



Univerza v Mariboru

Medicinska fakulteta

UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Izbrane vsebine in novosti v molekularni biologiji
Subject Title:	Selected Topics and Novelties in Molecular Biology

Študijski program in stopnja Study programme and cycle	Študijska smer Study option	Letnik Year of study	Semester Semester
Dentalna medicina/Dental Medicine 2. stopnja/2nd cycle		1	1., 2.

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
5	40				45	3

Nosilec predmeta / Lecturer:

red. prof. dr. Uroš Potočnik

Jeziki /

Predavanja / Lecture:

slovenščina/slovene

Languages:

Vaje / Tutorial:

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

Prerequisites:

Vsebina:

Molekularna biologija embrionalnega razvoja
Vloga telomerazne aktivnosti pri staranju in raku
Biološka zdravila: razdelitev, glavna terapevtska področja, imunogenost, proizvodnje tehnologije za biološka zdravila
RNA interferenca (RNAi): molekularna vloga celici, uporaba RNAi tehnologije v funkcijski genomiki in kot zdravilo;
Avtofagija: vloga v celici, signalne poti povezane z avtofagijo, povezava z boleznimi, metode za spremljanje
Cirkadijski cikel: regulacija, vključeni geni, bolezni povezane z motnjami cirkadijskega cikla;
nekodirajoče RNA: razdelitev, vloga v normalnih in patoloških procesih;

Content (Syllabus outline):

Molecular biology of embryonic development
The role of telomerase activity in aging and cancer
Biological drugs: classification, main therapeutic areas, immunogenicity, production technology for biological drugs
The role of RNA interference (RNAi) in cell; using of RNAi technology in functional genomics and therapy
Avtofagija; the role in cell, signal pathways that regulate autophagy, autophagy associated diseases, assays for monitoring of autophagy;
Circadian cycle: regulation, molecular pathways and genes; associated diseases, molecular targets for therapeutic intervention;
non-coding RNAs: the role in physiological processes and pathogenesis;

analiza mrež molekularno bioloških in signalnih poti z uporabo genske ontologije in bioinformatičnih orodij (Cytoscape) Celični cikel, proliferacija, diferenciacija celic, apoptoza Povezovanje celic v tkiva, komunikacija med celicami, signalne poti, receptorji, hormoni metode in eksperimentalne tehnike v molekularni biologiji: izolacija bioloških materialov (DNA, RNA, proteinov) iz kliničnih vzorcev (kri, biopsije, tkivo-resektati) in celičnih kultur, izolacija plazmidne DNA, gelska elektroforeza, pomnoževanje DNA z verižno reakcijo z encimom polimerazo (PCR), analiza genske ekspresije z metodo PCR v realnem času (Taqman), hibridizacija odtisa (southern, northern, western), konstrukcija cDNA in genomske knjižnice Funkcionalni celični modeli Vloga molekularne biologije v sodobni družba: etični, sociološki in ekonomski vidiki Molekularna biologija nepravilnosti zob in dlesni.	Analysis of molecular biology pathways and networks using gene ontology databases and bioinformatics tools (Cytoscape) Cell cycle: proliferation, differentiation, apoptosis Integration of cells into tissues, communication between cells, signal transduction, receptors, hormone signaling Methods and experimental techniques in molecular biology: isolation of biological molecules (DNA, RNA, proteins) from clinical samples (blood, biopsy, tissue, resection specimens) and cell cultures; plasmid DNA isolation, Polymerase Chain Reaction (PCR), gene expression analysis using Real time PCR (Taqman); hybridization and blotting (southern, western, northern); cDNA and genomic libraries Functional cell models Molecular biology and society: ethical and economical aspects Molecular biology of dental and gum pathology.
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Temeljni literatura in viri / Textbooks:

1. Molecular biology of the cell / Bruce Alberts ... [et al.]. 7th ed.. New York, 2022.
2. LODISH H., Baltimore D., Berk A., Zipursky S.L., Matsudaira P., Darnell J.: Molecular Cell Biology, 8th Ed., Scientific American Books, Freeman and Co., New York, 2016
3. Carlberg C., Velleuer E., Molnár F., Molecular Medicine: How Science Works, Springer: 2023
4. Tekoča periodika/Scientific research and review papers

Cilji:

