

Study Programme: Master Academic Studies in Biochemistry
Course Unit Title: Lipids and cell membranes
Course Unit Code: B-501
Name of Lecturer(s): Associate Professor Ivana Beara
Type and Level of Studies: Master of Science Degree
Course Status (compulsory/elective): compulsory
Semester (winter/summer): winter
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 7
Prerequisites: None
<p>Course Aims:</p> <p>The goal of the course is to provide students with advanced and extended knowledge of structure and function of lipids and other structural elements of cell membrane, as well as a structure and function of the cell membrane itself. Furthermore, the goal of the course is to develop students' ability to establish relationship between the gained knowledge of membrane lipids and proteins and their role in properties and functions of the cell membrane, which will enable better understanding of processes within the cell and the organism as a whole.</p>
<p>Learning Outcomes:</p> <p>By the end of this course, students will be able to (1) differentiate lipid classes and their functions in the organism, (2) independently choose methods for isolation, purification and analysis of lipids from different natural sources, (3) understand biochemical processes in organism which involve lipids, (4) understand structure of cell membrane and transport mechanisms of ions, biomolecules and signals through cell membrane, (5) understand the correlation between properties and various functions of the cell membrane and structure and properties of membrane lipids.</p>
<p>Syllabus:</p> <p><i>Theory</i></p> <p>Amphiphilic lipids (phospholipids, sphingolipids, glycolipids, eicosanoids): structure, properties, conformation of amphiphilic membrane lipids. Occurrence of lipids. Isolation from natural sources, analysis. Transport and reaction of lipids in the blood. Lipids in cellular signalling. Lipids in the diet. Lipid metabolism disorders and diseases. Phospholipase. The composition and structure of the membrane: membrane lipids, proteins and carbohydrates. Transport processes: simple and facilitated diffusion, osmosis, active and passive transport. Membrane potential. Ion channels. Signal transduction across the membrane. Membranes and energy conservation. Lipid peroxidation. The mechanism of lipid peroxidation. Peroxidation impact on living organisms.</p> <p><i>Practice</i></p> <p>The preparation, discussion and defence of the project-seminar paper on the chosen topic.</p>
<p>Required Reading:</p> <ol style="list-style-type: none"> 1. F. D. Gunstone, J. L. Harwood, A. J. Dijkstra: <i>The Lipid Handbook with CD-ROM</i>, CRC Press, 2007. 2. M. I. Gurr, J. L. Harwood, K. N. Frayn: <i>Lipid biochemistry</i>, Blackwell, 2002. 3. F. D. Gunstone: <i>Fatty acid and lipid chemistry</i>, Blackie Academic & Professional Springer, 1996. 4. D. E. Vance, J. E. Vance: <i>Biochemistry of Lipids, Lipoproteins and Membranes</i>, Elsevier, 1996.

5. P. L. Yeagle: *The Structure of Biological Membranes*, CRC Press, 2007.

6. M. Luckey: *Membrane Structural Biology: With Biochem. and Bioph. Found.*, Cambridge Univ. Press, 2008.

Weekly Contact Hours: 6 (90)	Lectures: 4 (60)	Practical work: 2 (30)
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Teaching Methods:

Lectures, seminar(s)

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	Final exam	points
Active class participation	10	written exam	70
Practical work		oral exam	
Preliminary exam(s)		
Seminar(s)	20		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.