

**Ministry of health of the Republic of Belarus**  
**Educational institution**  
**«Gomel State Medical University»**

Department of general and clinical pharmacology

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**METHODOLOGICAL RECOMMENDATIONS**

for a practical lesson on the discipline "Pharmacology"  
for the third-year students of the Faculty of Foreign Students,  
studying at the specialty 1-79 01 01 "General medicine"

**TOPIC 5: «PHARMACODYNAMICS OF DRUGS.  
FACTORS AFFECTING PHARMACODYNAMICS »**

Time: 3 hours

Approved at the meeting of the department of general and clinical pharmacology  
the protocol № 18 of 30.06.2022

## **LEARNING AND EDUCATIONAL GOALS, OBJECTIVES, MOTIVATION FOR LEARNING THE TOPIC**

Rational choice of drugs is impossible without knowledge of the features of pharmacodynamics, pharmacokinetics and their interactions. The mechanism of action, side and main effects, dose, metabolism of the drug, especially with prolonged use should be taken into account when prescribing medications, especially in conditions of altered sensitivity of the body.

### **Learning objective:**

– formation of scientific knowledge about the main pharmacological effects, providing therapeutic and preventive effect of drugs on the topic of the class, indications and contraindications for their use, the interaction of drugs, their combined use for use in medical and preventive activities.

### **Educational purpose:**

– to develop their value-personal, spiritual potential, to form the qualities of a patriot and citizen, ready for active participation in the economic, industrial, socio-cultural and public life of the country; to realize the social significance of their future professional activities, to learn to follow academic and work discipline, standards of medical ethics and deontology.

### **Tasks:**

As a result of the study lesson, the student should

#### **know:**

- classification and basic characteristics of the studied drugs, pharmacodynamics and pharmacokinetics, indications and contraindications for their use, side effects;
- features of pharmacokinetics and pharmacodynamics, advantages and disadvantages of different dosage forms of these drugs;
- principles of research and testing of new drugs; information and reference and search systems;

#### **be able to:**

- analyze the effect of the studied drugs on the set of their pharmacological properties and the possibility of their use in medical practice; to write them in prescriptions;
- use different dosage forms of these drugs, based on the peculiarities of their pharmacodynamics and pharmacokinetics;
- work with scientific literature, search for information about the use and action of the studied drugs;

#### **possess:**

- skills in choice of drugs on the topic of the lesson;
- the rules of prescribing the studied drugs in the treatment of various diseases and pathological conditions, taking into account the indications;
- skills of dosage regime correction in case of pathological changes in functions of organs or systems responsible for biotransformation and elimination of drugs or in case of joint use of different drugs;
- skills to search, analyze and summarize information about the use and effects of the studied drugs.

### **Motivation for learning the topic:**

– the specifics of training doctors in this specialty determines the need for students to purposefully study the main pharmacological effects, providing therapeutic and preventive effects of drugs on the topic of the class, indications and contraindications for their use, the interaction of drugs, their combined use, which will successfully complete the specialized disciplines of the specialty.

### **MATERIAL EQUIPMENT**

Reference and informational literature, charts, tables, presentations, drug collections.

### **CONTROL QUESTIONS FROM RELATED DISCIPLINES**

1. The nature of the biological action of chemicals. Physico-chemical (non-electrolytic) action: chemical nature of agents, their biological effects and application in medicine;
2. The concept of receptors in medicine, its origins and milestones of development.

### **CONTROL QUESTIONS ON THE TOPIC OF THE CLASS**

1. Pharmacodynamics, definition and components. Mechanism of action, vi-dy. Chemical mechanisms of action of drugs. Types of chemical reactions of medicinal substances with biosubstrate, the main mechanisms of the modulating effect of drugs on biological processes (molecular, metabolic, informational).
2. The molecular nature of drug receptors (regulatory proteins, enzymes, transport and structural proteins, nucleic acids). Signaling mechanisms of drug action (types of transmembrane signaling and secondary intermediaries). Quantitative laws of the action of medicinal products. The law of reducing the response of biological systems. Clark's model and its consequences. A general view of the concentration-effect relationship in normal and lognormal coordinates.
3. Terms and concepts of quantitative pharmacology: effect, efficacy, activity, agonist (complete, partial), antagonist. The clinical difference in the activity and effectiveness of drugs. Interaction of medicinal products. Antagonism: pharmacological (competitive, non-competitive), physiological, chemical. The nature of the change in the effect of drugs (activity, effectiveness) depending on the type of antagonism. The addition and potentiation of the action of drugs. Methods of evaluating the effect of medicinal products (graded, quantum), their essence and clinical applications. Parameters of quantitative assessment of the activity and effectiveness of medicinal products.
4. Selectivity and specificity of the action of drugs. Variability and variability of the action of drugs. Hyperactivity, hyperactivity, hypersensitivity, idiosyncrasy. Tolerance and tachyphylaxis. Cumulation. The reasons for the variability of the action of drugs. Drug addiction.
5. Types of doses: minimum, medium and higher therapeutic, single, daily and course, introductory and maintenance doses, toxic dose. Assessment of the safety of medicines. Therapeutic index and standard safety boundaries.

