

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

**Predmet:** CELIČNA IN MOLEKULARNA IMUNOLOGIJA  
**Course Title:** CELL AND MOLECULAR IMMUNOLOGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UŠP Biokemija, 1. stopnja	/	3.	5.
USP Biochemistry, 1 <sup>st</sup> Cycle	/	3 <sup>rd</sup>	5 <sup>th</sup>

**Vrsta predmeta / Course Type:**

obvezni / Mandatory

**Univerzitetna koda predmeta / University Course Code:**

BK133

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
30	15	30 LV	/	/	75	5

**Nosilec predmeta / Lecturer:**

doc. dr. Gregor Gunčar / Dr. Gregor Gunčar, Assistant Professor

**Jeziki / Languages:**

**Predavanja / Lectures:** slovenski / Slovenian

**Vaje / Tutorial:** slovenski / Slovenian

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

**Prerequisites:**

The course has to be assigned to the student.

**Vsebina:**

Splošne značilnosti imunskega sistema, nomenklatura, komponente imunskega sistema. Strukturne značilnosti protiteles in njihove biološke lastnosti. Organizacija imunoglobulinskih genov. Ogljikovi hidrati in njihova vloga pri delovanju imunskega sistema. Antigeni. Monoklonska protitelesa in njihova uporaba. Reakcije med antigeni in protitelesi. Pregled imunoloških metod. Zorenje in aktivacija limfocitov B. Poglavitni sistem tkivne skladnosti. Predstavljanje in T-celično spoznavanje antigena. Presajanje tkiv in organov. T-celični receptor. Zorenje, aktivacija in diferenciacija limfocitov T. Citokini in njihova vloga pri boleznih. Uravnavanje imunskega odziva. Imunska toleranca in avtoimunost.

**Content (Syllabus outline):**

Introduction to the immune system. Nomenclature. Basic concepts in immunology. Cells involved in the immune response. Antibodies and their structure. Generation of diversity. Organization of the immunoglobulin genes. Antigens. Monoclonal antibodies and their use. Reaction between antigens and antibodies. An overview of the immunological methods. Development of B lymphocytes. Major Histocompatibility Complex (MHC). Transplantation and rejection. T-cell receptor. Development of T-lymphocytes. Cytokines and their role in diseases. Regulation of the immune response. Immune tolerance and autoimmunity. Complement. Vaccination. Allergy and hypersensitivity. Immune

Sistem komplementa. Cepljenje. Alergija in preobčutljivost. Imunske pomanjkljivosti. Imunski sistem in rak.

Laboratorijske vaje:

Struktura protiteles in proteolitična razgradnja IgG, posredna in neposredna ELISA, komplement: aktivacija, litična faza, liza bakterijskih celic, prenos western- uporaba poliklonskih protiteles za detekcijo določenih antigenov v bakterijskem lizatu, točkovni nanos IgG za analizo hrane, imunološka bioinformatika: struktura nekaterih makromolekul imunskega sistema (IgG, MHC, TCR) in njihove interakcije, načrtovanje peptidov in napoved njihove vezave na molekule MHC

deficiencies. Immune system and cancer.

Laboratory practical courses:

Antibody structures and proteolytic degradation of IgG, ELISA, complement: activation, lytic phase, Western blot- use of polyclonal antibodies for detection of antigens in bacterial lysate, dot blot for food analysis, bioinformatics: structure of the molecules of the immune system- IgG, MHC, TCR, their interactions, peptide design and their binding to the MHC.

#### Temeljna literatura in viri / Readings:

- Abbas, Abul K., Andrew H. Lichtman, Shiv Pillai. Cellular and Molecular Immunology, Saunders, 2011 (60% vsebine)

Dodatna literatura / additional readings:

- Murphy, Kenneth, Paul Travers, and Mark Walport. Janeway's immunobiology. Taylor & Francis, 2011.

- Več avtorjev: Laboratorijske vaje iz celične in molekularne imunologije, FKKT, 2013

#### Cilji in kompetence:

Molekularna imunologija z imunokemijo je predmet s področja biomedicine, ki povezuje osnovne kemijske in biokemijske zakonitosti ter spoznanja na področju biologije in medicine, od koder imunologija izvira, zato je nepogrešljiva pri naravoslovno usmerjenih študijih. Predmet usmerja študenta k samostojnemu teoretičnemu in eksperimentalnemu delu. Omogoča mu, da rešuje probleme, razume načrtovanje in izvedbo projektov s tega področja ter pridobi znanje, ki je pomembno tudi v vsakdanjem življenju.

