

## **CLINICAL PHARMACOLOGY OF DRUGS THAT ACT ON ACID-BASE, WATER AND ELECTROLYTE HOMEOSTASIS, PLASMATIC VOLUME SUBSTITUTES AND DIURETICS**

### **A. Relevance:**

Acid-base and water and electrolyte balance deregulations are a reaction of the body to the action of various endogenous and exogenous harmful factors (shock, diabetes, heart attack, intoxication, etc.). The physicians' interest in the drugs used in the treatment of acid-base and water and electrolyte balance as well as plasma volume substitutes has increased with the discovery of new elements in the pathogenesis and treatment of shock, intoxication, etc.

Diuretics are an important group of drugs widely used in medical practice, and their selection and rational use requires wide knowledge of the particularities of action and efficacy in the treatment of diseases and pathologic conditions, accompanied by fluid retention in the body. The retention of salts and water in the body leads to edema and fluid accumulation in cavities, symptoms of kidney disease, cardiovascular failure, liver pathologies and emergency states (acute intoxication, hypertensive seizures, cerebral edema, etc.).

### **B. Goal of teaching:**

To learn the clinical and pharmacological principles for the selection and evaluation of the drugs efficacy, that influences on the acid-base and water and electrolyte balance, plasma volume substitutes and diuretics in the treatment of pathological diseases and conditions (shock, intoxication, peritonitis, necrotic pancreatitis, diabetes, heart attack, etc.)

### **C. Teaching objectives:**

*The student must possess the skills to:*

- a) appreciate the manifestations of the pharmacodynamic effects of drugs which influence the acid-base and water and electrolyte balance, plasma volume substitutes, diuretics;
- b) to analyze and appreciate the results of the pharmacodynamic study of these drugs, obtained by laboratory and instrumental methods;
- c) forecast possible complications and side effects of the drugs used;
- d) predicting the dependence of adverse reactions on the dosage regimen and on the functional state of the organs and systems of the organism;
- e) make a personal form (medicines P)

### **D. Knowledge of previously studied subjects and related ones:**

*Anatomy, histology, physiology, pathophysiology and biochemistry.* The physiological basics of the body's acid-base and water and electrolyte balance. The role of kidneys, liver, skin and other organs and systems in regulating acid-base balance. Nephron structure and functions. Kidney physiological mechanisms. Edema, dehydration and hydration states, development mechanisms.

*Clinical disciplines.* Diseases and pathological conditions accompanied by fluid retention in the body. Pathogenetic mechanisms of development of edema in cardiovascular, cerebrovascular, renal, pulmonary and digestive tract diseases, principles of treatment. Types of dehydration, hydration and shock, classification, pathogenesis, clinical manifestations, diagnostic principles and treatment. Pathologies and serious conditions in medical practice that cause metabolic acidosis and alkalosis.

*Pharmacology.* Classification, mechanism of action, indications, contraindications, adverse reactions of diuretics and drugs influencing the electrolytic and acid-base balance, plasma volume substitutes. Drugs used for alkalizing, acidifying, and correction of electrolyte disturbances, crystalloid solutions (isotonic, hypotonic, hypotonic) and colloidal solutions.

### **E. Questions of self-training:**

***I. Clinic-pharmacological characteristics of drugs used in changing the acid-base, water and electrolyte balance, as well as plasmatic volume substitutes and diuretics.***

1. Classification of diuretics by the site of action, duration and effect potency.
2. Osmotic diuretics: mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics.

3. Loop diuretics: mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics.
4. Thiazide diuretics and related (non-thiazide) diuretics: mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics.
5. Competitive antagonists of aldosterone: mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics
6. Uncompetitive aldosterone antagonists: mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics.
7. Classification of drugs with influence on water and electrolyte balance.
8. Clinical pharmacology of crystalloid substances used in water and electrolyte disturbances (iso-, hypo and hypertonic dehydration): mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics.
9. Classification of plasma volume substitutes. Clinical pharmacology of starch derivatives, blood preparations: mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics.
10. Dextran: classification, mechanism of action, particularities of pharmacological effects, indications and principles of use, adverse reactions, pharmacokinetics.
11. Clinical pharmacology of substances used in acid-base disorders: classification, mechanism of action, particularities of action, indications and principles of use, adverse reactions, pharmacokinetics.

***II. Clinical-pharmacological selection and use of MS in some diseases caused by acid-base, water and electrolyte disbalance:***

- Principles of drug selection and use in dehydration: hypotonic, isotonic, hypotonic;
- Principles of drug selection and use in acidosis and metabolic alkaloids.
- Principles of selection and use of diuretics in poisoning, pulmonary and cerebral edema, acute renal failure, etc .;
- Principles of selection and use of plasma volume substitutes in hypovolemic shock, orthostatic hypotension;

**F. Individual work:**

**1. Brief characterization of the main drugs.**

**Vertically – Intentional Nonproprietary Name (INN) of drug.**

**Horizontally - synonyms, forms of delivery, administration mode, doses (therapeutic, maximal), mechanism of action, indications, contraindications, adverse reactions.**

Eplerenone, triamterene + hydrochlorothiazide (triampur), albumin, neopolividon, bumetanide, indapamide, acetazolamide, hydroxyethylamide.

**2. Exercises on medical formulation (see methodological instructions for practical works on pharmacology for 3-rd year):**

Hydrochlorothiazide, furosemide, triamterene, mannitol, spironolactone, ammonium chloride, sodium chloride, dextran 40, dextran 70, sodium hydrocarbonate, potassium chloride, calcium chloride, trometamol, rehidron, torasemide.

**3. Specify the drugs used in (for):**

Metabolic acidosis; metabolic alkalosis; isotonic dehydration; hypotonic dehydration; hypertonic dehydration; hypovolemic shock; intoxications in peritonitis; toxic-food intoxications; haemorrhagic shock; cerebral edema; pulmonary edema of cardiac origin; toxic pulmonary edema; acute left ventricular failure; acute kidney failure; chronic renal failure; acute intoxication; liver cirrhosis with ascites; glaucoma; essential hypertension; forced diuresis;

congestive heart failure; hypertension with hyperaldosteronism prevention of thrombosis, insipid diabetes.

**4. Tests (Clinical Pharmacology (for faculty of medicine), Chisinau, 2014 pag. 56;**

**5. Clinical Cases, Chisinau, 2017, pag. 79;**

**6. Virtual Situations " Îndrumar pentru lucrări de laborator la farmacologie" ("Guideline for Laboratory Work in Pharmacology") Chisinau, 2016, p. 199.**

**7. Selection of diuretics and drugs with influence on acid-base and electrolyte equilibrium according to efficacy, safety and cost criteria for inclusion in the personal form (P drugs).**