

**DESCRIPTION OF COURSE UNIT FOR DOCTORAL STUDIES  
AT VILNIUS UNIVERSITY  
(Interdisciplinary Course)**

<b>Scientific Area/eas, Field/ds of Science</b>	Medical and Health Sciences (M 000): Medicine (M 001), Public Health (M 004)			
	Natural Sciences (N 000): Biology (N 010), Biochemistry (N 004)			
<b>Faculty, Institute, Department/Clinic</b>	Faculty of Medicine Institute of Biomedical Sciences Department of Physiology, Biochemistry, Microbiology and Laboratory Medicine			
<b>Course unit title</b> (ECTS credits, hours)	<b>Metabolism and healthy aging</b> 5 credits (134 hours)			
<b>Study method</b>	<b>Lectures</b>	<b>Seminars</b>	<b>Consultations</b>	<b>Self-study</b>
Number of ECTS credits	0.6	1.2	-	3.2
<b>Method of the assessment</b> (in 10 point system)	<p>Presentation on the prespecified topic. The topic of the report is discussed with the coordinating lecturers (the doctoral student must analyse, review and present the latest data related to the respective topic). Evaluation criteria: a) relevance and analysis of the material provided (3 points); b) general structure of the report, presentation of knowledge, argumentation, summary (4 points); c) answering questions, ability to participate in a discussion (3 points).</p>			
<b>PURPOSE OF THE COURSE UNIT</b>				
<p>To deepen and systematize the knowledge about human metabolism and its changes as the body ages, to understand the biochemical basis of age-related disease and to get acquainted with biomarkers for the assessment of biological age and aging. To promote an interdisciplinary and holistic approach to the aging changes in the metabolism of the human body and their significance for healthy aging.</p>				
<b>THE MAIN TOPICS OF COURSE UNIT</b>				
<p>Oxidative stress in the aging process and the role of antioxidants. Free radicals, their formation and metabolism. Enzymes involved in ROS metabolism. Natural and synthetic antioxidants and their benefits. Lipid metabolism in the body and the effects of aging. Changes in cholesterol metabolism in aging organism. The role of apolipoproteins in the development of atherosclerosis and neurodegenerative diseases. The most important apolipoproteins, their metabolism and functions. Changes in energy metabolism with age. The role of nicotinamide adenine dinucleotide in the aging process. Creatine, its tissue distribution, and the importance of creatine kinase function in aging.</p>				

mTOR, a mammalian target of rapamycin, signalling pathway and role in the aging process.

Intercellular material composition, tissue distribution and metabolism. Structural and functional changes in collagen and glucosaminoglycans in the elderly.

Folic acid metabolism and its significance for longevity. Causes and consequences of B vitamin deficiency in the elderly.

Vitamin D metabolism and age-related changes and the importance of various aspects of healthy aging. Age-related changes in mineral metabolism. Importance of vitamin D for cognitive function.

Carbohydrate metabolism, glycosylation processes and aging.

Nucleic acids and their changes with age. DNA damage, repair mechanisms and their defects. Telomeres, telomerase and aging.

Biochemical markers for the assessment of the aging process and biological age.

Oxidized proteins as markers of biological age. Immune systems and markers of inflammation reflecting aging. Extracellular vesicles and circulating microparticles.

Nutritional features of the elderly. Dietary changes associated with healthy aging and longevity.

### **RECOMMENDED LITERATURE SOURCES**

1. Harris, J. Robin, Korolchuk, Viktor I. (Eds.) Biochemistry and Cell Biology of Ageing: Part I Biomedical Science. Springer, 2018
2. Harris, J. Robin, Korolchuk, Viktor I. (Eds.) Biochemistry and Cell Biology of Ageing: Part II Clinical Science. Springer, 2019
3. Nelson D.L, Cox M.M. Lehninger Principles of Biochemistry. W. H. Freeman, 8th edition, 2021.
4. Baynes J.F., Dominiczak N.H. Medical Biochemistry. Elsevier, 5th Edition, 2018
5. Salway J.G. Metabolism at a Glance. Wiley-Blackwell, 4th Edition, 2017.
6. Stryer L., Berg J., Tymoczko J., Gatto G. Biochemistry. W.H. Freeman; 9th edition, 2019.
7. Devlin T.M. Textbook of Biochemistry with Clinical Correlation. Wiley; 7<sup>th</sup> edition, 2010.
8. Rodwell V.W., Bender D., Kennelly P.J., Weil P.A., Botham K.M. Harper's illustrated biochemistry. McGraw Hill, 32nd edition, 2022.
9. Alberts B., Heald R. Molecular Biology of the Cell. W. W. Norton & Company, 7th edition., 2022
10. da Poian A.T., Castanho M. A. R. B. Integrative Human Biochemistry: A Textbook for Medical Biochemistry. Springer, 2nd edition, 2021.

### **CONSULTING LECTURERS**

1. Coordinating lecturer: Dovilė Karčiauskaitė (Assoc. prof. dr.)

2. Arvydas Kaminskas (Prof. dr. HP)

### **APPROVED:**

By Council of Doctoral School of Medicine and Health Sciences at Vilnius University  
15<sup>th</sup> of June, 2022

Chairperson of the Board: Prof. Janina Tutkuvienė