

SUBJECT CARD

Faculty of Medicine and Health Sciences

Field of studies: Medicine

Form of studies: Full-time

Degree: long-cycle Master's program

Specializations: No specialization

Academic year: 2022/2023

METABOLISM AND SYSTEMIC HOMEOSTASIS	
SUBJECT	Metabolism and systemic homeostasis
NUMBER OF ECTS POINTS	3
LANGUAGE OF INSTRUCTION	English
TEACHER(S)	Assoc. Professor Piotr Kopinski, MD, PhD Assoc. Professor Ewa Wypasek, MD, PhD Małgorzata Kalemba-Drożdż, MD, PhD Janusz Ligeza, MD, PhD Tomasz Senderek, MD, PhD
PERSON RESPONSIBLE	Małgorzata Kalemba-Drożdż, MD, PhD
NUMBER OF HOURS	
LECTURES	15 h
SEMINARS	15 h
GENERAL OBJECTIVES	
OBJECTIVE 1	Discussion about mechanisms and dynamics of changes determining homeostasis.
OBJECTIVE 2	Integration of information in the field of molecular biology, cell biology and physiology.
LEARNING OUTCOMES	
MK1	Knowledge: Basic catabolic and anabolic pathways, ways of their regulation and the influence of genetic and environmental factors on them. (B.W15. / EUK7_W21)
MK2	Knowledge: Metabolic profiles of basic organs and systems. (B.W16. / EUK7_W22)
MK3	Knowledge: The activity and mechanisms of regulation of all organs and systems of the human body, including the circulatory system, respiratory system, digestive system, urinary system and skin integuments, and the relationships between them. (B.W21. / EUK7_W27)

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MK4	Knowledge: The mechanism of aging of the organism. (B.W23. / EUK7_W29)
MK5	Knowledge: Basic quantitative parameters describing the efficiency of individual organs and systems, including ranges of norms and demographic factors influencing the value of these parameters. (B.W24. / EUK7_W30)
MK6	Knowledge: Relationship between factors disturbing the balance of biological processes and physiological and pathophysiological changes. (B.W25. / EUK7_W31)
MK7	Knowledge: The influence of oxidative stress on cells and its importance in the pathogenesis of diseases and the aging. (C.W47. / EUK7_W82)
MK8	Knowledge: Deficiencies and excess of vitamins or minerals in organism and their consequences. (C.W48. / EUK7_W83)
MK9	Knowledge: Enzymes involved in digestion, the mechanism of hydrochloric acid production in the stomach, the role of bile, the absorption of nutrients. (C.W49. / EUK7_W84)
MK10	Knowledge: Consequences of malnutrition, prolonged starvation, unbalanced diets and overnutrition, disorders of digestion and absorption of nutrients. (C.W50. / EUK7_W85)
MK11	Knowledge: Causes and symptoms of the most common internal diseases in adults and their complications. Principles of diagnosis and therapeutic management. (E.W7. / EUK7_W116)
MS1	Skills: To perform simple tests assessing the human body as a stable regulatory system (stress tests, exercise tests) and to interpret the numerical data on the basic physiological variables. (B.U7. / EUK7_U12)
MS2	Skills: To use simple measuring instruments and to evaluate the accuracy of performed measurements. (B.U9. / EUK7_U14)
MS3	Skills: To describe changes in the functioning of the body in the event of homeostasis disorders, to define the integrated response to exposure to physical activity, high and low temperature, loss of blood or water, sudden upright standing, transition from sleep to wakefulness. (C.U20. / EUK7_U38)

INTRODUCTORY REQUIREMENTS

Biochemistry knowledge.