Predmet bo nudil študentom poglobitev razumevanja bistvenih molekularnih in bioloških procesov v celici, tkivih, organih in celotnem organizmu. Poseben poudarek bo na razumevanju patoloških sprememb v molekularnih procesih pri nastanku, razvoju in zdravljenju bolezni. Predstavljene bodo osnovne metode in eksperimentalne tehnike v molekularni biologiji in molekularni patologiji ter njihova uporaba pri raziskavah in preiskavah molekularnih označevalcev v diagnostiki, prognozi, načrtovanju novih zdravil in individualiziranem zdravljenju

Predvideni študijski rezultati:**Znanje in razumevanje:**

- osnovnimi molekularnimi in biološkimi procesi v celici, tkivih, organih in celotnem organizmu v zdravju in bolezni

Prenesljive/ključne spretnosti in drugi atributi:
laboratorijske metode in eksperimenti v biomedicini

Metode poučevanja in učenja:**Objectives:**

Student will have deep understanding of molecular and biological processes in cells, tissues, organs and whole human organism during health and disease. The focus will be on molecular mechanisms during disease development and treatment. Student will learn most important molecular biology and molecular pathology laboratory methods for diagnostics, biomarker discovery, novel drug development and individualized treatment based on patients genetic makeup.

Intended learning outcomes:**Knowledge and Understanding:**

- molecular and biological processes in cells, tissues, organs and whole human organism during health and disease

Transferable/Key Skills and other attributes:
laboratory methods and experimental techniques in biomedicine

Learning and teaching methods:

Predavanje Seminar	Lectures Seminars
Načini ocenjevanja: Delež (v %) / Assessment: Weight (in %)	
Način (pisni izpit, ustno izpraševanje, naloge, projekt) seminar pisni izpit ŠTUDIJSKE OBVEZNOSTI ŠTUDENTOV: -študenti napišejo seminar na izbrano tematiko in ustno predstavijo seminar s kratkim predavanjem -pisni izpit POGOJI ZA PRISTOP K POSAMEZNEMU PREVERJANJU ZNANJA: Opravljen seminar je pogoj za pristop k pisnemu izpitu.	Type (examination, oral, coursework, project): seminar written exam ACADEMIC OBLIGATIONS OF STUDENTS: -students should write an essay on selected topic and give oral presentation (seminar) -written exam REQUIREMENTS FOR ACCESS TO INDIVIDUAL KNOWLEDGE CHECKING: Students should complete seminar in order to approach to the written exam.
Reference nosilca / Lecturer's references:	
ČELEŠNIK, Helena Sabina, POTOČNIK, Uroš. Blood-based mRNA tests as emerging diagnostic tools for personalised medicine in breast cancer. <i>Cancers</i> . 2023, vol. 15, issue 4, [article no.] 1087, str. [1]-23. ISSN 2072-6694. https://www.mdpi.com/2072-6694/15/4/1087 , https://doi.org/10.3390/cancers15041087 , DOI: 10.3390/cancers15041087. [COBISS.SI-ID 141250307], [JCR, SNIP, WoS, Scopus] financer: ARRS, Programi, P3-0427, SI, Sistemski pristopi k raziskavam človeškega genoma za personalizirano medicino kroničnih imunskih bolezni; ARRS, Projekti, J3-9272, SI, Identifikacija molekularnih biooznačevalcev za napoved kliničnega poteka in zasevanja pri pacientkah s trojno negativnim rakom dojke kategorija: 1A1 (Z, A', A1/2);	
14. AVBELJ, Monika, HAFNER BRATKOVIČ, Iva, LAINŠČEK, Duško, MANČEK KEBER, Mateja, PETERNELJ, Tina Tinkara, PANTER, Gabriela, TREON, Steven P., GOLE, Boris, POTOČNIK, Uroš, JERALA, Roman. Cleavage-mediated regulation of Myd88 signaling by inflammasome-activated caspase-1. <i>Frontiers in immunology</i> . Jan. 2022, vol. 12, str. 1-14, ilustr. ISSN 1664-3224. https://www.frontiersin.org/articles/10.3389/fimmu.2021.790258/full , https://doi.org/10.3389/fimmu.2021.790258 , DOI: 10.3389/fimmu.2021.790258. [COBISS.SI-ID 93261315], [JCR, SNIP, WoS do 7. 8. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,20, Scopus do 22. 7. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,20] kategorija: 1A1 (Z, A", A', A1/2);	
11. REPAS, Jernej, ZUPIN, Mateja, VODLAN, Maja, VERANIČ, Peter, GOLE, Boris, POTOČNIK, Uroš, PAVLIN, Mojca. Dual effect of combined metformin and 2-deoxy-D-glucose treatment on mitochondrial biogenesis and PD-L1 expression in triple-negative breast cancer cells. <i>Cancers</i> . 2022, vol. 14, issue 5, str. [1]-30, ilustr. ISSN 2072-6694. https://doi.org/10.3390/cancers14051343 , https://www.mdpi.com/2072-6694/14/5/1343 , https://repozitorij.uni-lj.si/lzpisGradiva.php?id=137225 , DOI: 10.3390/cancers14051343. [COBISS.SI-ID 100035587], [JCR, SNIP, WoS do 14. 4. 2023: št. citatov (TC): 5, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 0,71, Scopus do 3. 6. 2023: št. citatov (TC): 6, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 0,86] financer: Raziskava sofinancirana s strani Slovenian Research Agency research core funding No. P1-0055; Raziskava sofinancirana iz MRIC UL IP-0510 BMCM; Raziskava sofinancirana iz FE Infrastructure program; Sofinancer Slovenian Research Agency young researchers program; ARRS, Projekti, J3-6794, SI, Celična energijska presnova kot tarča za zdravljenje raka - genski in farmakološki pristop; ARRS, Projekti, J7-7424, SI, Analiza možnih škodljivih učinkov nanodelcev in spremljajočih mehanizmov - od fizikalno-kemijske ter in vitro karakterizacije do aktivacije prirojenega imunskega sistema; ARRS, Projekti, P3-0067, SI, Farmakologija in farmakogenomika; ARRS, Projekti, P3-0427, SI,	

