers.

1. Adrenergic agent (adrenomimetic).
2. Antiadrenergic agent (adrenoblocker).
3. Cholinergic agent (cholinomimetic).
4. Anticholinergic agent (cholinoblocker).

Definitions
A. The drug which stimulates cholinceptors as acetylcholine or decreases the activity of acetylcholinesterase.
B. The drug which stimulates adrenoceptors and mimics the effects of sympathetic nervous system.
C. The drug which blocks the cholinceptors and transmission in cholinergic synapses.
D. The drug which blocks adrenoceptors or interrupts synthesis and release of mediator in adrenergic terminals, thus it decreases or prevents the effects of stimulation of sympathetic nervous system or effects of adrenergic drugs.

Task 3.

Choose the pharmacological effects of cholinomimetics:
1. Spasm of accommodation.
2. Paralysis of accommodation.
3. Miosis.
4. Mydriasis.
5. Increase of smooth muscles (gastro-intestinal, bronchial, uterine) tone.
6. Decrease of smooth muscles (gastro-intestinal, bronchial, uterine) tone.
7. Increase of intraocular pressure.
8. Decrease of intraocular pressure.
11. Vasodilation.

**Class tasks**

**Task 1.**

Find the differences between the structure of sympathetic, parasympathetic and somatic parts of peripheral nervous system. For this purpose look at the figure (1) and name the parts which are marked at it, and also the names of mediators and types of receptors. Fill in the following table:

![Figure 1](image-url)

<table>
<thead>
<tr>
<th>Mark</th>
<th>Name of the part</th>
<th>Name of mediator</th>
<th>Type of receptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
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<td></td>
<td></td>
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<tr>
<td>B1</td>
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<td>C1</td>
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<td>E</td>
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<td>A2</td>
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<td>B2</td>
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<td>C2</td>
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</tbody>
</table>
Task 2.

For understanding of pharmacodynamics of drugs which affect the autonomic nervous system you have to know the pharmacological effects that occur due to stimulating sympathetic and parasympathetic parts of nervous system. Fill in the table:

**The influence of sympathetic and parasympathetic innervation on organs and tissues**

<table>
<thead>
<tr>
<th>Organs and tissues</th>
<th>Effects in case of stimulation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>parasympathetic nervous system</td>
<td>sympathetic nervous system</td>
</tr>
<tr>
<td>Eye:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-circular muscle of iris (M-cholinoceptor);</td>
<td></td>
<td></td>
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<tr>
<td>-radial muscle of iris (α-adrenoceptor);</td>
<td></td>
<td></td>
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<tr>
<td>-intraocular pressure;</td>
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<tr>
<td>-accomodation</td>
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<tr>
<td>Secretion of exocrine glands (bronchial, salivary, gastro-intestinal, sudoriferous, sebaceous, lacrimal)</td>
<td></td>
<td></td>
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<tr>
<td>The tone of smooth muscles:</td>
<td></td>
<td></td>
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<tr>
<td>-bronchioles,</td>
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<tr>
<td>- gastro-intestinal tract,</td>
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<td>- ureter,</td>
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<tr>
<td>- body of urinary bladder,</td>
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<tr>
<td>- bile-excreting tract</td>
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<td></td>
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<tr>
<td>Blood vessels, blood pressure</td>
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<tr>
<td>Heart</td>
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<tr>
<td>Uterus</td>
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<tr>
<td>Sphincters</td>
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</tr>
</tbody>
</table>
Task 3.

Divide the following drugs into the M,N-cholinomimetics (A), M-cholinomimetics (B), N-cholinomimetics (C), irreversible inhibitors of acetylcholinesterase (D), reversible inhibitors of acetylcholinesterase (E), reactivators of acetylcholinesterase (F). For ticked drugs (*) point out the dosage.

Drugs

1. Carbacholine 6. Aceclidine 11. Armin*
5. Acetylcholine 10. Piridostigmine bromide 15. Pilocarpine*

Task 4.

After learning the mechanism of action of cholinergic agents match the names of drugs with their mechanism of action.

