

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	BIOLOGIJA CELICE
Course Title:	CELL BIOLOGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
UN Biokemija, 1. stopnja	/	2.	3.
USP Biochemistry, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type:

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

BK115

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
45	/	30 LV	/	/	75	5

Nosilec predmeta / Lecturer:

prof. dr. Peter Veranič / Dr. Peter Veranič, Full 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:

Celica kot osnovni gradnik vsega živega, primerjava med prokariotsko in evkariotsko celico.

Evkariotska celica.

Plazemska membrana – značilnosti lipidnega dvosloja; proteini v membrani, glikokaliks; komunikacija z okoljem in prenos sporočil.

Principi transporta majhnih molekul skozi membrano; sklopljenost različnih transportnih sistemov v celici.

Plazemska membrana v vlogi povezovanja s sosednjimi celicami in zunajceličnim

Content (Syllabus outline):

Cell as a basic brick stone of organism, comparison between prokaryotic and eukaryotic cell

Eukaryotic cell and its membranes, membrane domains, compartmentalization of eukaryotic cell

Intercellular communication and transport of messages

Cell junctions in connecting cell and extracellular matrix

Molecules of extracellular matrix

matriksom; vrste povezovalnih molekul in vrste medceličnih stikov.

Citoskelet in gibanje celic; mikrotubuli, aktinski filamenti in intermediarni filamenti. Znotrajcelični predelki in prenos proteinov na tarčna mesta v celici; pomen sporočilnih zaporedij.

Biosintetsko – sekrecijska pot in endomembranski sistemi; endoplazemski retikulum, Golgijev aparat, vezikularni transport.

Lizosomi in njihova vloga pri razgradnji makromolekul.

Eksocitoza; različne poti prenosa produktov iz celice na njeno površino.

Endocitoza; različne poti in mehanizmi prenosa makromolekul in delcev v celico, zgodnji in pozni endosomi.

Organeli energijskih pretvorb; mitohondriji, kloroplasti, semiavtonomni organeli. Jedro kot krmilo celice in nosilec genoma; jedro v interfazi, kromatin in nivoji kondenzacije kromatina, kromosomi, jedrce.

Celične delitve; mitoza, mejoza. Celični ciklus; faze in kontrolne točke v celičnem ciklu, mehanizmi regulacije. Celična smrt kot ravnotežje celičnim delitvam; nekroza, apoptoza. Diferenciacija celic; matične celice, nastanek različnih celic. Morfološke značilnosti rakasto transformirane celice.

Cytoskeleton: microtubules, actin filaments and intermediary filaments

Protein targeting and the meaning of signal sequences

Endomembrane system and biosynthetic pathway of proteins. Exocytosis

Endosome – lysosome system in degradation of biomolecules

Mitochondria: energy conversion and protein entry

Nucleus as a cell carrier of genome; interphase nucleus, chromatin and its condensation into chromosomes, nucleolus

Regulation of transport in and out of nucleus.

Differences between genetic and epigenetic changes in the genome, tumour suppressor genes, oncogenes

Cell cycle, phases and checkpoints in the cell cycle

Mechanisms of the regulation of cell cycle, cell division: mitosis, meiosis

Cell-biological characteristic of cancer cells, causes for transformation from normal to cancer cell

Types and characteristics of stem cells, cell differentiation and development of a variety of cells

Cell aging, cell death as the balance to cell division: necrosis, apoptosis

Temeljna literatura in viri / Readings:

- Kristijan Jezernik, Peter Veranič, Maksimiljan Sterle: Celična biologija, DZS, 2012

Cilji in kompetence:

Objectives and Competences:

Cilji: pridobiti znanje o celici kot osnovnemu gradniku vsega živega
Predmetno specifične kompetence:
 poznavanje in razumevanje povezanosti zgradbe celic s funkcijo;
 razumevanje specifičnosti procesov v celičnih organelih; razumevanje komunikacije celic z okoljem;
 poznavanje mehanizmov, ki regulirajo različne celične aktivnosti.

Students are familiar with basic characteristics of cell structure, cell organelle structure and function, as well with the elements of complex molecular structure and function, especially about the communication cell to cell and cell with the extracellular environment. They learn the techniques of cell biology.

