

ANALGESICS.

A. Actuality. Pain is the main cause of visit to a doctor. The sensation of pain accompanies most processes and pathological conditions. In some cases it is tolerable, in others it causes the discomfort, suffering or even pathological disorder, and in these cases it must be juggled. Treatment involves pain, in addition to measures to remove its cause, symptomatic annihilation by analgesics that may mitigate or suppress this feeling.

B. The purpose of the training is to familiarize the students with groups of analgesics, principles and possibilities jugular or attenuation the pain of different genesis.

C. Learning objectives:

1) The student must **know**: the general characteristics of the analgesics, their origin and their chemical structure, the principles of classification, the drug forms and the routes of administration of the main preparations in this group, the mechanism of analgesic action, the indications and contraindications, the adverse reactions, the symptoms of acute and chronic poisoning with opioid and non-opioid analgesics, as well as their assistance.

2) The student must **be able to**: prescribe the compulsory of the analgesics in various forms of medicine and indicate them in various diseases and pathological conditions accompanied by pain.

D. Initial level of knowledge required for interdisciplinary integration:

Human physiology. The biological importance of pain. Pain as an integral reaction of the body. Contemporary conceptions about nociception. Opioid receptors - types, location and effects to their excitement. Chemical mediators of pain and antinociceptive system. Endogenous and exogenous ligands of opioid receptors: enkephalins, endorphins and dinorphins. Driving paths of pain excitement. The central mechanisms of pain. The role of the cortex, subcortical formations, humoral factors in the formation of dolore reactions.

Pathophysiology. The role of pain syndrome in the development and evolution of the pathological process. The role of central and peripheral mechanisms in the formation of pain sensation.

E. Self-training questions:

1. Analgesics. Classification.
2. Opioid analgesics. Classification by receptor affinity. Mechanism of analgesic action at molecular and systemic level. The influence of opioid analgesics on the CNS, the respiratory system, the cardiovascular system, the gastrointestinal and urinary tracts. Indications, adverse reactions and contraindications.
3. The comparative characteristic of morphine and synthetic opioid analgesics. Notion about neuroleptanalgesia. Indications of neuroleptanalgesia.

4. Acute intoxication with opioid analgesics and first aid measures. Drug addiction, drug dependence, tolerance. Ways of prophylaxis and principles of treatment.
5. Agonists-antagonists, partial agonists and antagonists of opioid receptors. The principles of action. Indications, adverse reactions and contraindications.
6. Central analgesics with a mixed mechanism of action (opioid-non-opioid). Mechanisms of action. Indications, adverse reactions and contraindications.
7. Non-opioid analgesics with central action. Derivatives of paraaminophenol and from various groups. Mechanisms of action and effects. Indications, adverse reactions and contraindications.
8. Non-opioid analgesics with peripheral action. Classification. Mechanism of analgesic action. The effects. Indications, adverse reactions and contraindications.
9. Peculiarities of antipyretic action of non-opioid analgesics. Indications.
10. Peculiarities of action and administration of opioid and non-opioid analgesics in children.

F. Independent work (is done in written form while preparing for the lesson)

1)Brief characteristics of compulsory drugs: (Pharmaceutical form. Ways of administration. Doses (maximum for one intake, for 24 hours, therapeutic). Mechanism of action. Indications. Contraindications. Adverse reactions.)

1. Morphine hydrochloride. 2. Omnopone. 3. Trimeperidine. 4. Fentanyl. 5. Tilidine. 6. Naloxone. 7. Naltrexone. 8. Tramadol. 9. Paracetamol. 10. Acetylsalicylic acid. 11. Ketorolac. 12. Dexketoprofen trometamol. 13. Baralgin. 14. Pentazocine.

2.) Questions on medical prescriptions.

To prescribe the following drugs in all the possible medicinal forms:

1. Morphine hydrochloride. 2. Omnopone. 3. Trimeperidine. 4. Fentanyl. 5. Tilidine. 6. Naloxone. 7. Naltrexone. 8. Tramadol. 9. Paracetamol. 10. Acetylsalicylic acid. 11. Ketorolac. 12. Dexketoprofen trometamol. 13. Baralgin. 14. Pentazocine.

