

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: Energy exchange. Thermoregulation

The 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

To master the method of calculation of the basal metabolism according to tables and formulas, definitions of working metabolism at the dosed physical exercise. To define the minimum time of measurement of body temperature of the person at the level of ability.

Motivational characteristic of the subject

The medical student needs to know conditions of determination of level of the basal metabolism and to be able to count it. The student has to have an idea of the functional system providing constancy of body temperature and also mechanisms of its adjustment.

Tasks of the class

In the course of the class students have to get acquainted with a technique of definition of energy balance, learn and be able to determine due sizes of the basal metabolism by Garris-Benedict's tables and to get acquainted with calculation of a deviation size of the basal metabolism by Read's formula and the nomogram. To be able to determine the body temperature of the person and to determine the minimum time of an exposition of the thermometer for obtaining the result.

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

To know:

- physiological value of energy balance;
- the basic concepts and terms on the class subject;
- the factors determining the level of the basal metabolism;
- mechanisms of heat production and heat irradiation;
- nervous and humoral mechanisms of thermoregulation.

To be able:

- to count due basal metabolism and its deviation;
- to define working exchange at the dosed physical exercise;
- to take body temperature.

2. CONTROL QUESTIONS FROM RELATED SUBJECTS:

1. Sources and ways of energy transformation in an organism of animals and the person.
2. A concept about primary and secondary warmth. Hess's law.
3. Caloric equivalent of oxygen. Respiratory coefficient.

3. CONTROL QUESTIONS ON THE CLASS SUBJECT:

1. Energy balance. A source and ways of energy transformation in a human body. A concept about primary and secondary warmth.
 - 1.1. Accounting of consumption and using of energy. Principles of methods of direct and indirect calorimetry. Caloric equivalent of oxygen. Respiratory coefficient of oxygen.
 - 1.2. The basal metabolism, its size and factors it defining. Specific dynamic action of food. Energy consumption in the conditions of the basal metabolism.
 - 1.3. Working metabolism. Organism energy consumption at different types of work.
2. Value of constancy of internal medium temperature of an organism for normal course of vital activity processes. Classification of organisms by homeostatic mechanisms.
3. Body temperature of the person and its daily fluctuations. Temperature scheme of the person. Thermometry.
4. Chemical and physical thermoregulation. Mechanisms of a heat production and heat irradiation.
5. The functional system providing constancy of body temperature. Nervous and humoral mechanisms of thermoregulation.
6. Disturbances of thermoregulation. Feverish states. Hypothermia and hyperthermia.

Reports:

1. Modern methods of determination of energy balance level.
2. Diagnostic value of indicators of energy balance for clinic, sports physiology.

4. PRACTICAL PART OF THE CLASS

Laboratory work 27. 1. Calculation of due basal metabolism by tables and formulas.

Laboratory work 27.2. Calculation of the deviation of size of the basic metabolism by Read's formula and the nomogram.

Laboratory work 27.3. Definition of working metabolism at the dosed physical activity.

Laboratory work 27.4. Taking the human body temperature.

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 ;

- *Demands to the initial level of knowledge:* From biophysics students have to know sources and ways of energy transformation in an organism. A concept about primary and secondary warmth. Hess's law. Caloric equivalent of oxygen. Respiratory coefficient.

- *Correction of initial level of knowledge:* The teacher checks and supplements the initial level of knowledge of students of theoretical and applied questions on the class subject "Energy exchange. Thermoregulation". In this section it is necessary to pay attention to the factors influencing the level of the basal metabolism. The attention is focused on the functional system providing constancy of body temperature, mechanisms of a heat production and heat irradiation.

The teacher corrects answers of students on the considered subject;

- *Setting of problems which will be solved by students:* The teacher sets a task to master method of calculation of due basal metabolism and its deviation, and also definition of basal metabolism at the dosed physical exercise; to define the minimum time of measurement of body temperature of the person at the level of ability.

- *Independent performance of tasks by students:*

- students make out the protocol of the class with the subsequent discussion of a technique of performance;

- students perform practical work under control of the teacher and laboratory assistant. For performance of work students are provided with methodical guiding and the necessary equipment. Presentation is provided by tables and drawings.

- students read reports 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 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 a subject of the class and to answer test questions;

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

6. QUESTIONS FOR SELF-CHECKING OF KNOWLEDGE

1. At two examined patients the sizes of the basal metabolism were equal. However the received result is recognized normal only for one of them. On what basis is such conclusion made?

2. Definition of the basal metabolism was carried out in the hot and stuffy room. Why can't the received result be considered true? In what direction is it deviated?

3. The person consumed 630 l of oxygen per day and excreted 567 l of carbon dioxide with the exhaled air. What is the structure of the food consumed by this person?

4. Calculate energy exchange if at the examinee the quantity of the consumed O₂ is 1,5 l per 5 min.

5. Why, using data on volumes of consumed O₂ by an organism is it possible to determine the size of a metabolic cost?

6. Explain, for what purpose the definition of a metabolic cost of an organism is carried out.

7. How does the type of professional activity influences gross energy exchange?

8. In what ratios is there an intensity of energy balance and heat irradiation at an elephant and a mouse?

9. Why are the clothes from a natural fiber more preferable, than synthetic?

10. Characterize a pose of the sitting person if indoors a) t = 16 C; b) t = 26 C.

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.