

Ministry of Health of the Republic of Belarus
Education Establishment
"Gomel State Medical University"
Normal Physiology Department

It was discussed at the department meeting 30.08.16
The protocol № 8

METHODICAL INSTRUCTION

for carrying out classes by teachers with the 2nd course students
of Faculty for training specialists for foreign countries (teaching in English)
on normal physiology

Topic: General principles of coordinate activity of CNS

General time of the class 4 hours.

**1. THE STUDYING AND EDUCATIONAL PURPOSES, THE MOTIVATION FOR
ASSIMILATION OF THE SUBJECT, REQUIREMENTS TO THE INITIAL LEVEL OF
KNOWLEDGE**

Purpose of the class

To create idea of the reflex principle of nervous system functioning, of ways and mechanisms of information transfer in CNS and from CNS to the periphery, about the general principles of information processing in the nervous centers. To create idea of role and mechanisms of inhibition in CNS, to learn to use the gained theoretical knowledge for assessment of coordinate activity of CNS for identification of the possible reasons of its violations.

Motivational characteristic of the subject

The student needs to learn to estimate the tendinous reflexes which carry out regulation of a tone of muscles and their role in maintenance of a pose. In clinical practice tendinous reflexes are investigated for the purpose of definition of a functional condition of various links of a reflex arch and topic diagnosis of some diseases of CNS.

Tasks of the class

In the course of the class students have to study the main nervous chains forming afferent and the efferent carrying-out ways and reflex arches, to study information transfer mechanisms on the afferent and efferent carrying-out ways, through the central and peripheral synapses and the nervous centers.

As a result of carrying out the class the student has to:

To know:

- functions of neuroglia;
- structure of hematoencephalic barrier;
- the role of liquor in activity of a brain;
- mechanisms of blocking of information transfer in the inhibiting synapses;
- conditions and mechanisms of development of inhibition in exciting synapses of CNS.

To be able:

To give an assessment of the state of CNS reflex activity.

2. CONTROL QUESTIONS FROM RELATED SUBJECTS:

1. Structure and classification of neurons.
2. Structure of a reflex arch.
3. Structure and types of synapses.

3. CONTROL QUESTIONS ON THE CLASS SUBJECT:

1. Central nervous system. Its functions and role in ensuring activity of a complete organism and its relationship with the external environment. Levels of integration in CNS.
2. Neuron. Functional classification of neurons. Physiological properties of nervous cells and function of structural elements of neuron (soma, axon, dendrites). Features of appearance and distribution of excitation in neuron. Functions of neuroglia. Hematoencephalic barrier, its functions. Cerebrospinal liquid, its structure.
3. Reflex principle of nervous system functioning (R. Descartes, G. Prokhozka, I. M. Sechenov, I. P. Pavlov, P. K. Anokhin). Reflex. Types of reflexes. Structure of a reflex arch. Feedback, its value. Multilevel organization of a reflex.
4. Physiological concept of the nervous center, function of the nervous centers, their properties (space and time summation, transformation of a rhythm of excitation, tone, plasticity, fatigability of the nervous centers).
5. Inhibition in CNS (I. M. Sechenov), its types and physiological role. Inhibiting synapses and their mediators. Ionic mechanisms of inhibition postsynaptic potential.
6. Mechanisms of interaction of processes of excitation and inhibition - a basis of coordination activity of CNS. Basic principles and features of distribution of excitation in CNS (the principles of coordination activity of CNS: induction, feedback, reciprocity, "a final way", dominant.).

Questions for independent studying

1. General characteristic of structure and functions of CNS. Main features of evolution of the CNS functions.

Report:

1. Coordination of reflexes. Dominant.
2. Inhibition in CNS and its types and mechanisms.

4. PRACTICAL PART OF THE CLASS

Laboratory work 8.1 . Examination of reflex reactions of the person

Demonstration of virtual experiments:

1. Studying of process of central inhibition.
2. Studying of process of peripheral inhibition.

5. THE COURSE OF THE CLASS

- *Introduction*: the teacher answers questions of students which caused certain difficulties in the course of independent mastering of education material;
- *Requirements to the initial level of knowledge*: from sections of anatomy, histology, biophysics students have to know a structure of the main structures of CNS, the conducting ways of CNS.
- *Correction of the initial level of knowledge*: The teacher checks preparation of students according to the set section "CNS physiology", adds and specifies answers, the basic concepts and mechanisms of activity.
- Setting of problems which will be solved by students: - The teacher sets the task to master a technique of examination of reflex reactions of the person;
- *Independent performing of tasks by students*:
 - students make out the protocol of laboratory work with the subsequent discussion of its performance techniques:

-students perform practical work under monitoring of the teacher and laboratory assistant, For work performance students are provided with methodical guiding. Presentation is presented by tables, drawings, a slide projector;

- students report papers on the class subject with the subsequent discussion;

- *Assessment of final level of knowledge of the class subject:* - The teacher specifies the final level of knowledge of students on theoretical and practical questions, the basic concepts and terms, and also knowledge of basic physiological constants of the class subject;

- *Fixing of knowledge:* The teacher suggests students to solve several situation-dependent problems on the class subject, to pass computer test on the class subject, viewing of the video movie;

- *The conclusion of the teacher and the task to the next class:* At the end of the class the teacher makes the conclusion about the carried-out work and tells students the home task for the independent work. Then summing up the results of the class and signing of experience protocols. and also an assessment of practical skills in an account leaf is carried out.

Note: time of breaks is 15 minutes during a class.

6. QUESTIONS FOR SELF-CHECKING OF KNOWLEDGE

1. What the physiological sense of reciprocal inhibition? Give examples of violations which can be observed in lack of a reciprocity.

2. Explain what is the difference between processes pre-and postsynaptic inhibition?

3. Give examples and explain the nature of influence of feedback on functions of alpha motor-neuron in afferent motor ways.

4. Why time of a tendinous reflex is the shortest in comparison with time of other reflexes?

5. Why when studying reflexes of a muscle strain, except assessment of their force comparison of the same reflexes from the right and left side is necessary?

6. After a trauma the person had an involuntary urination. At what level in CNS damage localization is supposed, and what causes infringement of functions?

7. What nervous centers and the functions which are carried out with their participation are vital, where are these centers localized?

LITERATURE

Basic

1. Human physiology: textbook for overseas students = Физиология человека: учеб. пособие для иностранных студентов, обучающихся на английском языке / А. И. Киеня [и др.]; под ред. проф. Э. С. Питкевича; пер. на англ. яз. Р. А. Карпов, В. А. Мельник. — Гомель: УО ГoГМУ, 2009. — 352 с.

2. Text of lectures.

Alternate

1. Textbook of medical physiology // C. Guyton, 2006. — 1116 p.

2. Human anatomy and physiology // Alexander P., Spence-Elliott B. Masson.

3. Human physiology. The mechanisms of body function // Arthur J. Vander James H Sherman Dorothy S. Luciano, 1986. — 715 p.

4. Lecture notes on human physiology // John J Bray, Patricia A. Cragg, Anthony D.C. Macknight, Roland G. Mills and Douglass W. Taylor.

5. Human anatomy and physiology // Elaine N. Marieb, 1989. — 995 p.

6. Review of medical Physiology, International edition, 2003. — 912 p.