

TARAS SHEVCHENKO NATIONAL UNIVERSITY OF KYIV
EDUCATIONAL AND SCIENTIFIC CENTER "INSTITUTE OF BIOLOGY AND MEDICINE"
DEPARTMENT OF PHYSIOLOGY AND ANATOMY

«I AGREE»

Deputy director for scientific and
pedagogical work (department of
medicine)

Olga KHARCHENKO



THE WORKING PROGRAM ON THE DISCIPLINE
FUNDAMENTALS OF NEUROENDOCRINE
REGULATION OF PHYSIOLOGICAL
FUNCTIONS
for students

Branch of knowledge I «Healthcare»

Specialty I2 «Medicine»

Educational level «Master »

Educational program «Medicine»

Type of discipline selective

Form of study	<u>daytime</u>
Academic year	<u>2025/2026</u>
Semester	<u>3</u>
Amount of credits ECTS	<u>3</u>
Language of teaching,	
Learning and ratings	<u>english</u>
Form of final control	<u>credit</u>

Teachers:

PhD., Assistant Olga PODPALOVA

PhD., Assistant professor Evdokiya RESHETNIK

Prolonged: in 20__/20__ г.п. _____ (_____) «__» _____ 20__ г.
(signature, name, date)

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^ KYIV – 2026

Developers:

Olga PODPALOVA PhD., Assistant of Department of Fundamental Medicine
Evdokiya RESHETNIK PhD., Assistant professor of Department of Fundamental Medicine

APPROVED

Head of the Department of Physiology and
Anatomy (signature) (Oleksandr KOVALCHUK)

Protocol № 20 from «05» 06 2022y.

Considered by scientific and methodical commission
of Educational and Scientific Center "Institute of Biology and Medicine"
of Taras Shevchenko National University of Kyiv.

Protocol № 9 «23» 06 2022

Head of Scientific and Methodical Commission (signature) (Tetyana SHEVCHENKO)

«29» 06 2022

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Protocol № _____, « ____ » _____ 20 ____

Head of Scientific and Methodical Commission _____ (Tetyana SHEVCHENKO)

« ____ » _____ 20 ____

1. The purpose of the discipline is acquiring by each student general knowledge about the molecular mechanisms of neurohumoral regulation of the main life processes of the human body. To teach methodical approaches to the study of the systemic organization of bioregulatory functions and the assessment of its violations.

2. Preliminary requirements for mastering or choosing a discipline:

- 1. Proper knowledge of the structure of the human body, the microscopic organization of tissues and cells, as well as the development of the embryo. Understanding of chemical and biophysical processes occurring in a living organism, and mastery of the basics of international medical terminology. The ability to independently integrate and apply fundamental natural and structural-functional knowledge in practical activities, as well as effectively search and analyze scientific and methodological sources.*
- 2. Have the elementary skills of basic system analysis.*

3. Annotation of the discipline:

The discipline "Fundamentals of neuroendocrine regulation of physiological functions" is part of the professional training program for specialists of the educational and qualification level "master" in the field of knowledge 22 "Health care" specialty 222 "Medicine" of the educational and qualification level "master of medicine" professional qualification. "Doctor", which involves the assimilation by students of modern ideas about the etiology and pathogenesis of neuroendocrine diseases, the peculiarities of their clinical course, to master modern approaches to the diagnosis and treatment of systemic metabolic disorders, as well as preventive measures.

The knowledge obtained from the discipline "Fundamentals of neuroendocrine regulation of physiological functions" is the basis of the formation of skills that can be applied in the field of clinical medicine to substantiate clinical diagnosis, explain the peculiarities of the course of pathological processes, and solve diagnostic, therapeutic and surgical problems. tasks in other sciences (pharmacology, hygiene, etc.).

Organization of study process is carried out in accordance to the credit transfer system under the requirements of the Bologna process.

