MEDBIOT-04:	**MOLECULAR IMMUNOLOGY**
GENERAL INFORMATION	
Course Coordinator(s)	Stana Tokić, PhD, Assist Prof.
Associate(s)	Martina Mihalj, MD, PhD, Assoc.Prof.
Study Programme	Interdisciplinary Graduate Study Programme in English: Biotechnology
Course Status	Obligatory
Year of Study, Semester	2nd year / 3rd Semester
Credits (ECTS)	**4.5**
Teaching Method (number of classes)	Lectures: 30; Seminars: 5; Exercises: 20
Expected Number of Students in the Course	25-30

COURSE DESCRIPTION

Course Aims

The course objective is to broaden and upgrade specific knowledge and practical skills regarding genetic and molecular factors that underline cellular differentiation, immunological function and regulation of innate and acquired immunity. Students will be introduced with the basic concepts of immunogenetics, the mechanisms of autoimmunity and immunodeficiency, and the principles of molecular immunotherapy.

Prerequisites for Enrolment and the Entry Competencies Required for the Course

Completed undergraduate university study programme from the area of natural sciences (chemistry, biology) or biotechnical sciences, or biomedicine and healthcare. Completed and passed courses from 1st year of the study.

Learning Outcomes at the Programme Level Contributed by the Course

BIOTECH-6; BIOTECH-7; BIOTECH-10;MEDBIOT-1; MEDBIOT-5

Learning Outcomes at the Course Level

After completing the course the student will be able to:

1. Categorize the principles and mechanisms of immune cell migration and chemotaxis
2. Explain the molecular mechanisms underlying the development of T and B cell receptors
3. Asses the role of key signaling pathways, transcription factors, cytokine and chemokine receptors in the development and function of the CD4 + and CD8 + T lymphocyte effector lines
4. Explain the molecular basis of the humoral immunity
5. Asses the role of key genetic factors in the development of specific immune disorders
6. Critically evaluate the scientific literature in the field of immunology
7. Apply the acquired practical knowledge for the purpose of immune cell isolation, phenotyping and functional analysis of peripheral leukocytes

Course Content

Lectures. Immune system organization and physiology of immune response. Immune cells and tissues. Cellular components, cytokine representatives, and molecular mechanisms underlying innate immune response. Development of acquired immunity and molecular mechanisms in the synthesis of receptors and antibodies. Antigen presentation - MHC dependent and MHC independent mechanisms. Major histocompatibility complex - organization, expression and epigenetic mechanisms in the control of HLA gene expression. Biochemical background of ligand-receptor interaction. Immunological synapse and lymphocyte activation. Transduction of activation signal and signalling cascades. Synthesis and regulation of cytokine, chemokine and adhesion molecule expression. Chemotaxis and leukocyte tissue homing. Molecular mechanisms underlying development and function of CD4 + and CD8 + T lymphocyte effector lines. Activation of B lymphocytes and germinal centre development. Effective mechanisms of humoral immunity. Molecular basis and mechanisms of central and peripheral immunotolerance. Humoral and cellular components of the autoreactive immune response in the aetiology of autoimmune and allergic

diseases. Genetic background of autoimmunity and allergy. Hereditary and acquired immunodeficiencies. Immune response to tumor antigens. Molecular immunotherapy.
Seminars: Functional analyses of T and B lymphocytes. Laboratory methods and technologies in immunogenetics. Diagnostics and therapeutic strategies of autoimmune diseases. Diagnostics and therapeutic strategies of allergic diseases. Diagnostics and therapeutic strategies of hereditary and acquired immunodeficiencies.
Exercises: Isolation of peripheral mononuclear cells by density gradient centrifugation. Leukocyte activation *in vitro*. Quantification of cytokines in the cell culture supernatant using ELISA or Luminex immunoassay. Leukocyte labelling and phenotyping using flow cytometry. Data analysis using computer tools like FlowLogic or FloJo.

Teaching Methods

Lectures; seminars; laboratory exercises

Students' Obligations

Attendance at all forms of classes is mandatory and the students are obligated to attend all knowledge tests. The students may be absent from 30% (full-time students) and 50% (part-time students) of each of the forms of classes, provided that the absence is justified. An exercise or a seminar which has not been completed must be made up through a midterm exam.

Monitoring the Activity of the Students *(Connecting Learning Outcomes, Teaching Methods, and Grading)*

Class-related activity	ECTS	Learning outcome	Student activity	Evaluation method	Grade points	
					Min.	Max.
Attending classes	0.2	1-7	Attendance at classes, and laboratory	Keeping records	2	10
Seminars	0.8	2-5	Creation of seminar paper	Presentation	10	20
Laboratory exercises	0.5	6,7	Laboratory exercises	Report	8	20
Final exam	3	1-7	Studying for the final exam	Written exam	30	50
Total	4.5				**50**	**100**

Evaluation of the written part of the final exam:

Percentage of correct answers (%)	Grade
>95.00	50
90.00-94.99	47
85.00-89.99	45
80.00-84.99	40
75.00-79.99	38
70.00-74.99	35
65.00-69.99	33
60.00-64.99	30

Forming the final grade:
The points granted for the final exam are added to the grade points awarded during class attendance. The grading process is conducted by absolute distribution, i.e. based on total

achievements, and compared to the numerical system in the following manner:
A – Excellent (5): 90-100 grade points; B – Very Good (4): 80-89.99 grade points; C – Good (3): 65-79.99 grade points; D – sufficient (2): 50-64.99 grade points

Mandatory Literature (available in the library and via other media)

Title	Number of copies in the library	Availability via other media
Abbas A, Lichtman AH, Pillai S: Cellular and molecular immunology. 9th Ed., Elsevier, Philadelphia, USA, 2018.	-	
Scientific and professional papers related to particular chapters (available online)		Yes

Additional Literature

Timothy M. Cox, John Sinclair: The Molecular Biology in Medicine (Wiley-Blackwell), 1997.

Quality Assurance Procedures Designed to Ensure the Acquisition of Outcomes and Competencies

Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Medicine Osijek and/or the Faculty of Food Technology Osijek.

Note

E-learning is not included in the class quota, but it is used in teaching and it contains links to various sites and video and audio materials available on websites.