

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:** Functional methods of examination of cardiovascular 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**

**Purposes of the class**

Students have to study mechanisms of regulation of cardiovascular system activity, local and systemic mechanisms of regulation of action of the heart and vessels.

**Motivational characteristic of the subject**

The students of medical school and in particular students of medico-diagnostic faculty need to know the main functional methods of research of cardiovascular system condition which are used in applied medicine.

**Tasks of the class**

In the course of the class students have to create idea of vascular tonus origin, its role and mechanisms of maintenance of the systemic AP and providing of local blood flow

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

**To know:**

- basic principles of systemic circulation regulation;
- role of reflex and humoral mechanisms of AP regulation;

**To be able:**

- to give an assessment of condition of cardiovascular system.

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

1. Structure of arteries, veins, capillaries, lymphatic vessels and lymph nodes.
2. Localization of the vasomotor center and innervation of heart and vessels.

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

1. Metabolic vessels, structurally functional characteristic of microcirculation. Capillary blood flow and its features.

1.1. Mechanisms of transcapillary exchange of liquid and various substances between blood and tissues, the characteristic of the main components of microcirculation.

1.2. The equation of Starling. Filtration and reabsorption of liquid in capillaries. Hydrostatic and oncotic pressure at the level of microcirculation.

2. Blood flow in veins, the factors causing venous return of blood to heart. Blood pressure in veins. Central venous pressure (CVP), techniques of its research. Venous pulse. Analysis of a phlebogram.

3. Regulation of the blood flow in vessels.

3.1. Reflex regulations of a vascular tonus. Vasomotor center, its afferent and efferent communications.

3.2. The major reflexogenic zones.

3.3. Humoral regulation of a vascular tonus. Vasoconstricting and vasodilating endogenic substances (hormones, biogenic amines, kinin system, metabolites, endothelial factors, prostaglandins). Myogenetic regulation of tonus of vessels.

4. The functional system (FS) providing regulation of systemic arterial pressure.

4.1. Nervous and humoral regulation of arterial blood pressure. Renin — angiotensin — aldosterone system (RAAS).

4.2. Short-term, intermediate and long-term mechanisms of regulation of the systemic AP and VCB.

5. Lymph and lymphokinesis. Lymphization. Structure of a lymph. Movement of a lymph. Role of lymph nodes.

### **Questions for independent studying**

1. Lymph. Lymphokinesis.

### **Reports:**

1. Circulation in capillaries. Microcirculation.

### **4. PRACTICAL PART OF THE CLASS**

22.1. Orthostatic test

22.2. Functional test for reactivity of cardiovascular system

22.3. Influence of exercises on cardiovascular system

### **The virtual experiment:**

1. Influence of an adrenaline, acetylcholine, atropin and adrenaline on the basis of atropin on arterial pressure

### **5. THE COURSE OF THE CLASS**

- *Introduction*: the teacher answer the questions of students which caused certain difficulties in the course of independent mastering of education material;

- *Requirements to the initial level of knowledge*: -from anatomy and histology students have to know morphology of vessels (arteries, veins, capillaries), their innervation, features of vascularization of separate organs;

- *Correction of the initial level of knowledge*:: on the subject "Functional methods of examination of cardiovascular system". The teacher corrects answers of students on a subject;

- *Setting of problems which will be solved by students*: The teacher sets a task to master functional methods of a research of CCC state at the level of knowledge.

- *Independent performing of tasks by students*: students make out the protocol of laboratory work with the subsequent discussion of a technique of its performance;

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

- students report the paper with the subsequent discussion;

- *Assessment of final level of knowledge of the class subject*: The teacher specifies the final level of knowledge of students of 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 situational problems of the class subject, to pass computer test, viewing of the video.

- *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 assessment of practical skills in a leaf of their account is carried out.

Students of medico-diagnostic faculty need to pay special attention to methods research and assessment of cardiovascular system condition and to master them at the level of ability.

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

## 6. QUESTIONS FOR SELF-CHECKING OF KNOWLEDGE

1. At hard physical activity heart rate is considerably enlarged, however the MVB at the same time can decrease. Why?
2. What main types of receptors mediate vasoconstriction and vasodilation of vessels?
3. Will differences in change of heart work, systolic and diastolic blood pressure in the conditions of emotional tension or a moderate exercise be observed?
4. Some people after several deep inspirations have a giddiness. Why?
5. What is the reason of a respiratory arrhythmia of heart?

## 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 ГомМУ, 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.