For the educational component, a level 2 use of generative artificial intelligence is generally established according to the "Regulations on the use of artificial intelligence in the implementation of educational programs at Taras Shevchenko National University of Kyiv"

4. The main tasks of studying the discipline:

1. Formation of knowledge of basic laws and mechanisms of intercellular integration and regulation of functions of multicellular organisms, classification of signaling molecules (SM) - hormones, neurotransmitters; mechanisms of action and physiological effects of hormones and other SM, protein-peptide nature, steroid and thyroid hormones, biogenic amines, etc.;
2. The ability to interpret neuroendocrinological indices from the standpoint of

norm and pathology; formation of the ability to choose the most rational methods of physiological research;

3. Formation of skills to apply knowledge of neuroendocrinology and physiology to substantiate the diagnosis and understanding of the pathogenesis of various pathological processes;
4. Formation of the ability to choose the most rational methods of physiological research;
5. Study of functions in experiments on animals, isolated organs, cells, models or based on experiments recorded in videos and films, presented in computer programs or other types of technology;
6. Study of functions on a healthy person;
7. Solving situational tasks (estimation and analysis of functional indicators, parameters of homeostasis, regulatory mechanisms, etc.), which are experimentally or clinically and physiologically directed.

In accordance with the requirements of the Standard on Higher Education of Ukraine (second (master's) level of higher education (seventh level of National Qualifications Framework of Ukraine), field of knowledge I "Health care", specialty I2 "Medicine"), the discipline ensures that students acquire the following competencies:

integral:

The ability to solve complex problems, including those of a research and innovation nature in the field of medicine. Ability to continue learning with a high degree of autonomy.

general:

GC 2. The ability to learn and master modern knowledge.

GC 4. Knowledge and understanding of the subject field and understanding of professional activity.

GC 7. Ability to work in a team.

GC 9. Ability to communicate in a foreign language.

GC 10. Ability to use information and communication technologies.

GC 11. Ability to find and process and analyze information from various sources.

special (professional, subject):

PC 17. The ability to assess the impact of the environment, socio-economic and biological determinants on the state of health of an individual, family, population.

PC 21. Clearly and unambiguously convey one's own knowledge, conclusions and arguments on health care problems and related issues to specialists and non-specialists, in particular to people who are studying.

PC 24. Compliance with ethical principles when working with patients and laboratory animals.

5. Results of studying in a discipline (semester 3):

Learning outcomes (1. know; 2. able; 3. communication; 4 autonomy and responsibility);		Forms (and/or methods and technologies) of teaching and learning	Methods of assessment	Percentage in the final assessment of the discipline
Code	Results of studying			
1	Know			
1.1.	subject and tasks of neuroendocrinology, classification and principles of receptor functioning; the principle of reverse regulation of neuroendocrine influence.	lecture laboratory lesson, independent work	assessment of oral and written answers; evaluation of written tests; final modular control work	7
1.2.	mechanisms of functioning of all parts of the pituitary gland and its hormones. Neurohormonal control of the processes of growth and development of the human body.	Lecture, laboratory lesson, independent work	assessment of oral and written answers; evaluation of written tests; evaluation of the performance of practical work; final modular control work	7
1.3.	neuroendocrine mechanisms of stress and aggressive behaviordevelopment	Lecture, laboratory lesson, independent work	assessment of oral and written answers; evaluation of written tests; evaluation of the performance of practical work; final modular control work	7
1.4.	neuroendocrine control of the processes of reproduction, puberty and sexual development, parental behavior.	Lecture, laboratory lesson, independent work	assessment of oral and written answers; evaluation of written tests; evaluation of an oral report, final modular control work	7
1.5	mechanisms of circadian rhythms in neuroendocrine systems. mechanisms of neurohormonal regulation of cardiovascular system activity. neuroendocrine regulation of the work of the digestive system and maintenance of stable blood	Lecture, laboratory lesson, independent work	assessment of oral and written answers; evaluation of written tests; evaluation of the performance of practical work; final modular control work	7
1.6	Pathologies of neuroendocrine regulation. Syndromes and diseases associated with dysfunction of the neuroendocrine system at different levels of regulation.	Lecture, laboratory lesson, independent work	assessment of oral and written answers; evaluation of written tests; final modular control work	7