<i>Nr.</i>	<i>Denumirea medicamentului</i>	<i>Forma de livrare, doza</i>
1.	Omnopone	Ampoules sol.1% and 2%-1ml.
2.	Trimeperidine	Ampoules sol.1% and 2%-1ml. Tablets 0,025;
3.	Fentanyl	Ampoules sol. 0,005%-1, 2 and 10 ml Plasters 0,000025 and 0,00005;
4.	Tilidine	Ampoules sol. 5%-1/2ml; Vials sol. 5%-10ml (pic. p/u uz intern); Suppositories 0,05 and 0,1; Tablets 0,05 and 0,1.
5.	Naloxone	Ampoules sol. 0,04%-1ml
6.	Naltrexone	Capsules 0,05

7.	Tramadol	Ampoules sol.5%-1 and 2ml; 10%-1ml Vials sol 10%-10; 20; 30; 50 and 100ml (drops for internal use) Suppositories rectal 0,1 Tablets 0,05; 0,1; 0,15 and 0,2
8.	Paracetamol	Ampoules sol.15%-2ml Vials susp. 2,4%-70; 100 and 300ml; 5%-100ml;10%-15ml; Syrup 2,4%-50 and 100ml; 2,5%-60; 100 and 120ml; 3,2%-30 and 120ml; 4%-60 and 120ml; Powder in packs 0,08; 0,15 and 0,24 (internally); Capsules 0,325 and 0,5; Tablets 0,125; 0,2; 0,325 and 0,5.
9.	Acetylsalicylic acid	Tablets 0,1; 0,325; 0,25 and 0,5
10	Ketorolac	Ampoules sol. 3%-1ml Tablets 0,01
11	Dexketoprofen trometamol	Ampoules sol.2,5%-2ml Tablets 0,025
12	Baralgin	Tablets 20; Ampoules-5ml.
13	Pentazocine	Ampoules sol. 3%-1ml; Suppositories 0,05; Tablets 0,05

List the groups and drugs used in (for): myocardial infarction, trauma, headache, biliary and renal colic, fever, neuralgia, myositis, acute dental pain, premedication, postoperative pain, labor analgesia, neuroleptanalgesia, algodysmenorrhea, inoperable cancer, acute poisoning with opioid analgesics.

3.) Tests (Guidelines for Laboratory Work in Pharmacology).

4.) Tables

Table N1

Types of opioid receptors and effects on their stimulation

The opioid receptor	Effects of their stimulation
μ	
κ	
δ	

Spectrum of interaction of opioid analgesics and their antagonists with receptors

The type of interaction with the receptor	Drug	The types of opioid receptors		
		μ	δ	κ
Agonists	Morphine			
	Trimeperidine			
	Fentanyl			

Agonist-antagonists and partial agonists	Pentazocine			
	Butorphanol			
	Buprenorphine			
Antagonists	Naloxone			

Please express the presence of a pharmacologic effect with a “+” sign.

Table N3

The pharmacological effects of opioid analgesics (on the example of morphine)

Location of the action	Effect	The clinical significance of the effect
Respiratory center		
Cough center		
Thermoregulation center		
Oculomotor nerve center		
Vagus nerve center		
Vomiting center		
Cortex		
Smooth muscles of the gastrointestinal tract		
Smooth muscle of the urinary and biliary		
Smooth muscle of the bronchi		

Please express the presence of a pharmacologic effect with a “+” sign.

Table N4

Comparative analysis of the analgesics from agonists and agonist-antagonists of opioid receptors

Parameters	Agonists	Agonist-antagonists
The degree of analgesic effect		
Inhibition of the respiratory center		
Drug dependence		
Tolerance		
The ability to produce euphoria		

Please express the presence of a pharmacologic effect with a “+” sign.

G. Interactive activity

1. Experimental and virtual didactic film (elaboration of protocols, conclusions)

- 2. Clinical case (Guidelines for Laboratory Work in Pharmacology).**
- 3. Virtual situations (Guidelines for Laboratory Work in Pharmacology).**
- 4. Virtual didactic movie.**

5.) Solve the case:

A patient with inoperable pulmonary cancer was given injectable morphine. A constipation has been observed in a short period of time in the patient. A contrast stasis was determined radiologically at the level of the first colon curve. The patient was laparotomized, tumor formations were not detected.

What was the cause and mechanisms of constipation development?

What are the possible measures of prophylaxis of the complication?

GENERAL ANESTHETICS.

A. Actuality. The issue of fighting pain in various surgeries has been a concern for doctors since ancient times. The discovery of general anesthesia allowed to perform complicated operations and save lives of many patients. Despite the results, the field of medicine requires careful and intense study of general anesthetics us who must meet the current requirements of surgery and anesthesiology.

B. The purpose of the training is to study the pharmacology of general anesthetics, the possibility of their use in medical practice.

C. Learning objectives:

1) The student must **know:** definition, classification, mechanism of action, comparison feature, indications, contraindications and side effects of general anesthetics.

2) The student must **be able to:** prescribe the medical prescriptions for most important general anesthetics in all possible drug forms, indicates general anesthetics by surgery.