Mechanism of action

1. Drug directly stimulates the M- and N-cholinoceptors.
2. Drug stimulates only M-cholinoceptors.
3. Drug stimulates the N-cholinoceptors of carotid sinus and thus stimulates the respiration.
4. Drug forms the reversible complexes with acetylcholinesterase, prevents the inactivation of acetylcholine, thus the time of mediator and receptor interaction increases.
5. Drug causes the long-term block of acetylcholinesterase because of formation (irreversible) of complexes between drug and enzyme.
6. Drug interacts with irreversible acetylcholinesterase inhibitors (or phosphororganic substances) which are bound to enzyme and releasing the acetylcholinesterase reducts its physiologic activity.
Drugs
A. Aceclidine  D. Carbacholine
B. Armin  E. Proserine
C. Dipiroxim  F. Citisine

Task 5.
Preparing the report for ophthalmologists about the drugs for treatment of glaucoma compare these agents and fill in the table:

<table>
<thead>
<tr>
<th>N</th>
<th>Drugs</th>
<th>Pharmacological group</th>
<th>The time of acting (miosis), hour</th>
<th>Side effects</th>
<th>The concentration of solution, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbocholine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pilocarpine</td>
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<td></td>
<td></td>
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<tr>
<td>3</td>
<td>Aceclidine</td>
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<tr>
<td>4</td>
<td>Physostygmine</td>
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<tr>
<td>5</td>
<td>Proserine</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>6</td>
<td>Armin</td>
<td></td>
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</tr>
</tbody>
</table>

Task 6.
Choose the contraindications for M-cholinomimetics (A) and reversible acetylcholinesterase inhibitors (B). Match the letters with numbers.
1. Epilepsy 7. Peptic ulcer
2. Bronchial asthma 8. Hypotension
3. Hyperkinesis 9. Tachycardia
4. Bradycardia 10. Atony of intestine and urinary bladder
5. Pregnancy 11. Atherosclerosis
6. Angina pectoris
Task 7.

Correct the following prescriptions:

Rp.: Oxazyli 0,005  
D.t.d. №50  
S. 1 tablet 3 times a day.  
#

Rp.: Proserini 0,015  
D.t.d. in tab.  
S. 1 tablet 2 times a day.  
#

Rp.: Sol.Galanthamini hydrochloridi  
D.t.d. №6 in amp.  
S. 0,5 ml s/c 1 time a day for 3 years children.  
#

Rp.: Sol.Aceclidini 1 ml  
D.t.d. №6  
S.  
#

Rp.: Sol.Pilocarpini hydrochloridi 2 %  
D.S.  
#

Tests

Describe the drugs using following schems:

1. Pharmacological group → Interchangeability → Mechanism of action.  
2. Pharmacological effects → Indications → Dosage*.  

1. Pilocarpine*  
2. Proserine*  
3. Armin  
4. Aceclidine  
5. Lobeline  
6. Physostygmine
ANTICHOLINERGIC AGENTS

Topicality of the subject

These drugs decrease the cholinergic transmission in synapses of smooth and skeletal muscles, blood vessels, exocrine glands and because of this cause spasmolytic, hypotensive, muscle relaxant, etc. effects. Such pharmacological effects are very important and they are used in anesthesiology and also for treatment of hypertension, peptic ulcer, bronchial asthma and other diseases.

Theoretical questions

1. The classification and nomenclature of anticholinergic agents.
2. The mechanism of action of M- and N-cholinoblockers.
3. The pharmacodynamics and indications of M- and N-cholinoblockers.
4. The side effects, contraindications and principles of rational administration of anticholinergic agents.
5. The symptoms of poisoning with M-cholinoblockers, ganglionic blockers, miorelaxants and the first aid.

Home tasks

Task 1.