#### Objectives and Competences:

Objectives: Molecular immunology with immunochemistry is the area of biomedicine and brings together basic knowledge of chemistry, biochemistry, biology and medicine (from the last immunology originates). It is thus indispensable for the study of life sciences. Competences: Students are encouraged to be independent in their theoretical and practical work. They are able to solve the problems, understand the design and implementation of the projects from the field and to learn the topics, which are also important for everyday life.

#### Predvideni študijski rezultati:

##### Znanje in razumevanje

Študent se pri predmetu najprej seznanja z osnovami imunologije ter z nomenklaturo. Po uvodnih predavanjih pridobi dovolj znanja, da

#### Intended Learning Outcomes:

##### Knowledge and Comprehension

Basics of immunology and nomenclature. After introductory lectures the ability to understand the principles of immunochemistry methods,

<p>razume princip imunokemijskih metod, ki jih nato uporablja pri vajah za reševanje problemov. V nadaljevanju spozna mehanizme in dejavnike, ki sodelujejo pri imunskem odzivu. V zadnjem delu predavanj spozna osnove cepljenja ter pridobi osnovna znanja o alergijah, imunskih pomanjkljivostih ter imunskem sistemu in raku.</p>	<p>which are then utilized in laboratory practical courses to solve the problems. Gain knowledge about mechanisms and cells/molecules of the immune response. Basics of vaccinations, allergies, immune deficiencies and the role of immune system in cancer.</p>
<p><u>Uporaba</u> Vsebine predmeta spadajo med znanja, ki zaokrožujejo naravoslovno izobrazbo. Poleg teoretičnih vsebin nudi predmet mnogo praktičnih znanj, tudi takšnih, ki jih potrebujemo ne le v strokovnem, temveč tudi v vsakdanjem življenju. Zasnovan je tako, da študente vzpodbuja k razmišljanju, k povezovanju ter k reševanju problemov.</p>	<p><u>Application</u> Course topics add to the basic knowledge in life sciences. Besides the theoretical fundamentals the students also learn about practical knowledge and methods that are needed not only in the professional environment but also in everyday life. Students are encouraged to think and integrate knowledge to solve the problems.</p>
<p><u>Refleksija</u> Poleg pregleda znanj s področja imunologije in imunokemije pridobi študent občutek za način dela in razmišljanja na področju biomedicine in biotehnologije.</p>	<p><u>Analysis</u> Besides the overview of the immunology and immunochemistry, the student is directed towards biomedical and biotechnological way of work and problem solving.</p>
<p><u>Prenosljive spretnosti</u> Izkušnje pri reševanju problemov. Timsko delo, predvsem pri vajah. Zbiranje, analiza in interpretacija rezultatov ter njihovo kritično vrednotenje. Uporaba domače in tuje literature. Podajanje poročil o opravljenem delu.</p>	<p><u>Skill-transference Ability</u> Problem solving skills, team work in laboratory, collecting data, data analysis, interpretation and critical assessment, use of English scientific literature, writing laboratory reports.</p>

**Metode poučevanja in učenja:**

Predavanja, laboratorijske vaje.

**Learning and Teaching Methods:**

Lectures, laboratory practical courses.

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %) **Assessment:**

<p>Opravljene vaje so pogoj za pristop k izpitu. Kolokvij iz vaj Seminarska naloga Pisni izpit</p>	<p>Laboratory practical completion is required to attend written exams. Laboratory practical written exam Seminar work Written exam</p>
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**Reference nosilca / Lecturer's references:**

- WANG, Ching-I. A.\*, **GUNČAR, Gregor\***, FORWOOD, Jade K., TEH, Trazel, CATANZARITI, Ann-Maree, LAWRENCE, Gregory J., LOUGHLIN, Fiona E., MACKAY, Joel P., SCHIRRA, Horst Joachim, ANDERSON, Peter A., ELLIS, Jeffrey G., DODDS, Peter N., KOBE, Boštjan. Crystal structures of flax

rust avirulence proteins AvrL567-A and -D reveal details of the structural basis for flax disease resistance specificity. *Plant cell.*, 2007, vol. 19, no. 9, str. 2898-2912. \*deljeno prvo avtorstvo

- MIHELIČ, Marko, DOBERŠEK, Andreja, **GUNČAR, Gregor**, TURK, Dušan. Inhibitory fragment from the p41 form of invariant chain can regulate activity of cysteine cathepsins in antigen presentation. *J Biol Chem*, 2008, vol. 283, no. 21, str. 14453-14460.

- **GUNČAR, Gregor**, PUNGERČIČ, Galina, KLEMENČIČ, Ivica, TURK, Vito, TURK, Dušan. Crystal structure of MHC class II-associated p41 li fragment bound to cathepsin L reveals the structural basis for differentiation between cathepsins L and S. *EMBO j.*, 1999, vol. 18, str. 793-803.

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