



UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Izbrane vsebine in novosti v molekularni biologiji
Subject Title:	Selected topics and novelties in molecular biology

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Splošna medicina General medicine – EMŠP		1	2

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Labor work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
5	40				45	3

Nosilec predmeta / Lecturer:

Izred. prof. dr. Uroš Potočnik

Jeziki /

Predavanja / Lecture: Slovenski/Slovene

Languages:

Vaje / Tutorial:

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

Prerequisites:

Vsebina:

DNA struktura in lastnosti, replikacija (prokarioti, eukarioti), rekombinacija DNA, DNA popravilni mehanizmi, DNA mutacije, struktura in funkcija genov in kromosomov

RNA struktura in lastnosti, vrste RNA molekul in funkcije, transkripcija (prokarioti, eukarioti), posttranskripcijske modifikacije

Struktura proteinov, sinteza proteinov, posttranslacijske modifikacije proteinov, zvižanje proteinov, transport proteinov

Regulacija proteinske sinteze: regulacija ekspresije genov pri prokariotih, pri bakteriofagih, pri evkariotskih organizmih (enoceličnih, multicelularnih, povezava z embrionalnim razvojem), regulacija na ravni translacije in posttranslacijska regulacija,

Embrionalni razvoj

Celični cikel, proliferacija, diferenciacija celic, apoptoza

Povezovanje celic v tkiva, komunikacija med celicami, signalne poti, receptorji, hormoni

Imunski sistem in avtoimunske bolezni

Virusi, HIV, SARS, DNA diagnostika pri infekcijskih boleznih

Molekularna patologija: molekularni mehanizmi vključeni v nastanek bolezni, od bolezni do gena

metode in eksperimentalne tehnike v molekularni biologiji: izolacija bioloških materialov (DNA, RNA,

Content (Syllabus outline):

DNA structure and characteristics, replication (prokaryotes, eukaryotes), recombination, repair and mutations, structure and function of genes and chromosomes,

RNA structure characteristics: role of different types of RNA, transcription (prokaryotes, eukaryotes), post transcription modification

Protein structures, synthesis of proteins, translation, posttranslational modifications, protein folding, protein trafficking

Regulation of protein synthesis: transcriptional regulation of gene expression, regulation of translation, posttranslational regulation

Embryonic development

Cell division (meiosis, mitosis)

Cell cycle: proliferation, differentiation, apoptosis

Integration of cells into tissues, communication between cells, signal transduction, receptors, hormone signaling

Immune system

Viruses :HIV, SARS, Avian influence, DNA diagnostics and infection diseases

Molecular pathology: from disease to gene

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

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 genomskih knjižnic, Rekombinantna DNA tehnologija, kloniranje človekovih genov
 Monogenske genetske bolezni, kompleksne genetske bolezni,
 Molekularna biologija raka: onkogeni, tumorsko zaviralni geni, dedne oblike, molekulska diagnostika in zdravljenje, biološka zdravila
 Vloga molekularne biologije v sodobni družba: etični, sociološki in ekonomski vidiki

isolation, Polymerase Chain Reaction (PCR), gene expression analysis using Real time PCR (Taqman); hybridization and blotting (southern, western, northern); cDNA and genomic libraries
 Recombinant DNA technology, cloning of human genes
 Monogenic (Mendelian) and complex diseases
 Molecular biology of cancer: oncogenes, tumor suppressor genes, hereditary cancer, molecular diagnostics and treatment, biological drugs
 Molecular biology and society: ethical and economical aspects

Temeljni literatura in viri / Textbooks:

1. B. ALBERTS et al.: Molecular biology of the cell., 5th Ed., Garland Publish, Inc., New York, 2008
2. EPSTEIN RJ: Human molecular biology, An Introduction to the Molecular Basis of Health and Disease; Cambridge University Press, Cambridge, 2002
3. LODISH H., Baltimore D., Berk A., Zipursky S.L., Matsudaira P., Darnell J.: Molecular Cell Biology, 5th Ed., Scientific American Books, Freeman and Co., New York, 2004 STRACHAN T and READ AP: Human Molecular genetics, Garland Publish, Inc., New York, 3rd ed., 2004 Liciano J. (ed.): Pharmacogenomics, The Search for Individualized Therapies, John Wiley&Sons, 2002 R.J.M

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

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.