Write the following prescriptions:

1. Atropine sulfate (Atropini sulfas) – eye drops 1%-10 ml; sol. f/i 0,1% -1 ml, amp.
2. Belladonna extract (Extractum Belladonnae siccum) – rect. supp. 0,015.
3. Platiphyllin hydrotartrate (Platiphyllini hydrotartras) - sol. f/i 0,2% -1 ml, amp.
4. Scopolamine hydrochloride (Scopolamini hydrochloridum) - sol. f/i 0,05% -1 ml, amp.
5. Hexamethonium benzosulfonate (Hexamethonii benzosulfonas) - sol. f/i 2,5% -1 ml, amp.
6. Dimecolin hydroiodide (Dimecolini hydroiodidum) – tabl. 0,05.
7. Suxamethonium hydroiodide (Suxamethonii hydroiodidum) - sol. f/i 2% - 5 ml, amp.

Task 2.

For understanding the pharmacology of anticholinergic agents it is necessary to know some information from physiology, pathology, pharmacognosy courses. Do you know:

- the physiologic effects which occur due to block of cholinergic transmission of nerve impulses in synapses;
- the names of alkaloids which are contained in plants such as Atropa Belladonna, Hyoscyamus niger, Senecio platiphylloides;
- the symptoms of bronchospasm and colic (renal, hepatic, intestinal)?

Task 3.

Divide the preparations into the M-cholinoblockers (A), ganglionic blockers (B) and miorelaxants (C). For ticked drugs (*) point out the dosage.

Drugs
1. Hexamethonium benzosulfonate* 8. Diplazin
2. Suxamethonium hydroiodide* 9. Pirenzepine
3. Scopolamine hydrochloride* 10. Trepirium hydroiodide
4. Tubocurarine hydrochloride 11. Platiphyllin hydrotartrate*
5. Metacine hydroiodide* 12. Pipecuronium hydrobromide
7. Azamethonium hydrobromide 14. Dimecolin hydroiodide

Task 4.

Compare the pharmacodynamics of M-cholinoblockers (A) and N-cholinoblockers (ganglionic blockers) (B). Match the pharmacological effects (numbers) with the names of pharmacological groups (letters).
Pharmacological effects

1. Bronchodilation.
2. Relaxation of smooth muscles of internal organs.
3. Decrease of blood pressure.
4. Inhibition of exocrine gland (gastric, intestinal, bronchial, etc) secretion.
5. Dilation of the pupil (mydriasis).
6. Increase of intraocular pressure.
7. Increase of uterine contraction.
8. Decrease of uterine contraction.
10. Tachycardia.
11. Increase of systolic blood output.
12. Central anticholinergic effects.

Class tasks

Task 1.

Divide the following drugs into M-cholinoblockers (A), ganglionic blockers (B), depolarizing (C) and nondepolarizing (D) miorelaxants. For ticked drugs (*) point out the dosage. Underline the new drugs.

Drugs

1. Atropine sulfate*
2. Hexamethonium benzosulfonate*
3. Suxamethonium hydroiodide*
4. Scopolamine hydrochloride*
5. Tubocurarine hydrochloride
6. Metacine hydroiodide
7. Homatropin hydrobromide
8. Diplazin
9. Azamethonium hydrobromide*
10. Platiphyllin hydrotartrate*
11. Adiphenine
12. Dimecolin hydroiodide
13. Trepirium hydroiodide
14. Pempyidine tosilate
15. Pirenzepine
16. Ipratropium hydrobromide
17. Vekuronium hydrobromide
18. Mellictine
19. Butylscopalamine hydrobromide
11. Pachycarpin hydroiodide*  23. Aprophene

Task 2.
Choose for each group of anticholinergic agents the suitable mechanism of action. Match the letters with numbers.

Pharmacological group
1. M-cholinoblockers.
2. Ganglionic blockers.
3. Depolarizing miorelaxants.

Mechanism of action.
A. The pharmacological denervation of organs: the block of N-cholinoceptrors in vegetative ganglia.
B. The prolonged depolarization of postsynaptic membrane.
C. Competitive antagonism with acetylcholine.
D. Block of M-cholinoceptrors.

