

Ministry of Health of the Republic of Belarus
Educational institution
"Gomel State Medical University"

Department of Biological Chemistry

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METHODOLOGICAL RECOMMENDATIONS
for a practical lesson in the academic discipline "Biological Chemistry"
for 2nd year **students** of the Faculty of Foreign Students
majoring in 1-79 01 04 "Medical Care"

Topic: Hormones 1. General endocrinology.

Duration 4 hours

Approved at the meeting of the Department of Biological Chemistry
(Protocol No. 10 dated 29.08.2025)

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1. TRAINING AND EDUCATIONAL OBJECTIVES, MOTIVATION FOR COMPLETION OF THE TOPIC, REQUIREMENTS FOR THE INITIAL LEVEL OF KNOWLEDGE:

Clarification of the role of hormones in the vital activity of the body, which began only a few decades ago, already today gives tangible results. Some experts believe that the future of medicine is the era of hormones.

Purpose of the class: to study the chemical structure, classifications, mechanisms of action of hormones. With the formation of an idea of the levels of organization of the neuro-endocrine system. To study the mechanisms of regulation of calcium-phosphorus metabolism. To foster students' sense of pride in their chosen profession and to form a culture of respect for their health.

Objectives of the class: to form ideas about the role of hormones in metabolism, the principles of neuro-endocrine system functioning, mechanisms of regulation of metabolism, the role receptors in signaling, the significance of secondary messengers. During the lesson, students will master unified methods for determining calcium ions in biological fluids.

The student should know:

1. The concept of the principles of organization of the neuro-endocrine system.
2. Understanding the threshold of sensitivity of the hypothalamus.
3. Characteristics of hormonal receptors, their localization.
4. Characteristics of protein kinases and their role in the implementation of hormonal effects.
5. The concept of exogenous hormones – vitamin D₃, its tissue metabolism and metabolites.

The student must be able to:

1. Work with micropipets.
2. Work with the semi-automatic biochemistry analyzer.

2. CONTROL QUESTIONS FROM RELATED DISCIPLINES:

- 2.1 The nature of hormones and their properties (bioorganic chemistry, human physiology, histology).
- 2.2 Types and localization of receptors (physiology, histology).

3. CONTROL QUESTIONS ON THE TOPIC OF THE CLASS.

- 3.1 Classification of hormones by chemical structure, place of formation, mechanism of action, etc.
- 3.2 Principles of organization of the neuro-endocrine system:
 - 3.2.1 Hierarchical – levels of organization of the neuro-endocrine system: target cells, endocrine glands, pituitary gland, hypothalamus.
 - 3.2.2 The presence of direct and feedback of positive and negative communication (+, – interaction).
 - 3.2.3 Presence of central and peripheral effects of hormones.
 - 3.2.4 Presence of a threshold of sensitivity of the hypothalamus.

3.3 Factors that determine the intensity of the hormonal effect. General scheme of hormone synthesis. Processing of hormones. The concept of prohormones. Secretion of hormones. Circulatory transport of hormones in the blood. Metabolism of hormones in peripheral tissues (catecholamines, peptide, steroid, and thyroid), characteristics of enzymes. Ways of hormones excretion.

3.4 Tissue spectrum of action of hormones. Characteristics of hormonal receptors, their localization. The mechanism of action of hormones - catecholamines, peptide, steroid, and thyroid. The role of "intracellular" hormones and Ca^{2+} in the implementation of hormonal effects.

3.5 Hormonal regulation of Ca-P metabolism. Parathyroid hormone and calcitonin. The concept of exogenous hormones is vitamin_{D3}, its tissue metabolism and metabolites.

3.6 SSART QUESTIONS:

1 Hormones. Characteristic. Properties. Paracrine and autocrine action of hormones.

2 The phenomenon of desensitization, its mechanism and biological significance. Permissive and sensitizing effects of hormones.

3 Rickets, a characteristic of biochemical disorders.

4 The main enzymes, metabolic stages, and metabolites of arachidonic acid (C20: 4) (prostaglandins (PG), thromboxanes (Tx), leukotrienes (LT)) and inositolphosphatides are normal and pathological.

5. The concept of antihormones.

6. Protein kinases, their characteristics and role in the implementation of hormonal effects.

4. PRACTICAL PART OF THE CLASS

Laboratory work No. 1 "Determination of calcium concentration in blood serum by a unified colorimetric method" (performed practically), Laboratory work No. 2 "Determination of calcium in urine by the Sulkovich method", and Laboratory work No. 3 "Qualitative reactions confirming the protein nature of insulin" (performed theoretically).

Laboratory work is carried out according to the publication "Biological Chemistry: Workbook" (at 2 h., part 2) / A.N. Koval [et al.]. – Gomel: GomSMU, 2020. – Ch.2– 88 p.

5. COURSE OF THE CLASS

5.1 Introduction

5.2 Theoretical part of the class: control questions are considered, the tasks of the SIWS are analyzed.

5.3 Practical part of the class: laboratory work is performed using a workbook on biological chemistry.

5.4 Control of the assimilation of the topic.

5.5 Class conclusions. Summing up the results, checking the protocols, announcing the tasks (as well as the topics of the abstract messages of the SIWS) for the next class.

6. QUESTIONS FOR SELF-CONTROL OF KNOWLEDGE

Self-control of knowledge on the topic "Hormones-1" is carried out by computer testing using the Moodle platform access mode: <https://dl.gsmu.by/course/view.php?id=81>

7. LITERATURE

1. Биохимия : учебник / под ред. Е.С. Северина. – 5-е изд., испр. и доп. – М.: ГЭОТАР-Медиа, 2020. – 768 с.: ил.
2. Схемы и реакции основных метаболических путей : учеб.-метод. пособие для студентов учреждений высш. образования, обучающихся по специальностям 1-79 01 01 "Лечеб. дело", 1-79 01 04 "Мед.-диагност. дело" / М-во здравоохранения РБ, УО "ГомГМУ", Каф. общей, биоорганической и биологической химии ; А.И. Грицук [и др.]. – Гомель: ГомГМУ, 2018. – 127 с. – Рек. УМО по высш. мед., фармацевт. образованию.
3. Baynes, J. W. Medical biochemistry / J.W. Baynes, M. H. Dominiczak ; ELSEVIER . – 2019. – 682 p.
4. Ferrier, D. R. Lippincott's Illustrated Reviews: Biochemistry / D. R. Ferrier ; Wolters Kluwer . – 2014. – 552 p.
5. Chatterjea, M. N. Textbook of Medical Biochemistry / M. N. Chatterjea, R. Shinde ; Jitendar P Vij. – 2012. – 876 p.
6. Vasudevan, D. M. Textbook of Biochemistry for Medical Students / D. M. Vasudevan, S. Sreekumari, K. Vaidyanathan ; Jitendar P Vij. – 2011. – 657 p.
7. Marks, D. B. Board Review Series: Biochemistry / D. B. Marks ; Harwal Publishing . – 1994. – 337 p.