6. Therapeutic, side and toxic effects of drugs, their nature from the standpoint of the concept of receptors. Therapeutic strategy to combat side effects and toxic effects of drugs. The effect of medicinal products on the fetus and the course of pregnancy, the concept of embryotoxic, teratogenic, fetotoxic effects.

### **PROCESS OF THE STUDY**

- 1.
- 2.
- 3.
- 4.
- 5.

#### **Theoretical part**

Theoretical part is described in the study guide of the department “General pharmacology”

#### **Practical part**

1. Take notes on theoretical material demonstrated by the teacher.
2. Master the methods of solving the tasks and writing out prescriptions on the topic of the class.

#### **Theme learning control**

Conducted in the form of independent written work (solution of practical problems and prescriptions for individual task).

### **METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF STUDENTS' INDEPENDENT WORK (SIW)**

#### **The time given for independent work can be used by students for:**

- preparing for the practical classes;
- completing the tasks on the topic of the class in the workbook;
- preparing thematic reports, essays and presentations;
- taking notes from academic literature.

#### **The main methods of organizing independent work:**

- completing tests and practical tasks of the electronic educational-methodical complex (EEMC) for self-monitoring and self-assessment.

#### **The list of tasks of the SIW:**

- solving practical problems in the EEMC;
- completing the test tasks of the EEMC.

#### **Control of the SIW is carried out in the form of:**

- assessment of an oral answer to a question, report, report, or solution of a task in a practical class;
- individual conversation.

### **METHODOLOGICAL RECOMMENDATIONS FOR ORGANIZATION AND EXECUTION OF CONTROLLED INDEPENDENT WORK OF STUDENTS (CIWS)**

#### **Recommended forms of CIWS organization:**

- doing exercises on the topic of the class in the workbook;

- writing an essay on a given topic;
- preparing a report and a multimedia presentation on a given topic.

### **The list of tasks of the CIWS:**

Topics of essays / multimedia presentations:

1. New directions in pharmacology – chronopharmacology, pharmacogenetics, pharmacovaleology (filling out workbooks).
2. Features of prescribing medicines to children.
3. Features of prescribing medicines to elderly patients.

### **Forms of control of CIWS realization:**

- checking and grading an essay on a given topic;
- checking and grading a multimedia presentation on a given topic.

## **LIST OF REFERENCES**

1. Kharkevitch, D. A. Pharmacology : textbook for med. students: transl. of 12th ed. of Russ. textbook "Pharmacology" (2017) / D. A. Kharkevitch. - 2nd ed. – Москва : ГЭОТАР-Медиа, 2019. - 676 с. : ил., табл. - Рек. ФГАУ "ФИРО". – Режим доступа: <http://www.studmedlib.ru/book/ISBN5970402648.html> – Дата доступа: 23.05.2022.
2. Кратко о лекарственных средствах : учеб.-метод. пособие для студентов 3 курса лечеб., мед.-диагност. фак. и фак. подг. спец. для зарубеж. стран, 6 курса лечеб. фак. и фак. подг. спец. для зарубеж. стран, аспирантов, магистрантов, учреждений мед. образования : в 2 ч. / Е. И. Михайлова [и др.]. – Гомель : ГомГМУ, 2019. – Ч. 1. – Гомель : ГомГМУ, 2020. – 56 с. – Режим доступа: <http://elib.gsmu.by/xmlui/handle/GomSMU/7128> – Дата доступа: 23.05.2022.
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4. Rang and Dale's Pharmacology / J. M. Ritter [et al.]. - 9th ed. - Edinburg [et al.] : Elsevier, 2020. - xvi, 789 p. : ill., tab. + Student consult online.