D. Initial level of knowledge required for interdisciplinary integration:

Human anatomy. Ascending pathways (therein) nerve conduction (exteroceptive, proprioceptive, interoceptive) and their destinations. Larynx, trachea, bronchi, lungs. Their structure.

Human physiology. CNS physiology. Mediators CNS. The mechanism of transmission of nerve impulses. Excitation and inhibition processes in the CNS. The reflector CNS activity.

General surgery. History of general anesthesia. Theories of general anesthesia. The phases of general anesthesia.

E. Self-training questions:

1. Definition and classification of general anesthetics.

2. The mechanism of action of general anesthetics.

3. Inhaled general anesthetics. Classification. The physico-chemical and pharmacological properties of the volatile liquid anesthetic gas. Index anesthetic.

4. General anesthetics influence on the phases and levels of inhalation general anesthesia. Adverse effects of inhaled general anesthetics.

5. Pharmacokinetics of inhaled general anesthetics.

6. Intravenous general anesthetics. Classification.

7. General anesthetics influence on the phases and levels of intravenous general anesthesia. Indications. Adverse reactions. Pharmacokinetics.

8. Concomitant use of general anesthetics.

F. Independent work (is done in written form while preparing for the lesson)

1) Brief characteristics of compulsory drugs: (Pharmaceutical form. Ways of administration. Doses (maximum for one intake, for 24 hours, therapeutic). Mechanism of action. Indications. Contraindications. Adverse reactions.)

Drug name 1. Halothane. 2. Diethyl ether. 3. Thiopental sodium. 4. Ketamine. 5. Sodium oxybutyrate. 6. Enflurane. 7. Isoflurane. 8. Nitrous oxide. 9. Propanidide.

2.) Questions on medical prescriptions.

To prescribe the following drugs in all the possible medicinal forms:

1. Halothane. 2. Diethyl ether. 3. Thiopental sodium. 4. Ketamine. 5. Sodium oxybutyrate. 6. Enflurane. 7. Isoflurane. 8. Nitrous oxide. 9. Propanidide.

<i>Nr.</i>	<i>Denumirea medicamentului</i>	<i>Forma de livrare, doza</i>
1.	Halothane	Vials 50 and 250ml bottles
2.	Diethyl ether	Vials 100 and 150ml
3.	Thiopental sodium	Vials with lyophilized powder 0.5 and 1.0
4.	Ketamine	Ampoules sol.1%-5ml; 5%-2 and 10ml Vials sol.1%-20ml; 5%-5 and 10ml; 10%-10ml
5.	Sodium oxybutyrate	Ampoule sol.20%-10ml Syrup in vial 5%-400ml
6.	Enflurane	Vials 125 and 250ml
7.	Isoflurane	Vials 100 and 250ml
8.	Nitrous oxide	Bottle 10 l
9.	Propanidide	Amp. sol. 5%-10ml.

List the groups and drugs used in (for): major surgical interventions with long duration, surgical interventions with short duration, acute myocardial infarction, initiation of anesthesia, convulsions, labor anesthesia, neuroleptanalgesia.

3) Tests (Guide for laboratory work in pharmacology.).

4) Tables (recapitulation of knowledge)

Table N1

Comparative analysis of inhaled anesthetics

Drugs	Ether	Nitrous oxide	Halothane	Sevoflurane
Anesthesia capacity (large, medium, small)				
The level of expression of arousal stage (highlighted / unhighlighted)				
The range of the anesthetic				

action (high / low)				
Irritability (characteristic/ uncharacteristic)				
Flammable (yes / no)				
Other peculiarities				

Please express the presence of a pharmacologic effect with a “+” sign.

Table N2

Comparative analysis of non-inhaled anesthetics

Parameters	Propanidid (Sombrevin)	Ketamine (Calipsol)	Thiopental Sodium	Sodium oxybutyrate
The level of expression of anesthetic property (high / medium / low)				
The rate of appearance anesthesia at intravenous administration (min)				
Effect duration (min)				
Influence on CV system				
Other peculiarities				

Please express the presence of a pharmacologic effect with a “+” sign.

G. Interactive activity

- 1. Experimental and virtual didactic film** (elaboration of protocols, conclusions)
- 2. Clinical case** (Guidelines for Laboratory Work in Pharmacology).
- 3. Virtual situations** (Guidelines for Laboratory Work in Pharmacology).
- 4. Virtual didactic movie.**

5.) Solve the case:

A patient with myocardial infarction for juggling pain was inspired to inhale a gaseous mixture with an inhaled anesthetic. After some inspiration with the given blend, the patient said the painful heartbeat sensations almost disappeared.

What inhalation anesthetic was indicated?

What was the mechanism of analgesics?