Task 3.
For understanding of peculiarities of pharmacodynamics of anticholinergic agents compare the pharmacological effects of different groups of cholinoblockers. Fill in the table:

<table>
<thead>
<tr>
<th>Pharm. effects Pharm. group</th>
<th>Dilatation of pupil</th>
<th>↑IOP</th>
<th>Decrease of gland secretion</th>
<th>↓BP</th>
<th>Total relaxation of skeletal muscles</th>
<th>Central anticholinergic effects</th>
<th>Tachycardia</th>
<th>Decrease of smooth muscles tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-cholinoblockers</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ganglionic blockers</td>
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<tr>
<td>Miorelaxants</td>
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</tbody>
</table>

Note: the effect is: “+” - present; “−” - absent.
Task 4.

Atropine sulfate is the drug of reference for M-cholinoblockers; Hexamethonium benzosulfonate is the drug of reference for ganglionic blockers. Fill in the boxes (gaps) at the figure with different pharmacological effects (in different organs) of these drugs.
Task 5.

Answer the questions:

1. Why do nondepolarizing miorelaxants cause the pseudoallergic reactions often?
2. What side effects occur in some minutes after the ganglionic blockers administration?
3. What routes of administration are there for the Atropine sulfate?
4. Why are M-cholinoblockers contraindicated for glaucoma?
5. Why is Adiphenine contraindicated for patients while doing the work which requires attention?

Task 6.

For learning the interchangeability of anticholinergic agents fill in the table concerning their indications.

<table>
<thead>
<tr>
<th>Indications</th>
<th>Diagnostics of eye diseases</th>
<th>Peptic ulcer</th>
<th>Bronchial asthma</th>
<th>Premedication</th>
<th>Colics</th>
<th>Poisoning with cholinomimetics</th>
<th>Endarteritis</th>
<th>Hypertension, hypertensive crisis</th>
<th>Reposition relief of bone break-offs, setting dislocations</th>
<th>Relaxation during general anesthesia</th>
<th>Parkinson’s disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine sulfate</td>
<td>+</td>
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<td>Aprophene</td>
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<td>Scopolamine</td>
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<td>Adiphenine</td>
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<td>Hexamethonium</td>
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<td>Diplazin</td>
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<td>Platiphyllin</td>
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</tbody>
</table>

Note: the indication is: “+” - present; “−” - absent.

Make the conclusion about the interchangeability of anticholinergic agents.
Task 7.

Tell the patient about:
- the side effects and the symptoms of poisoning (overdosage) with Atropine sulfate and the first aid in such a case;
- the orthostatic hypotension caused by Hexamethonium benzosulfonate and principles of its rational administration.

Task 8.

Recognize the “pharmacological face” of drug.
The drug (in comparison with other anticholinergic agents) has the following peculiarity:
1. It has an antiseptic effect.
2. It has an uterotonic effect.
3. It has an uterolytic effect.
4. It is indicated for treatment of motion sickness.
5. It causes an addiction.
6. It is indicated for brain edema or pulmonary edema.
7. It is the drug of choice for treatment peptic ulcer.
8. It is indicated for dehydration of eyeball.

Drugs
A. Hexamethonium   E. Besalol
B. Diplazin        F. Scopolamine
C. Metacine        G. Adiphenine
D. Pachycarpin     H. Pirenzepine

Task 9.

Offer the substitution of Adiphenine, Pirenzepine, Butylscopalamine, Dimecolin, Suxamethonium, Trepirium hydroiodide, Vekuronium hydrobromide:
A- among the other members of this pharmacological group;
B- among the trade marks.
Task 10.
Correct the following prescriptions:

1. Rp.: Atropini sulfas 0,1% - 10 ml
   D.S.: Use 1-2 drops in each eye.
   #

2. Rp.: Pachycarpini hydroiodidi 3% - 5 ml
   D. t. d. N10
   D.S.: I/m 3-5 ml.
   #

3. Rp.: Soluc. Platiphyllini hydrochloridi 1 ml
   D. t. d. N10 in ampuli
   S.: 1 ml s/c TDS.
   #

4. Rp.: Diplazini 2%
   D. t. d. N10
   S. 2 ml i/m.

Tests
Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action.
2. Pharmacological effects → Indications → Dosage*.