2	Able			
2.1.	interpret and graphically represent the mechanisms of neurohormonal regulation based on the principle of feedback.	Lecture, laboratory lesson, independent work	evaluation of oral / written answers; evaluation of written tests; final modular control work	7
2.2.	Name and analyze the principles of action of pituitary hormones and hormones affecting the growth, development and metabolic activity of the body. To be able to schematically depict the action of these hormones in the form of contours of neurohumoral regulation.	Lecture, laboratory lesson, independent work	evaluation of oral / written answers; evaluation of written tests; evaluation of the performance of practical work; final modular control work	7
2.3.	draw conclusions about the neuroendocrine regulation of human stress and aggression.	Lecture, laboratory lesson, independent work	evaluation of oral / written answers; evaluation of written tests; evaluation of the performance of practical work; final modular control work	7
2.4.	to analyze changes in neuroendocrine factors during pubertal development, sexual differentiation and the reproduction process; schematically draw the contours of the regulation of the activity of the corresponding hormones.	Lecture, laboratory lesson, independent work	assessment of oral and written answers; evaluation of written tests; evaluation of an oral report, final modular control work	7
2.5.	analyze regulated parameters and draw conclusions about the state of regulatory hormonal mechanisms of the cardiovascular and digestive systems. Be able to explain the main mechanisms of circadian regulation of neuroendocrine system activity.	Lecture, laboratory lesson, independent work	evaluation of oral / written answers; evaluation of written tests; evaluation of the performance of practical work; final modular control work	6
2.6.	analyze and be able to give an assessment and determine the specificity of neuroendocrine disorders of the body based on the data presented.	Lecture, laboratory lesson, independent work	evaluation of oral / written answers; evaluation of written tests; final module control work	6
3	Communication			
3.1.	Communicate with colleges and auditory in English both in oral and written forms; provide professional scientific discussion on topics.	Laboratory lesson, independent work	assessment of oral answers	6

3.2.	Demonstrate skills in written explanation and presentation of own research findings	Laboratory lesson, independent work	evaluation of the oral report based on the materials of the individual project work	6
4.	Autonomy and responsibility			
4.1.	Orientation in key questions of human physiology; provide selection and analyses of modern literature in given scientific direction, skills of primary data analyses	Independent work	Assessment of oral report based on individual project work materials; final module test	6

6. The ratio of the results of discipline study with program learning results (semester 3)

Program learning outcomes (code) Program learning outcomes (title)	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	4.1
PLO 1. Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.	+	+	+	+									+		+
PLO 2. Understanding and knowledge of fundamental and clinical biomedical sciences at a level sufficient for solving professional tasks in the field of health care.		+	+	+									+		+
PLO 21. Search for the necessary information in professional literature and databases, other sources, analyze, evaluate and apply this information.							+	+	+	+			+		+

7. Scheme of estimation formation (semester 3)

7.1. Forms of student assessment:

semester assessment:

1. Assessment of students' oral and written answers - RS 1.1. – 1.6; 2.1. – 2.6; 3.1 – 3.2 points / 16 points

2. Evaluation of written tests - RS 1.1. – 1.6; 2.1. – 2.6; – 16 points / 8 points

3. Evaluation of laboratory work – RS 1.2; 1.3; 1.5; 2.2; 2.3; 2.5; - 16 points / 8 points

4. Evaluation of individual project work – RS 1.4; 2.4; 3.2; 4.1 - 8 points / 4 points

5. Final module control work - RS 1.1. – 1.6; 2.1. – 2.6 – 30 points / 15 points

The use of generative artificial intelligence is not allowed for items 2 and 5.

final assessment: in the form of a credit

Completion of all practical classes is mandatory for a positive final score (60 points and above and "passed"). Provided that all practical classes are completed and the student achieves a positive final score for practical classes, the student is allowed to write the final module test in the form of a test.

*The final evaluation of the educational component, the final form of control for which the calculation is established, is defined as the sum of evaluations (points) for all successfully evaluated learning outcomes. Scores below the minimum threshold are not added to the final score. **The use of generative artificial intelligence is not allowed***

It is forbidden to change the semester control in order to improve a positive grade

7.2. Organization of assessment:

Modular control tests are conducted after the end of laboratory classes.