METABOLISM AND SYSTEMIC HOMEOSTASIS

COURSE PROGRAM	DETAILED DESCRIPTION OF THE TOPIC BLOCKS
LECTURE 1	<p>The concept of homeostasis. Mechanisms of organ and system regulation and dependencies between them. Positive and negative feedback. The integrating role of the nervous system - selected examples. The role of the vegetative system. Main sites of activity, mediators and receptors. The integrating role of the endocrine system. Mechanisms of hormones and examples of disorders of these mechanisms. (3 h – dr Janusz Ligęza)</p>
LECTURE 2	<p>The molecular function of selected vitamins and micronutrients in the body metabolism. The role of folic acid, vitamin B12, vitamin A. (2 h – dr Małgorzata Kalemba-Drożdż)</p>
LECTURE 3	<p>Summary of messages about the mechanisms of programmed death. Her variations. Examples of physiological and pathological role. Cell cycle regulation, proto-oncogenes and suppressor genes. (2 h – dr Janusz Ligęza)</p>
LECTURE 4	<p>The concept and mechanisms of aging. The aging process of cells, tissues and organs. The specificity of homeostasis in the aging process, genetic mechanisms and stochastic theories of systemic aging. Evolutionary aspects of the typical features of homeostasis. (2 h – dr Janusz Ligęza)</p>
LECTURE 5	<p>Systemic haemostasis. Vascular and plasma components. The physiological role of vitamin K. The role of platelets in hemostasis. (2 h – prof. Ewa Wypasek)</p>
LECTURE 6	<p>Water and electrolyte balance. Plasma osmolarity regulation. Conduction, dehydration, and regulation of body fluid volume. Adjusting the blood pressure. Baroreceptors. (2 h – dr Tomasz Senderek)</p>
LECTURE 7	<p>Mechanism of ventilation, respiratory drive, construction, operation, regulation of peripheral and central chemoreceptor functions, including neural regulation of central chemoreceptor activities. The mechanism of gas transport in the blood. Gas exchange in the lungs. Hb saturation with oxygen. (2 h – prof. Piotr Kopiński)</p>
SEMINAR 1	<p>Regulation of hunger and satiety. Metabolism of sugars and fats regarding to tissue specificity (liver, muscles, brain). (2 h – dr Janusz Ligęza)</p>
SEMINAR 2	<p>Function of macro- and microelements and water-soluble vitamins. Allowances, absorption, distribution, examples of typical disorders (Fe, Ca, Mg, P, S, Zn, Cu, Mn, Se, Mo, Cr, I; B1, B2, B5, B6, H, folic acid, pantothenic acid, B12, PP, C). (3 h – dr Małgorzata Kalemba-Drożdż)</p>

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SEMINAR 3	Regulation of gene expression – genetics and physiology issues on selected examples. (2 h – dr Janusz Ligęza)
SEMINAR 4	Detailed discussion on the mechanisms of vascular hemostasis. Cascade of the coagulation system. Routes of activation and regulation of the coagulation cascade. (3 h – prof. Ewa Wypasek)
SEMINAR 5	Reactive oxygen species in metabolism and signaling. Oxidative stress. Cascade of arachidonic acid. Autacoids. (2 h – dr Janusz Ligęza)
SEMINAR 6	Disturbances in the pH-balance - multidisciplinary statement. Acidosis, alkalosis. Compensation mechanisms. Systemic buffers. Chemoreceptors. Hemoglobin and oxygen transport. (3 h – prof. Piotr Kopiński)
DIDACTIC METHODS (APPLIED)	
	Lectures; Seminars; Self-education; Discussion; Troubleshooting.
STUDENTS WORKLOAD	
NUMBER OF HOURS UNDER SUPERVISION	30 hours
NUMBER OF PREPARATION HOURS	Preparation for classes: 20 hours Preparation for the exam: 30 hours
TOTAL NUMBER OF HOURS FOR THE COURSE	80 hours
CONDITIONS FOR COURSE COMPLETION	
	1. Attendance in all lectures and seminars is obligatory. 2. Active participation in classes. One absence is allowed when all tests are passed. 3. Positive rating in all partial tests. 4. Positive rating in the final exam.
METHODS OF ASSESMENT	
IN TERMS OF KNOWLEDGE	Open questions, test.
IN TERMS OF SKILLS	Written exam for the exam includes multiple choice test, open questions and supplementing the text.
IN TERMS OF SOCIAL COMPETENCY	Observation of students during active participation in classes.

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FORMATIVE	The pass for the classes is active attendance in seminars and passing the formative tests by receiving 75% of the maximum point score.
SUMMATIVE (I & II terms)	I term (EXAM): test of 80 questions, 5 open questions. II term (RETAKE EXAM): 6-10 open questions.

GRADING SCALE

3,0 (SATISFACTORY)	60-69% of the maximum number of points (applies to tests and final test).
3,5 (SATISFACTORY PLUS)	70-79% of the maximum number of points. In open questions the student demonstrates a satisfactory mastery of knowledge but does not use appropriate nomenclature.
4,0 (GOOD)	80-84% of the maximum number of points. In open questions the student has mastered the knowledge to a good level, uses the correct nomenclature.
4,5 (GOOD PLUS)	85-90% of the maximum number of points. In open questions, the student demonstrates having extensive knowledge, but not outside the scope of the discussed material.
5,0 (VERY GOOD)	91-100% of the maximum number of points. In open questions, the student demonstrates having extensive knowledge, thinks independently and constructs research problems.

BASIC LITERATURE

- [1] Constanzo L – Physiology, 2017, Elsevier;
[2] Litwack G – Human Biochemistry, 2017, Academic Press.

SUPPLEMENTARY LITERATURE

- [1] Appleton R, Vanbergen O. — Metabolism and nutrition. Crash Course., 2017, Elsevier;
[2] Baynes J, Dominiczak M – Medical Biochemistry, 2018, Elsevier.