Drugs

1. Atropine sulfate*
2. Pirenzepine
3. Ipratropium hydrobromide
4. Scopolamine hydrochloride*
5. Hexamethonium benzosulfonate*
6. Pachycarpin hydroiodide*
7. Azamethonium hydrobromide
8. Dimecolin hydroiodide
9. Diplazin
10. Suxamethonium hydroiodide*
11. Mellictine
ADRENERGIC AND ANTIADRENERGIC AGENTS

Topicality of the subject

The influence on the adrenergic synapses produces the activation or inhibition of the adrenergic transmission. Because of this it is possible to increase or decrease the blood pressure, cardiac output, bronchial tone, etc.

For pharmacist it is necessary to know the mechanism of action, pharmacodynamics, indications, side effects, etc. of adrenergic and antiadrenergic agents, because such drugs are widely prescribed for treatment of many dangerous for life pathologic conditions (such as shock, collapse, bronchospasm, hypoglycemic coma).

Theoretical questions

1. The classification of adrenergic agents.
2. The mechanism of action, pharmacodynamics, indications and comparative description of adrenomimetics.
3. The side effects, contraindications and principles of rational administration of adrenergic agents.
4. The classification and mechanism of action of antiadrenergic agents.
5. Pharmacodynamics, indications and peculiarities of antiadrenergic agents.
6. The side effects, contraindications and principles (instructions) of rational administration of antiadrenergic agents.

Home tasks

Task 1.

Write the following prescriptions:

1. Epinephrine hydrochloride (Epinephrini hydrochloridum) - sol. f/i 0,1% – 1 ml, amp.
2. Norepinephrine hydrotartrate (Norepinephrini hydrotartras) - sol. f/i 0,2% – 1 ml, amp.
3. Phenylephrine (Phenylephrinum) - sol. f/i 1% – 1 m, amp.
4. Ephedrine hydrochloride (Ephedrini hydrochloridum) - sol. f/i 2% - 10 ml (nasal drops).
5. Isoprenaline (Isoprenalinum) - sol. 2% - 100 ml, vial (for inhalations).
6. Prazosine (Prazosinum) – tabl. 0,001.
7. Propranolol (Propranololum) - tabl. 0,04.

Task 2.

Answer your colleagues questions:
“What adrenergic and antiadrenergic agents are used for treatment of bronchial asthma (1), shock (2), collapse (3), heart stoppage (4), hypertension (5), angina pectoris (6), tachyarrhythmias (7) and for prolonging action of local anesthetics (8)?”

Name these drugs and their dosage.

Class tasks

Task 1.

Divide the following drugs into the adrenomimetics (A), sympathomimetics (B), adrenoblockers (C), sympatholytics (D). For ticked drugs (*) point out the dosage. Underline the new drugs.

Drugs

1. Epinephrine
2. Salbutamol
3. Phentolamine
4. Propranolol
5. Phenylephrine
6. Orciprenalin sulfate
7. Dihydroergotamine mezilate
8. Oxprenolol
9. Reserpine
10. Dobutamine
11. Terbutaline
12. Klenbuterol
13. Salmeterol
14. Tamsulosine
15. Doxazosine
16. Prazosine
17. Terazosine
18. Nycergoline
10. Xylomethazolin  30. Metoprolol
11. Norepinephrine  31. Talynolol
12. Oxymetazoline  32. Acebutolol
13. Fenoterol  33. Sotalol
14. Isoprenaline  34. Labetalol
15. Ephedrine hydrochloride  35. Proxodolol
16. Octadine  36. Dophamine
17. Pyrroxan  37. Pyndolol
18. Tetrizolin  38. Iochimbin hydrochloride
20. Clonidin

Task 2.

Preparing the report for doctors about the peculiarities of adrenergic agents’ pharmacological effects fill in the table: “Pharmacodynamics of adrenomimetics”.

