**ANALGESICS**

1. **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.
2. **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.
3. **Learning objectives:**
4. The student must **know**: the general characteristicts 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.
5. 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.
6. **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.

1. **Self-training questions:**
2. Analgesics. Classification.
3. Opioid analgesics. Classification according to the affinity for the receptors. Molecular and systemic mechanism of analgesic action. The influence of opioid analgesics on the CNS, respiratory, cardiovascular, gastrointestinal and urinary systems. Indications, side effects and contraindications.
4. Comparative characteristic of morphine and synthetic opioid analgesics. Notion about neuroleptanalgesy. Neuroleptanalgesy’s indications.
5. Acute poisoning with opioid analgesics and first aid measures. Pharmacodependence, drug addiction, tolerance. The ways of prevention and treatment principles.
6. Agonist-antagonists, partial agonists and opioid receptor antagonists. Principles of action. Indications, side effects and contraindications.
7. Central analgesics with mixed mechanism of action (opioid-non-opioid). The mechanisms of action. Indications, side effects and contraindications.
8. Centrally acting non-opioid analgesics. Paraaminophenol derivatives and from various groups. Mechanisms of action and effects. Indications, side effects and contraindications.
9. Peripherally acting non-opioid analgesics. Classification. The mechanism of analgesic action. Effects. Indications, side effects and contraindications.
10. Peculiarities of antipyretic action of non-opioid analgesics. Indications.
11. 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:**

**Down:** Drug name.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. Baralgain. 14. Pentazocine.

**Across:** 1. Medicinal form. 2. Way of administration. 3. Doses (therapeutic, maximal for one intake and for 24 hours). 4. Spectrum of action 5. Mechanism of action. 6. Indications and contraindications. 7. Side effects.

# 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. Baralgain. 14. Pentazocine.

**Drugs used in (for):** myocardial infarction, trauma, headache, biliary and renal colic, fever, neuralgia, myositis, acute dental pain, premedication, postoperative pain, labor analgesia, neuroleptanalgesia, algodismenorrhea, inoperable cancer, intoxication with opioid analgesics.

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

**4.) Clinical case** (Guidelines for Laboratory Work in Pharmacology).

**5.) Virtual situations** (Guidelines for Laboratory Work in Pharmacology).

**6.) Virtual didactic movie.**

**7.) Tables**

Table N1

**Types of opioid receptors and effects on their stimulation**

|  |  |
| --- | --- |
| The opioid receptor | Effects of their stimulation |
| **μ** |  |
| **κ** |  |
| **δ** |  |

Note! The effects determined by the stimulation of the respective receptors are described.

Table N2

**Comparative analysis between antipsychotics and tranquilizers**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 |  |  |  |

Note! Agonism towards a particular type of receptor is noted with the sign "+" and the antagonism - with the 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 |  |  |

Note! The effects determined by the stimulation of opioid receptors by morphine and their clinical importance are described.

Table N4

**Comparative analysis of the analgesics of 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 |  |  |

Note! The presence of the effect is noted with the sign "+" and the absence - with the sign "-".

**9.) 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**

1. **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.
2. **The purpose of the training is** to study thepharmacology of general anesthetics, the possibility of their use in medical practice.
3. **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.

1. **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.

1. **Self-training questions:**
2. Definition and classification of general anesthetics.
3. The mechanism of action of general anesthetics.
4. Inhaled general anesthetics. Classification. The physico-chemical and pharmacological properties of the volatile liquid anesthetic gas. Index anesthetic.
5. General anesthetics influence on the phases and levels of inhalation general anesthesia. Adverse effects of inhaled general anesthetics.
6. Pharmacokinetics of inhaled general anesthetics.
7. Intravenous general anesthetics. Classification.
8. General anesthetics influence on the phases and levels of intravenous general anesthesia. Indications. Adverse reactions. Pharmacokinetics.
9. Concomitant use of general anesthetics.

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

**1) Brief characteristics of compulsory drugs:**

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

**Across:** 1. Medicinal form. 2. Way of administration. 3. Doses (therapeutic, maximal for one intake and for 24 hours). 4. Spectrum of action 5. Mechanism of action. 6. Indications and contraindications. 7. Side effects.

# 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.

**Drugs used in (for):** major surgical interventions with long duration, surgical interventions with short duration, acute myocardial infarction, initiation of anesthesia, seizures, labor anesthesia.

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

**4.) Clinical case** (Guidelines for Laboratory Work in Pharmacology).

**5.) Virtual situations** (Guidelines for Laboratory Work in Pharmacology).

**6.) Virtual didactic movie.**

**7.) Tables**

Table N1

**Comparative analysis of inhaled anesthetics**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Drugs** | **Diethyl ether** | **Nitrous oxide** | **Halothan** | **Sevofluran** |
| 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 |  |  |  |  |

Note! It is completed using the qualifications from the first column.

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 speed of onset of anesthesia at intravenous administration (min) |  |  |  |  |
| Effect duration (min) |  |  |  |  |
| Influence on CV system |  |  |  |  |
| The action on the breath |  |  |  |  |
| The action on skeletal muscles |  |  |  |  |
| Other peculiarities |  |  |  |  |

Note! Is completed using the qualifications in the first column, as well as the specific features of the respective drugs.

**8.) 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?