Sistemiški pristopi k raziskavam človeškega genoma za personalizirano medicino kroničnih imunskih bolezni; Sofinancer Ministry of Education, Science and Sport (C3330-19-952026); ARRS, Programi, P3-0108, SI, Diferenciacija urotelijskih celic
kategorija: 1A1 (Z, A', A1/2)

2. GORIČAN, Larisa, BÜDEFELD, Tomaž, ČELEŠNIK, Helena Sabina, ŠVAGAN, Matija, LANIŠNIK, Boštjan, POTOČNIK, Uroš. Gene expression profiles of methyltransferases and demethylases associated with metastasis, tumor invasion, CpG73 methylation, and HPV status in head and neck squamous cell carcinoma. *Current issues in molecular biology*. 2023, vol. 45, issue 6, str. 4632-4646, ilustr. ISSN 1467-3045. <https://doi.org/10.3390/cimb45060294>, <https://www.mdpi.com/1467-3045/45/6/294>, DOI: 10.3390/cimb45060294. [COBISS.SI-ID 153940995], [JCR, SNIP]
financer: ARRS, Programi, P3-0427, SI, Sistemiški pristopi k raziskavam človeškega genoma za personalizirano medicino kroničnih imunskih bolezni; ARRS, Programi, P3-0067, SI, Farmakologija in farmakogenomika; Sofinancer: Univerzitetni klinični center Maribor (interna raziskovalna projekta IRP-2021/02-14 in IRP-2015/01-21)
kategorija: 1A3 (Z)

1. MARTIN-ALMEIDA, Mario, PEREZ-GARCIA, Javier, HERRERA-LUIS, Esther, ROSA-BAEZ, Carlos, GORENJAK, Mario, NEERINCX, Anne H., SARDON-PRADO, Olaia, TONCHEVA, Antoaneta, HARNER, Susanne, WOLFF, Christine, BERCE, Vojko, POTOČNIK, Uroš, et al. Epigenome-wide association studies of the fractional exhaled nitric oxide and bronchodilator drug response in moderate-to-severe pediatric asthma. *Biomedicines*. [Online ed.]. 2023, vol. 11, issue 3, str. [1]-15, ilustr. ISSN 2227-9059. <https://www.mdpi.com/2227-9059/11/3/676>, <https://doi.org/10.3390/biomedicines11030676>, DOI: 10.3390/biomedicines11030676. [COBISS.SI-ID 143009027], [JCR, SNIP, WoS, Scopus]
financer: Sofinancer: Ministry of Education, Science and Research (BMBF), project no. C330-16-500-106; Sofinancer: Slovenian Research Agency, research core funding no. P3-0427
kategorija: 1A2 (Z, A1/2)