<table>
<thead>
<tr>
<th>Group of drugs</th>
<th>Vasoconstriction</th>
<th>↑BP</th>
<th>↓BP</th>
<th>Cardio-stimulation</th>
<th>Bronchodilatation</th>
<th>Uterolytic effect</th>
<th>↑glycogennolysis, lipolysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>α₁ – AM</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>α₂ – AM</td>
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<tr>
<td>β₁ – AM</td>
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<td>β₂ – AM</td>
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<td>β₁-, β₂ – AM</td>
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<td>α₁-, α₂-, β₁,-</td>
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<td>β₂ – AM</td>
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</tr>
</tbody>
</table>

Note: the pharmacological effect is: “+” - present; “−” - absent.
Task 3.

Preparing the report for your colleagues about the peculiarities of antiadrenergic agents’ pharmacodynamics fill in the table: “Pharmacological effects of antiadrenergic agents”.

<table>
<thead>
<tr>
<th>Pharmacological effects</th>
<th>Group of drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hypotensive effect</td>
<td></td>
</tr>
<tr>
<td>2. Dilation of peripheral vessels</td>
<td></td>
</tr>
<tr>
<td>3. Decrease of cardiac output</td>
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<tr>
<td>4. Antianginal effect</td>
<td></td>
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<tr>
<td>5. Antiarrhythmic effect</td>
<td></td>
</tr>
<tr>
<td>6. Increase of blood supply of organs</td>
<td></td>
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<tr>
<td>which are located in small pelvis</td>
<td></td>
</tr>
<tr>
<td>7. Decrease of smooth muscles tone of</td>
<td></td>
</tr>
<tr>
<td>prostatic part of the urethra</td>
<td></td>
</tr>
<tr>
<td>8. Decrease of intraocular pressure</td>
<td></td>
</tr>
</tbody>
</table>

Task 4.

Answer the question: “What indications do different groups of adrenergic and antiadrenergic agents have?” For these purpose match the group of drugs (letters) with their indications (numbers).

Groups of drugs

| A. $\alpha_1$ – adrenomimetics | G. $\alpha_1$ – adrenoblockers |
| B. $\alpha_2$ – adrenomimetics | H. $\alpha_2$ – adrenoblockers |
| C. $\beta_1$ – adrenomimetics  | I. $\beta_1$ – adrenoblockers  |
| D. $\beta_2$ – adrenomimetics  | J. $\beta_1$, $\beta_2$ – adrenoblockers |
| E. $\beta_1$, $\beta_2$ – adrenomimetics | K. $\alpha_1$, $\alpha_2$, $\beta_1$, $\beta_2$ – adrenoblockers |
| F. $\alpha_1$, $\alpha_2$, $\beta_1$, $\beta_2$ – adrenomimetics | L. Sympatholytics |
|                              | M. Sympathomimetics             |
Indications

1. Hypertension
2. Angina pectoris
3. Hypertensive crisis
4. Withdrawal syndrome
5. Shock, collapse
6. Rhinitis
7. Heart stoppage
8. Cardiogenic shock
9. Hypotension
10. Bradyarrhythmia
11. Anaphylactic shock
12. Bronchial asthma
13. Prolonging of local anesthetics effect
14. Hypoglycemic coma
15. Threatened prematurity labor
16. Adenoma of prostate
17. Endarteritis
18. Diagnostics and treatment of pheochromocytoma
19. Motion sickness
20. Migraine
21. Tachyarrhythmia

Tack 5.

Tell the doctors about the main side effects of adrenergic and antiadrenergic agents. Fill in the table:

<table>
<thead>
<tr>
<th>Group of drugs</th>
<th>Tachyarrhythmias</th>
<th>of heart rate</th>
<th>Necrosis of nasal mucous membrane</th>
<th>Bronchospasm</th>
<th>of norepinephrine release by the negative feed-back</th>
<th>of motility and secretion of GIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_1, \beta_2 ) - adrenoblockers</td>
<td></td>
<td></td>
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<td>( \alpha_1, \alpha_2 ) - adrenoblockers</td>
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<td>( \alpha_1 ) - adrenomimetics</td>
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<td>( \beta_1, \beta_2 ) - adrenomimetics</td>
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<tr>
<td>Sympatholytics</td>
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</tbody>
</table>

Note: the side effect is: “+” - present; “−” - absent.
Task 6.
Answer your colleagues questions concerning the peculiarities of adrenergic and antiadrenergic agents.

