



<b>Study program:</b> Doctoral Academic Studies in Biomedical Sciences		
<b>Name of the subject:</b> CELL SIGNALING		
<b>Teacher(s):</b> Dušan M. Lalošević, Nada Naumović, Damir Lukač, Matilda Đolai		
<b>Status of the subject:</b> elective		
<b>Number of ESPB points:</b> 20		
<b>Condition:</b> -		
<b>Goal of the subject</b> Within the proposed course, doctoral students should be introduced to the basic mechanisms of communication between cells in the human body. This signaling is the basis for maintaining morphofunctional constancy and balance both in the cell itself and in organs and organ systems. The general goal of the course is to clarify that appropriate cellular signaling is the basis of the morpho-physiological integrity of an organism.		
<b>Outcome of the subject</b> Introducing students to the basic principles of cellular signaling or transmembrane signaling of the human body. Clarification of the mechanisms and specifics of the cell signaling function determined by its morphological affiliation with the purpose of achieving the target function, especially in the nervous, endocrine, sensory, muscular and immune systems. Based on the acquired knowledge, mastering modern knowledge of the physiological laws of cell signaling, which are the basis for understanding the functioning of the organic systems of the body and the organism as a whole.		
<b>Content of the subject</b> <i>Theoretical lectures</i> <ol style="list-style-type: none"> <li>1. The importance of intercellular communication for the physiological functioning of cells, organs, organ systems and the human body as a whole; Biological properties of the cell membrane.</li> <li>2. Significance of subcellular structures in the synthesis and transport of signaling molecules; Signal transmission in the central nervous system. Types of synapses.</li> <li>3. Types of signaling molecules; Biosynthesis, deposition, exocytosis and inactivation of neurotransmitters.</li> <li>4. Creation, emptying, renewal of synaptic vesicles; Release of neurotransmitters, quantum hypothesis, role of calcium ions.</li> <li>5. Postsynaptic receptors, types; Generation of postsynaptic potentials, slow postsynaptic potentials, significance of G protein.</li> <li>6. Synaptic integration and mechanisms of regulation of integrative activity of the nervous system.</li> <li>7. Modulation of synaptic transmission (depression, facilitation, post - tetanic facilitation, long - term potentiation); Presynaptic receptors, types, roles.</li> <li>8. Significance of cell skeleton, actin proteins, microtubules in cell signaling.</li> <li>9. Cellular signaling in the immune system; The role of cytokines in cell signaling.</li> <li>10. Significance and role of glia in cellular signaling; Cellular signaling in the peripheral nervous system; Neuromuscular synapse.</li> <li>11. Cellular signaling within sensor systems, types; Efferent signaling of sensor systems.</li> <li>12. Autocrine, paracrine and endocrine signaling.</li> <li>13. Significance of endocrine system signaling in the regulation of organism functions.</li> <li>14. Cellular mechanisms of neurohumoral integration of organism functions</li> <li>15. Importance of regulation of cell properties and number for cell signaling as a basis for integration of organism functions.</li> </ol> <i>Practical lectures</i> One exercise will be dedicated to the thematic units with the envisaged content, within which, in accordance with the type of exercise, microscopic material, video material will be used and the principles of the function of cell signaling on biological material will be examined. As part of the exercises, the material will be processed through seminar papers.		
<b>Literature</b> 1. Handbook of Cell Signaling, 2e, Edited by: Bradshaw RA, Dennis EA. Academic Press, Elsevier Inc. 2009		
<b>Number of active classes</b>	<b>Theory:</b> 60	<b>Practice:</b> 45
<b>Methods of delivering lectures:</b> theoretical lessons, exercises, seminars		
<b>Evaluation of knowledge (maximum number of points 100):</b> project presentation: 50 seminars: 50.		