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

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

Metode poučevanja in učenja:

- Predavanje
- Seminar

Learning and teaching methods:

- Lectures
- seminar

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt) seminar Izpit	40 % 60 %	Type (examination, oral, coursework, project): seminar Exam
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Reference nosilca / Lecturer's references:

JOSTINS, Luke, MITROVIČ, Mitja, POTOČNIK, Uroš, et al. Host-microbe interactions have shaped the genetic architecture of inflammatory bowel disease. *Nature*, ISSN 0028-0836, 2012, vol. 491, no. 7422, str. 119-124, doi: 10.1038/nature11582. [COBISS.SI-ID 512230968], [JCR, SNIP, WoS do 15. 1. 2014: št. citatov (TC): 131, čistih citatov (CI): 130, normirano št. čistih citatov (NC): 52, Scopus do 8. 1. 2014: št. citatov (TC): 168, čistih citatov (CI): 167, normirano št. čistih citatov (NC): 266]; SCI impact factor=36.28

RIVAS, Manuel A, MITROVIČ, Mitja, POTOČNIK, Uroš, et al. Deep resequencing of GWAS loci identifies independent rare variants associated with inflammatory bowel disease. *Nature genetics*, ISSN 1061-4036, 2011, vol. 43, no. 11, str. 1066-1073, doi: 10.1038/ng.952. [COBISS.SI-ID 15421974], [JCR, SNIP, WoS do 14. 1. 2014: št. citatov (TC): 124, čistih citatov (CI): 124, normirano št. čistih citatov (NC): 34, Scopus do 15. 1. 2014: št. citatov (TC): 139, čistih citatov (CI): 139, normirano št. čistih citatov (NC): 38]; SCI impact factor=35.53

LIU, Jimmy Z, MITROVIČ, Mitja, POTOČNIK, Uroš, et al. Dense genotyping of immune-related disease regions identifies nine new risk loci for primary sclerosing cholangitis. *Nature genetics*, ISSN 1061-4036, 79 str., ilustr. <http://www.nature.com/ng/journal/vaop/ncurrent/full/ng.2616.html>, doi: 10.1038/ng.2616. [COBISS.SI-ID 512280376], [JCR, SNIP, WoS do 18. 12. 2013: št. citatov (TC): 9, čistih citatov (CI): 9, normirano št. čistih citatov (NC): 2, Scopus do 1. 1. 2014: št. citatov (TC): 12, čistih citatov (CI): 12, normirano št. čistih citatov (NC): 3]; SCI impact factor=35.53

BERCE, Vojko, PINTO KOZMUS, Carina, POTOČNIK, Uroš. Association among ORMDL3 gene expression, 17q21 polymorphism and response to treatment with inhaled corticosteroids in children with asthma. *Pharmacogenomics journal*, ISSN 1470-269X, Dec. 2013, vol. 13, iss. 6. <http://www.nature.com/tpj/journal/vaop/ncurrent/full/tpj201236a.html>, doi: 10.1038/tpj.2012.36. [COBISS.SI-ID 4406079], [JCR, SNIP, WoS do 23. 12. 2013: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 23. 10. 2013: št. citatov (TC): 3, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 1]; SCI impact factor=5.13

REPNIK, Katja, POTOČNIK, Uroš. Haplotype in the IBD5 region is associated with refractory Crohn's disease in Slovenian patients and modulates expression of the SLC22A5 gene. *Journal of gastroenterology*, ISSN 0944-1174, 2011, vol. 46, no. 9, str. 1081-1091, doi: 10.1007/s00535-011-0426-6. [COBISS.SI-ID 15110422], [JCR, SNIP, WoS do 5. 4. 2012: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0, Scopus do 24. 11. 2011: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]; SCI impact factor=4.16