1. How does the action of epinephrine change due to influence of \( \alpha_1 \)-adrenoblockers?
2. What side effects do noncardioselective \( \beta_1 \), \( \beta_2 \)–adrenoblockers have in comparison with cardioselective \( \beta_1 \)–adrenoblockers? What differences are there in the contraindications of these pharmacological groups?
3. Why don’t \( \alpha + \beta \)-adrenoblockers influence on the cardiac activity and bronchial tone in comparison with the selectively acting drugs?
4. Why are \( \beta_2 \)-adrenomimetics the drugs of choice as bronchodilatators?
5. What drugs (selective \( \beta_1 \) – adrenomimetics or nonselective \( \beta_1 \), \( \beta_2 \)–adrenomimetics) are the drugs of choice for treatment of cardiogenic shock? Why?

Task 7.
Recognize the “pharmacological face” of drug (peculiarities of each drug). Match the letters with numbers.

Drugs
1. Epinephrine
2. Xylometazoline
3. Norepinephrine
4. Octadine
5. Ephedrine
6. Dophamine
7. Reserpine
8. Iochimbine
9. Proxodolol

A. Drug isn’t indicated for chronic rhinitis.
B. Drug causes neuroleptic effect due to decrease of adrenergic transmission in CNS.
C. Drug produces hypotensive effect in 2-3 days after the beginning of treatment.
D. Drug can be introduced only by intravenous injection because it causes necrosis in case of intramuscular route of administration.
E. Drug can be administered only by parenteral rout, but the subcutaneous injection isn’t effective because of the strong vasoconstriction.
F. Drug stimulates CNS.
G. Drug may be used for glaucoma because it decreases the intraocular pressure.
H. Drug has diuretic effect.
I. Drug improves the blood supply of small pelvis organs; increase the potency.

Task 8.
Match the names of pharmacological groups with their contraindications.

Pharmacological group of drugs

A. $\beta_1$, $\beta_2$ – adrenoblockers
B. $\alpha_1$ – adrenomimetics
   (long-term administration)
C. Sympatholytics
D. $\alpha_1+\alpha_2$ – adrenoblockers

Contraindications

1. Chronic rhinitis
2. Bronchial asthma
3. Peptic ulcer
4. Tachycardia

Task 9.
Offer the patient the substitution of Phenylephrine hydrochloride, Tetrizolin, Fenoterol, Dobutamine, Isoprenaline, Doxazosine, Acebutolol, Propranolol, Nycergoline.
A – among the other members of pharmacological group;
B – among the trade marks.
Task 10.
Correct the following prescriptions:

1. Rp.: Ephedrini hydrochloridi - 10 ml
   D.S.: As always.
   #

2. Rp.: Naphthizini 0,1% - 1 ml
   D.S.: Use 1-2 drops in each eye.
   #

3. Rp.: Tabul. Anaprilini
   D.t.d. N 20
   S.: Use 1 tablet 3 times a day.
   #

4. Rp.: Adrenalini hydrochloridi 0,1% - 10 ml
   D.S.: 1ml i/v.
   #

Tests
Describe the drugs using following schemes:

1. Pharmacological group → Interchangeability → Mechanism of action.
2. Pharmacological effects → Indications → Dosage*.

Drugs

1. Epinephrine*
2. Ephedrine*
3. Phenylephrine*
4. Xylomethazolin*
5. Salbutamol
6. Dobutamine
7. Prazosine*
8. Metoprolol*
9. Propranolol*
10. Reserpine*
11. Clonidin
12. Fenoterol
13. Isoprenaline
14. Nycergoline
15. Tetrizolin