



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Izbrana poglavja iz molekulske biologije prokariotov
<b>Course title:</b>	Selected Courses in Molecular Biology of Prokaryotes

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Biologija in ekologija z naravovarstvom 2. stopnja		1/2	Poletni/ Zimski
Biology and Ecology with Nature Conservation 2nd level		1/2	Summer/ Winter

**Vrsta predmeta / Course type**

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
25		20			135	6

**Nosilec predmeta / Lecturer:**

**Jeziki / Languages:**

<b>Predavanja / Lectures:</b>	slovenski/Slovenian
<b>Vaje / Tutorial:</b>	slovenski/Slovenian

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

**Prerequisites:**

**Vsebina:**

V okviru predavanj predmeta bodo predstavljena izbrana poglavja iz molekulske biologije prokariontov:

- Bakterija *Escherichia coli* v molekulske biologiji,
- Virus lambda v molekulske biologiji,
- Mutacija, mutageneza in popravljalni mehanizmi,
- Mobilni elementi DNA (plazmidi, transpozicijski elementi),
- Horizontalni genski prenosi (konjugacija, transdukcija, transformacija, konjugativna transpozicija, fagom sorodni dejavniki prenosa genov),
- Primeri iz uravnavanja izražanja genov (operon *lac*, operon *ara*, operon *trp*),
- Molekulske kloniranje, genetsko inženirstvo ter gensko spremenjeni organizmi in zakonodaja.

V okviru laboratorijskih vaj, ki potekajo zaporedno 5 dni po 4 ure, bodo študentje izvedli: načrtovanje kloniranja promotorja gena *traJ* (*PtraJ*) v vektor pCB267 (plazmidni vektor za analizo aktivnosti promotorjev), samo molekulske kloniranje PCR –produkta *PtraJ* v pCB267, analizo aktivnosti kloniranega *PtraJ* v beta-galaktozidaznih testih in izvedli konjugativen prenos, ki bo izkazal pomen TraJ za konjugacijo.

**Content (Syllabus outline):**

The students will get during lectures familiar with selected chapters in molecular biology of prokaryotes:

- Bacterium *Escherichia coli* in molecular biology,
- Virus lambda in molecular biology,
- Mutations, mutagenesis and repair mechanisms,
- Mobile DNA elements (plasmids, transposable elements),
- Horizontal (lateral) gene transfer (conjugation, transduction, transformation, conjugative transposition, gene transfer agents GTA),
- Examples of gene regulation (*lac* operon, *ara* operon, *trp* operon),
- Molecular cloning, genetic engineering and genetically modified organisms and legislation.

In the practical lab course, that will be held on 5 consecutive days (each day for 4 hours), the students will: design the cloning of the *traJ* gene promoter (*PtraJ*) into the vector pCB267 (promoter-probe plasmid vector), perform the molecular cloning of the *PtraJ* PCR product into the pCB267, analyse the cloned *PtraJ* activity with the beta-galactosidase assay and perform the conjugative assay to see the TraJ importance for conjugation.

**Temeljni literatura in viri / Readings:**

Priporočena literatura:

- Madigan MT, Martinko JM, Bender KS, Buckley DH, Stahl D. 2015. Brock Biology of Microorganisms. 14. izdaja, Pearson, 1130 str.
- Snyder L, Peters JE, Henkin TM, Champness W. 2013. Molecular Genetics of Bacteria. 4. izdaja, ASM, 728 str.
- Watson JD, Baker TA, Bell SP, Gann A, Levine M, Losick R. 2014. Molecular Biology of the Gene. 7. izdaja, Pearson Cold Spring Harbor Laboratory Press, 872 str.

**Cilji in kompetence:****Objectives and competences:**

Študent bo nagradil svoje osnovno znanje iz molekulske biologije prokariontov in se v okviru vaj naučil praktične izvedbe molekulskega kloniranja in analize aktivnosti genskega promotorja.

Students will get familiar with advanced subjects in molecular biology of prokaryotes and on the practicals learn to perform molecular cloning and analysis of promoter activity.

#### **Predvideni študijski rezultati:**

Po uspešno opravljeni učni enoti bodo študentje sposobni:

- razumeti pomen dveh pomembnih modelnih organizmov molekulske biologije (E. coli in virus lambda),
- razumeti in pojasniti vlogo mutacij, mutageneze, popravljalnih mehanizmov, mobilnih elementov DNA in horizontalnih genskih prenosov,
- razumeti in pojasniti mehanizme genskega uravnavanja,
- razumeti in izvesti molekulsko kloniranje in analizo aktivnosti promotorja.

#### **Intended learning outcomes:**

By the end of this course students will be able to:

- understand the importance of the two important model organisms of molecular biology (E. coli and lambda virus),
- to understand and explain the role of mutations, mutagenesis, repair mechanisms, mobile DNA elements and horizontal gene transfer,
- understand and explain the mechanisms of genetic regulation,
- understand and perform molecular cloning and analysis of promoter activity.

#### **Metode poučevanja in učenja**

Predavanja  
Vaje

#### **Learning and teaching methods:**

Lectures  
Practicals

<b>Načini ocenjevanja:</b>	<b>Delež (v %) / Weight (in %)</b>	<b>Assessment:</b>
Pisni izpit	100%	Written exam

#### **Reference nosilca / Lecturer's references:**

1. RAIMONDI, Stefano, RIGHINI, Lucia, FRANCESCO, Candelieri, MUSMECI, Eliana, BONVICINI, Francesca, GENTILOMI, Giovanna, **STARČIČ ERJAVEC, Marjanca**, AMARETTI, Alberto, ROSSI, Maddalena. Antibiotic resistance, virulence factors, phenotyping, and genotyping of *E. coli* isolated from the feces of healthy subjects. *Microorganisms*, ISSN 2076-2607, 2019, vol. 7, iss. 8, str. 1-18.
2. MASLENNIKOVA, Irina L., KUZNETSOVA, Marina V., TOPLAK, Nataša, NEKRASOVA, Irina V., ŽGUR-BERTOK, Darja, **STARČIČ ERJAVEC, Marjanca**. Estimation of the bacteriocin ColE7 conjugation-based "kill" - "anti-kill" antimicrobial system by real-time PCR, fluorescence staining and bioluminescence assays. *Letters in applied microbiology*, ISSN 0266-8254, 2018, vol. 67, iss. 1, str. 47-53.
3. VADNOV, Maruša, BARBIČ, Damjana, ŽGUR-BERTOK, Darja, **STARČIČ ERJAVEC, Marjanca**. *Escherichia coli* isolated from feces of brown bears (*Ursus arctos*) have a lower prevalence of human extraintestinal pathogenic *E. coli* virulence-associated genes. *Canadian journal of veterinary research* = : *Revue canadienne de recherche*

vétérinaire, ISSN 0830-9000, 2017, vol. 81, no. 1, str. 59-63.

4. **STARČIČ ERJAVEC, Marjanca**, PETKOVŠEK, Živa, KUZNETSOVA, Marina V., MASLENNIKOVA, Irina L., ŽGUR-BERTOK, Darja. Strain ŽP - the first bacterial conjugation-based "kill" - "anti-kill" antimicrobial system. *Plasmid*, ISSN 0147-619X, 2015, vol. 82, str. 28-34.
5. **STARČIČ ERJAVEC, Marjanca**, ŽGUR-BERTOK, Darja. Virulence potential for extraintestinal infections among commensal *Escherichia coli* isolated from healthy humans - the Trojan horse within our gut. *FEMS microbiology letters*, ISSN 0378-1097. [Print ed.], 2015, vol. 362, iss. 5, str. 1-9,