

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:** Reflex activity of the vegetative nervous system

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 basal ganglions, limbic system and cortex of large cerebral hemispheres. To study participation of these structures in implementation of sensor, motor, vegetative, integrative and conduction functions and the nature of violation of functions at damage of each of these structures of CNS. To create idea of mechanisms of internal functions regulation by the vegetative nervous system (VNS). To give a concept about structure and functions of sympathetic and parasympathetic departments of VNS. To create a basis for understanding of ways of functions correction at their violation.

**Motivational characteristic of the subject**

The medical student has to know essence of research techniques of various functions of a healthy organism which are widely used in applied medicine. For assessment of adaptation of an organism to influence of the environment and manifestation of compensatory processes the definition of a state and reactivity of VNS is important that it is especially important to know for the student of medico-diagnostic faculty. Using clinoortostatic test, the student has to determine an initial vegetative tone and vegetative reactivity by method of cardiointervalography and by Kerdo's index.

**Tasks of the class**

To study morpho-functional features of basal ganglions, limbic system and cortex of big cerebral hemispheres, their interrelation. To study features of sensor and motor functions in the conditions of the damages which are localized: a) in a somatosensory zone of cortex, b) in a prefrontal zone of cortex, c) in premotor and additional motor cortex zones, d) in a motor zone of cortex. To give an idea on the level of knowledge about response regularities of VNS to clinoortostatic test. To study the general principles of assessment of VNS functional condition by means of the CIG method. To get acquainted with a technique of CIG and to define a state and reactivity of VNS at the person.

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

**To know:**

- morpho-functional features of basal ganglions, limbic system, cortex of cerebrum, their interrelation; structure and functions of sympathetic and parasympathetic departments of VNS;
- mechanisms of regulation of functions of internals by vegetative nervous system;
- methods of assessment of VNS functional condition by means of the CIG method and calculation of the index of Kerdo;
- the basic concepts and terms on the class subject;
- basic physiological constants on the class subject.

**To be able:**

To estimate VNS functional condition by means of the CIG method and calculation of the index of Kerdo.

**2. CONTROL QUESTIONS FROM RELATED SUBJECTS:**

1. Morphofunctional features of structures of limbic system, basal ganglions.
2. Structure of cerebrum cortex.
3. Structure of the vegetative nervous system. Ganglions of VNS. Reflex arch of VNS.

**3. CONTROL QUESTIONS ON THE CLASS SUBJECT:**

1. Limbic system of brain. Its role in formation of motivations and emotions.
2. Basal ganglions. Their participation in formation of a muscular tone and complicated motor acts.
3. Cortex of cerebrum.
  - 3.1. Morphofunctional organization of cortex.
  - 3.2. Sensor, associative and motor areas of cortex.
  - 3.3. Electric manifestations of activity of cortex.
  - 3.4. Interhemispheres relationship.
4. Autonomous (vegetative) nervous system.
  - 4.1. Morphofunctional structure of autonomous nervous system.
  - 4.2. Synaptic transfer of excitement in VNS.
  - 4.3. Vegetative reflexes.
  - 4.4. Influence of VNS on functions of tissues and organs.
5. Age changes in CNS.

**Questions for independent studying**

1. Clinically important vegetative reflexes.
2. A concept about metasympathetic nervous system.

**Report:**

1. A role of limbic system of brain in formation of motivation and emotion.
2. Electric manifestations of activity of cortex, their practical value.

**4. PRACTICAL PART OF THE CLASS**

Laboratory work 10.1 Definition of the state and the reactivity vegetative nervous system by method of cardiointervalography

Laboratory work 10.2. Evaluation of vegetative tonus by Kerdo index

**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 the morphofunctional characteristic of CNS departments, the autonomic nervous system;

- *Correction of the initial level of knowledge:* The teacher checks and adds the material on the subject of the class "The physiology of basal ganglions, limbic system, cortex of cerebrum", "VNS physiology", specifies the basic concepts, mechanisms of activity and regulation.

- *Setting of problems which will be solved by students:* - The teacher sets the task to master a technique of definition of the state and the reactivity vegetative nervous system by method of cardiointervalography;

- *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. Representation of receptors of what organs occupies especially big space in the first sensomotor zone? Why?

2. Describe a role of associative and motor zones of cortex of big hemispheres in starting and implementation of voluntary and involuntary movements.

3. Why can tired soldiers fall asleep in a order and continue to march without violation of a rhythm of walking?

4. Explain what nervous mechanisms have caused tension of muscles of forward belly wall in the field of localization of pathological process, for example, at appendicitis or cholecystitis?

5. On the example of what spinal or other vegetative reflexes it is possible to show the maximum autonomy of vegetative reflexes and on what – their subordination to consciousness?

6. What are differences in the mechanism of starting influences of somatic motor nerves on a skeletal muscle and vegetative postganglionic nerves on a smooth muscle?

## 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 ГоГМУ, 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.