Federal State Budgetary Educational Institution of Higher Education

“Professor V.F. Voino-Yasenetsky Krasnoyarsk State Medical University”,

the Russian Federation Ministry of Health

Prof. A.T. Pshonik Department of Physiology

Instructional guidelines for students (out-of-class work)

for the discipline

**"Normal physiology"**

for students in the specialty Specialty 31.05.01 – General medicine

**FOR PRACTICAL CLASS № 1**

**01.09.2021-07.09.2021**

**Acquaintance with the department. Introduction to physiology.**

**Basic concepts and terms.**

**Questions to prepare for the lesson:**

1. Physiology as a fundamental biomedical science, subject and methods of normal physiology.

2. The body, the main functions of the body.

3. Mechanisms of regulation of vital functions.

4. The concept of functional systems. The structure of functional systems.

5. Basic principles of system genesis.

**Abstract (summary) of the topic:**

Physiology is the science of nature, functions and processes occurring in the body or its constituent systems, organs, tissues and cells, and the mechanisms of their regulation that ensure the vital activity of humans and animals in their interaction with the environment.

If the subject of anatomy and morphology answers the question "how does an organism work?", Then physiology - "how and why does it work like that?"

An organism is an independently existing unit of the organic world, which is a self-regulating system that reacts as a whole to any external influences, capable of existing only with constant interaction with the environment and capable of self-renewal as a result of such interactions.

Since the time of R. Descartes, it was believed that the main property of living matter is its reactivity, i.e. the ability to respond to influences with reflected (reflex) reactions. However, when physiologists came close to studying the functions of the brain, they encountered unexpected features of its reflex activity. THEM. Sechenov drew attention to the extreme variability of brain reflexes, their dependence on the internal state of the organism and the environment. I.P. Pavlov, who is the founder of the theory of higher nervous activity, found that the body's responses (reflexes) depend on many factors: the initial state of the animal, the level of its excitability (VND activity), the type of VND, environmental influences (external stimuli), previous life experience ( memory), etc. The concept of "dynamic stereotype" was introduced, in the implementation of which a large role is assigned to "consistency" in the work of the cerebral hemispheres, which unites various parts of the cerebral cortex into analytical and synthetic activity. A.A. Ukhtomsky demonstrated in his research the leading (dominant) role of external stimuli in the formation of the body's responses to them. Canadian biologist L. von Bertalanffy in the 60s of the twentieth century formulated the concept of biological systems, understanding the latter as "an ordered set of interconnected elements." It was from this time that a new direction began to develop, called the systems approach, which became widespread in the natural sciences: mathematics, cybernetics, philosophy, economics, psychology, etc. P.K. Anokhin continued the teachings of L. Bertalanffy and developed the concept of "functional system" (FS) for a living organism. He was the first to show that living matter has the property of dynamically combining into discrete self-regulating FSs, which provide results useful for the organism through their activity. The concept of FS was proposed by P.K. Anokhin and refined by his followers. It is currently defined as follows.

FUNCTIONAL SYSTEMS - dynamic, selectively united by the corresponding needs of the body, self-regulating central-peripheral organizations, whose activities are aimed at achieving adaptive results useful for the system and the body as a whole - satisfaction of leading needs. Each FS has the following properties.

The human body consists of numerous systems, each of which performs its own specific function. For example, the cardiovascular system ensures the movement of blood through the vessels, the respiratory system - gas exchange, excretory - the excretion of metabolic products from the body, etc. The specificity of the function is due to the specificity of the structure of the organ or system. This is the manifestation of the dialectical unity of function and structure. The practical significance of physiology as a science: if the future doctor does not know how various systems function in a healthy body, which are assessed according to certain indicators (parameters), he will not be able to identify deviations in these indicators, which indicate various pathologies. However, human physiology is concerned not only with the study of vital processes or functions, but also with their regulation, without which the existence of an organism in constantly changing environmental conditions is impossible. The regulation of various functions of the body is based on both humoral and nervous mechanisms. The more ancient regulation is phylogenetically humoral-metabolic, associated with the influence of various substances contained in the liquid medium of the body (hormones, etc.) on the functions of various organs and systems. It, as a rule, changes the functional state of various organs and systems slowly, while nervous regulation turns on systems and organs almost instantly. If the cellular type of regulation is more associated with humoral mechanisms, then the organ and, especially, systemic with the nervous ones. Maintaining the constancy of the internal environment of the body (homeostasis) and its adaptation to constantly changing environmental conditions is carried out by functional systems, the doctrine of which was developed by Academician P.K. Anokhin. A functional system should be understood as a dynamic self-regulating organization, the action of all elements of which is aimed at achieving some useful result. It is generally accepted that it is possible to talk about an organism only if it is characterized by the following features:

1) has the ability to self-regulation at the level of the cell, organ and system;

2) reacts to the action of various stimuli of the organism's environment as a whole;

3) exists and develops with constant interaction with the environment;

4) has the ability to renew itself in the process, that is, to return to the initial level.

A child is not an adult in miniature, but a relatively perfect organism for each age, with its own morphological and functional characteristics, for which the dynamics of their course from newborn to puberty is natural.

The child's body is an extremely complex and at the same time very vulnerable socio-biological system. It is in childhood that the foundations of the health of the future adult are laid. An adequate assessment of the physical development of a child is possible only when taking into account the characteristics of the corresponding age period, comparing the indicators of the child's vital activity with the standards of his age group.

There are two main periods of ontogenesis: antenatal and postnatal. The antenatal period is represented by the embryonic period (from conception to the 8th week of the intrauterine period) and the fetal period (from the 9th to the 40th week). Pregnancy usually lasts 38–42 weeks. The postnatal period covers the period from birth to natural death of a person. The following periods are distinguished in the postnatal development of the child's body:

Newborn (1 - 30 days),

Chest (30 days - 1 year),

Early childhood (1-3 years),

First childhood (4 - 7 years old),

Second childhood (8 - 12 years old boys, 8 - 11 years old girls),

Teenage (13 - 16 years old boys, 12 - 15 years old girls),

Youthful (17 - 21 years old boys, 16 - 20 years old girls).

**Course textbooks and manuals**

1. Dunn, R. B. USMLE Step 1. Lecture Notes. Physiology / R. B. Dunn ; ed. D. E. Fitzovich. - [S. l.] : Kaplan, 2006. - 576 p.

2. Hall, J. E. Guyton and Hall Textbook of Medical Physiology / J. E. Hall. - 13th ed., Int. ed. - Philadelphia : Elsevier, 2016. - 1145 p.

3. Silbernagl, S. Color Atlas of Phisiology / S. Silbernagl, A. Despopoulos. - 7th ed. - Stuttgart : Thieme, 2015. - 458 p.

4. Wilson, L.B. USMLE Step 1. Lecture Notes. Physiology / L.B. Wilson. - Kaplan, 2013. - 423 p.