Predvideni študijski rezultati:

<u>Znanje in razumevanje</u> Poznavanje zgradbe celice in razumevanje povezanosti zgradbe s funkcijo, razumevanje specifičnosti procesov v celičnih organelih, razumevanje komunikacije celice z okoljem, poznavanje metod v celični biologiji.
<u>Uporaba</u> Poznavanje vloge celice in celičnih organelov za razumevanje zgradbe in nastanka makromolekul in potek biokemičnih procesov v celici.
<u>Refleksija</u> Poznavanje nivojev organizacije v celici, zmožnost razumevanja pomena kompartmentalizacije v evkariontski celici ter razumevanje mehanizmov, ki regulirajo različne celične aktivnosti.
<u>Prenosljive spretnosti</u> Sposobnost samostojnega mikroskopiranja, izbira metod za načrtovanje eksperimentalnega dela, interpretacija mikrofotografij, povezovanje znanja celične biologije z vsebinami molekularne biologije, biokemije in splošne biologije, uporaba literature v tujih jezikih.

Intended Learning Outcomes:

<u>Knowledge and Comprehension</u> Understanding of concepts, and principles necessary for the studies of fundamental processes at the level of cells, tissues, organs and organisms.
<u>Application</u> Knowledge of the role of cells and organelles in formation of macromolecules. Knowledge of the location of biochemical process in cells and tissues as a crucial factor for effective modulation of processes in cells.
<u>Analysis</u> Comprehension of the levels of cell organisation, the benefits of cell compartmentalisation, and mechanisms controlling biochemical processes in cells.
<u>Skill-transference Ability</u> Sovereignty in the use of microscopes, choosing proper methods in experimental work with cells and tissues, linking of the knowledge of cell biology with molecular biology and biochemistry.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje

Learning and Teaching Methods:

Lectures, laboratory exercises

Načini ocenjevanja:

Kolokvij iz vaj 30 %. Pisni izpit 70 %.
 Ocene: 6-10 (pozitivno), 1-5 (negativno).

Delež (v %) /

Weight (in %)

Assessment:

Laboratory practical exam 30%
 Written exam 70 &
 Grades: 6-10 (positive), 1-5 (negative)

Reference nosilca / Lecturer's references:

1. DRAGIN, Urška, **VERANIČ, Peter**, ERDANI-KREFT, Mateja. Amniotic membrane scaffolds enable the development of tissue-engineered urothelium with molecular and ultrastructural properties comparable to that of native urothelium. *Tissue engineering*, ISSN 1076-3279, 2013, kategorija: 1A1 (Z1, A', A1/2);
2. BREGAR, Vladimir Boštjan, LOJK, Jasna, ŠUŠTAR, Vid, **VERANIČ, Peter**, PAVLIN, Mojca. Visualization of internalization of functionalized cobalt ferrite nanoparticles and their intracellular fate. *International journal of nanomedicine*, ISSN 1178-2013. [Online ed.], 2013, vol. 8, str. 919-931, kategorija: 1A1 (Z1, A', A1/2)
3. ERMAN, Andreja, KEREC KOS, Mojca, ŽAKELJ, Simon, RESNIK, Nataša, ROMIH, Rok, **VERANIČ, Peter**. Correlative study of functional and structural regeneration of urothelium after chitosan-induced injury. *Histochemistry and cell biology*, ISSN 0948-6143, Nov. 2013, kategorija: 1A1 (Z1, A'', A', A1/2);
4. RESNIK, Nataša, SEPČIČ, Kristina, PLEMENITAŠ, Ana, WINDOFFER, Reinhard, LEUBE, Rudolf, **VERANIČ, Peter**. Desmosome assembly and cell-cell adhesion are membrane raft-dependent processes. *The Journal of biological chemistry*, ISSN 0021-9258, 2011, vol. 286, issue 2, str. 1499-1507, 1A1 (Z1, A', A1/2);
5. **VERANIČ, Peter**, ERMAN, Andreja, KEREC KOS, Mojca, BOGATAJ, Marija, MRHAR, Aleš, JEZERNIK, Kristijan. Rapid differentiation of superficial urothelial cells after chitosan induced desquamation. *Histochemistry and cell biology*, ISSN 0948-6143, 2009, vol. 131, no. 1, str. 129-139, 1A1 (Z1, A'', A', A1/2);
6. **VERANIČ, Peter**, LOKAR, Maruša, SCHÜTZ, Gerhard J., WEGHUBER, Julian, WIESER, Stefan, HÄGERSTRAND, Henry, KRALJ-IGLIČ, Veronika, IGLIČ, Aleš. Different types of cell-to-cell connections mediated by nanotubular structures. *Biophys. j.*, 2008, letn. 95, št. 9, str.593-607. 1A1 (Z1, A', A1/2);