Evaluation of oral answers, implementation and design of laboratory works is carried out during the semester in laboratory classes. An individual oral report is evaluated based on the topics submitted for self-training

Validity Scale

Passed	60-100
Fail	0-59

8. Structure of the discipline. Thematic plan* (semester 3)

№	Title of the topic	Number of hours			
		Lectures	Laboratory lessons	Consultations	Independent work *
1	Lecture 1. The subject and tasks of neuroendocrinology. Neurosecretion. The principle of feedback in neuroendocrinology. Nervous control of the pituitary gland.	2			
2	Laboratory lesson 1. Subject and tasks of neuroendocrinology. Neuroendocrine transduction and basic aspects of neuroendocrine integration. Principles and classes of receptors in neuroendocrine signal transduction		2		
3	Independent work. Selective ligand-induced signaling.				5
4	Laboratory lesson 2. Secondary messengers, desensitization, signaling dysfunction.		2		
5	Lecture 2. Neuroendocrine regulation of development, growth and metabolism.	2			

6	Laboratory lesson 3. Study of the principle of feedback in the regulation of the neurohumoral activity of the body. Functions of the hypothalamic nuclei. Mechanisms of regulation of the secretion of liberins and statins.		2		
7	Laboratory lesson 4. Neurohumoral control of the anterior and middle lobes of the pituitary gland. Nervous control of the posterior lobe of the pituitary gland (Neurohypophysis). Secretion of tropic hormones. Physiological functions of vasopressin. Physiological functions of oxytocin.		2		
8	Laboratory lesson 5. Regulation of growth hormone secretion. Neuroendocrine growth disorders (dwarfism, gigantism).		2		
9	Laboratory lesson 6. Neuroendocrine regulation of development, growth and metabolism - the study of the thyroid gland. Disorders of the hypothalamic-pituitary-thyroid axis.		2		
10	Independent work. Proopiomelanocortin. Sex-steroid determinants of growth hormone secretion.				5
11	Lecture 3. Hypothalamic-pituitary-adrenal axis and neuroendocrine reactions to stress. Neuroendocrinology of aggression.	2			
12	Laboratory lesson 7. Hypothalamic-pituitary-adrenal axis. The effect of stress on other neuroendocrine systems. The effect of stress hormones on brain function. Itsenko-Cushing's syndrome, Addison's disease.		2		
13	Independent work. Chronic social stress: effects on neuroendocrine function. Social stress and affective disorders.				5
14	Laboratory lesson 8. Neuroendocrinology of aggressive behavior. Neural circuits of aggression. Effects of steroids on aggressive behavior.		2		
15	Independent work. The influence of stress hormones on human behavioral reactions. The influence of protein and peptide hormones on aggressive behavior				5
16	Lecture 4. Neuroendocrine control of the reproduction process. Gender differentiation of the brain and behavior.	2			
17	Laboratory lesson 9. Evolution of sex neurohormones. Sex neurohormone receptors. Pituitary connection between the brain and the gonads. Gonadotropic hormones of the pituitary gland.		2		
18	Independent work. Kisspeptin and its receptors. Development of the GnRH system and their localization within the brain.				5

19	Laboratory lesson 10. Differences in reproductive behavior and physiology. The influence of steroid hormones on the development of the body. Neuroendocrine mechanism of puberty. Sexual behavior. Parental behavior and perinatal programming of infant development. Hormonal influence on the behavior of parents.		2		
20	Independent work. Extranuclear (nongenomic) effects of gonadal steroid hormones in the brain.				5
21	Lecture 5. Circadian rhythms of neuroendocrine systems. Cardiovascular neuroendocrinology. Neuroendocrine regulation of the digestive system.	2			
22	Laboratory lesson 11. The main mechanisms controlling neuroendocrine and endocrine rhythms. Circadian regulation.		2		
23	Independent work. Desynchronosis: developmental mechanisms and neuroendocrine consequences for human health				5
24	Laboratory lesson 12. Conditions of altered sleep and circadian rhythm.		2		
25	Laboratory lesson 13. Neuroendocrine bases of emotional well-being: the reward system, mood modulation, and stress adaptation.		2		
26	Independent work. Production of angiotensinogens. Models of integration of neuroendocrine, autonomic and behavioral-motor components.				5
27	Lecture 6. Pathologies of neuroendocrine regulation. Syndromes and diseases associated with dysfunction of the neuroendocrine system at different levels of regulation.	2			
28	Laboratory lesson 14. Cardiovascular neuroendocrinology. Functions of the paraventricular nucleus of the hypothalamus. Opposing actions of angiotensin II and natriuretic peptides.		2		
29	Laboratory lesson 15. Neuroendocrine regulation of digestion: the interaction of hormones and the nervous system in the control of gastrointestinal functions.		2		
30	Laboratory lesson 16. Disorders of the hypothalamic-pituitary-adrenal system. Pituitary adenomas.		2		
31	Independent work. Disorders of the hypothalamic-pituitary-gonadal axis. Neuroendocrine inherited or induced aromatase enzyme deficiencies.				6
44	Total	12	32		46

Total volume 90 hours, including:

Lectures – 12 hours

Laboratory lessons – 32 hours

Individual work– 46 hours

9. Recommended literature:

1. George Fink, Donald Pfaff, Jon Levine Handbook of Neuroendocrinology 1st Edition - August 31, 2011, P. 858.
2. Patricia E. Molina Endocrine Physiology, 5th edition. New York, McGraw-Hill, 2018. 320 c. McGraw Hill LLC; April 2018, P. – 320
3. Stanislav Oravec Diseases of the endocrine system Lectures from Endocrinology. Comenius University in Bratislava, Faculty of Medicine, 1st edition. Published online. 2018. P.70.
4. BOON, N.A., COLLEDGE, N.R., and WALKER, B.R., (eds.). Davidson's Principles and Practice of Medicine. 20th ed. Philadelphia: Churchill Livingstone/Elsevier Health Sciences Division, 2006, xvi, 1381 p. ISBN 978-0-443-10057-4. Available at: www.studentconsult.com
5. 5. Fink, George, et al., editors. Handbook of Neuroendocrinology. Academic Press, 2012. – 858p.
6. 6. "Collection of test questions for current control of the level of knowledge. Part 1" for 2nd year students studying in the OP "Medicine". Chapter 9 "Humoral regulation of visceral functions". / O.M. Podpalova, E.M. Reshetnik/ Compiled by O.M. Podpalova, E.M. – K.: Electronic edition, 2024. – 170 p.

Additional literature

1. Chernykh Maria, Podpalova Olga, Kravchenko Victoria, Reshetnik Evdokia, Kaminsky Rostyslav, Kovalchuk Oleksandr, Chelpanova I.V. "Neurodynamic correlates of chronic war-related stress: evidence of cognitive and emotional vulnerability in women and men" Wiadomości Lekarskie, (WLE-01611-2025-01) 2026. 79(5), 1012-1022.
2. Regulations on the use of artificial intelligence in the implementation of educational programs at the Taras Shevchenko National University of Kyiv
https://biomed.knu.ua/images/stories/NMK/Documents/Baza_vnutrishnih_doc/2026/Polozhennia_pro_AI_compressed.pdf

Informational sources

1. http://www.freebookcentre.net/medical_text_books_journals/endocrinology_ebooks_online_texts_download.html
2. <https://www.intechopen.com/books/187>
3. <https://accessmedicine.mhmedical.com/book.aspx?bookid=2343>
4. https://www.academia.edu/38979245/HANDBOOK_OF_NEUROENDOCRINOLOGY_Edited_by
5. http://www.freebookcentre.net/medical_text_books_journals/endocrinology_ebooks_online_texts_download.html
6. <http://www.nbu.gov.ua>
https://books.google.com.ua/books?id=_PTUCQAAQBAJ&printsec=frontcover&hl=uk#v=onepage&q&f=false