MIKROBIOLOGIJA – TEORETIČNI PREDMETI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Odpornost proti protimikrobnim učinkovinam v okolju
Course title:	Resistance to antimicrobial agents in the environment

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni

Univerzitetna koda predmeta/University course code:	0640309

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	10	10	0	10	85	5

Nosilec predmeta/Lecturer:	Karmen Godič Torkar
Izvajalci predavanj:	Jerneja Ambrožič Avguštin, Karmen Godič Torkar, Anja Klančnik, Polonca Trebše
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	teoretični /theoretical
Jeziki/Languages:	Predavanja/Lectures: Angleščina, Slovenščina
	Vaje/Tutorial: Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Diplomanti enovitih magistrskih študijskih programov in študijskih programov 2. stopnje s področja biomedicinskih, biotehniških in naravoslovno matematičnih usmeritev.	Graduates of unified master's degree programs and 2nd degree programs of biomedical, biotechnical and natural sciences.

Vsebina:	**Content (Syllabus outline):**
1. Pregled spojin, za katere je znano, da vzpodbudijo razvoj odpornosti mikroorganizmov: a. štirje podrazredi: antibiotiki, antimikotiki, protivirusna zdravila in antiparazitiki; b. substance za vzpodbujanje rasti v živinoreji; c. biocidi (npr. razkužila in površinsko aktivne snovi, konzervansi), d. spojine naravnega izvora (npr. iz rastlin), e. ksenobiotične snovi (npr. topila, kot so oktanol, heksan in toluen); f. težke kovine 2. Intrinzični in pridobljeni mehanizmi protimikrobne odpornosti, vertikalni in horizontalni prenosi genov	1. The overview of chemicals, which are known to stimulate the resistance development a. four subclasses:antibiotics, antifungals, antivirals, and antiparasitics; b. growth promoting substances in food animal production; c. biocides (i.e., disinfectants and surfactants, preservatives, aditives), d. natural chemicals (e.g., plant-derived), e. xenobiotic substances (e.g., solvents such as octanol, hexane and toluene), f. heavy metals;

3. Skupne značilnosti, hkratni ali navzkrižni prenos in povezave med odpornostjo proti različnim snovem in postopkom. 4. Načini širjenja protimikrobnih sredstev in odpornih mikroorganizmov v okolju: 1. vodna okolja, površinske vode, podtalnice, 2. odpadne vode iz zdravstvenih in farmacevtskih ustanov; 3. komunalne in industrijske odpadne vode 4. izplake gnojevke iz živinoreje v okolje in njihova uporaba v poljedelstvu 5. uporaba aktivnega blata iz čistilnih naprav kot gnojilo; 6. ribogojstvo; 7. aerosoli; 8. rastlinska biomasa; 9. živali za proizvodnjo hrane; 10. prst, sediment in kompostiranje 5. Protimikrobne snovi v okolju: fizikalno-kemijske lastnosti (pH, topnost, hidrofobnost, Henrijev koeficient itd.), stabilnost in spremembe v okolju ter delovanje in aktivnost razgradnih produktov. 6. Vpliv ostankov protimikrobnih snovi na organizme v okolju, vključno s človekom in ocena tveganja (akutni in/ali dolgoročni, kronični strupeni učinki na človeka in okolje, skrb vzbujajoče PBT in vPvB snovi) 7. Intrinzična odpornost okoljskih nepatogenih mikroorganizmov proti protimikrobnim snovem v okolju, brez vpliva človeka. Možnosti horizontalnega prenosa genov za odpornost na potencialne humane patogene in obratno. 8. Prenos večkratno odpornih mikroorganizmov v javnih nezdravstvenih ustanovah (npr. socialno varstvene ustanove, šole, vrtci) ter v domačem okolju in njihov vpliv na okužbe, povezane z zdravstvom. 9. Uporaba protimikrobih snovi v živilstvu in njihov vpliv na odpornost patogenih mikroorganizmov, ki se prenašajo alimentarno in kot zoonoze. 10. Pregled metod za ugotavljanje delovanja protimikrobnih snovi in odpornih mikroorganizmov ter iskanje njihovih tarč ali mehanizmov prilagoditve/odpornosti. 11. Celostni nadzor nad uporabo protimikrobnih snovi in drugih biocidov ter pojavom genov za odpornost v humani in veterinarski medicini, v živinoreji, v živilstvu in okolju	2. Intrinsic and acquired mechanisms of antimicrobial resistance, vertical and horizontal genes transmissions 3. The common characteristics, simultaneous or cross-transmission and bound resistance to various substances and procedures. 4. The ways of spreading the antimicrobial agents and resistant microorganisms in the environment: 1. aquatic environments, surface water and groundwater, 2. wastewater from healthcare and pharmaceutical facilities, 3. municipal, industrial wastewater 4. animal manure and sewage effluents from farms and its use in agriculture 5. activated sludge from sewage treatment plants used as fertilizer in agriculture; 6. aquaculture; 7. aerosols; 8. plant biomass; plant influent and effluent; 9. animals for food production; 10. soil, sediment and composting process. 5. Antimicrobial substances in the environment: physicochemical properties (pH, solubility, hydrophobicity, Henry's coefficient, etc.), stability and changes in the environment and function and activity of degradation products. 6. Impact of antimicrobial residues on organisms in the environment, including humans, and its risk assessment (acute and /or long-term, chronic toxic effects on humans and the environment, PBT and vPvB substances of concern) 7. Intrinsic resistance of environmental non - pathogenic microorganisms to antimicrobial substances in the environment, without human influence. Possibilities of horizontal gene transfer for resistance to potential human pathogens and vice versa. 8. Transfer of multiple resistant microorganisms in community and public non-health institutions (e.g., social welfare institutions, schools, child care facilities) and their impact on nosocomial infections. 9. Use of antimicrobial substances in foodstuffs and their impact on the resistance of pathogenic microorganisms that are transmitted allimentarily and as zoonoses. 10. The overview of the methods for the detection of antimicrobials and resistant micro-organisms, serch of their targets and mechanisms of adaptation/resistance 11. Integrated control of the use of antimicrobials, other biocides, procedures and the resistance genes spreading as well in human and veterinary medicine, livestock, food production and in the environment.

Temeljna literatura in viri/Readings:

Patricia L. Keen, Mark H. M. M. Montforts. Antimicrobial Resistance in the Environment. Wiley, p: 632, ISBN: 978-0-470-90542-5

Antimicrobial resistance and food safety : methods and techniques. Editors Chin-Yi Chen, Xianghe Yan, Charlene R. Jackson. Amsterdam [etc.] : Elsevier/AP, cop. 2015, p. 438.
Hardcover ISBN: 9780128012147; eBook ISBN: 9780128013373.
Carlos F. Amabile-Cuevas Antibiotics and Antibiotic Resistance in the Environment, 2020 CRC Press, p. 136 ISBN 9780367575175
Antibiotic Resistance in the Environment. A Worldwide Overview. Editors: Manaia, C.M., Donner, E., Vaz-Moreira, I., Hong, P. 2020, Springer Nature Switzerland AG ISBN 978-3-030-55065-3.
The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2017/2018. ECDC EJ EFSA Journal, Approved: 31 January 2020. doi: 10.2903/j.efsa.2020.6007. dostopno na: https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2020.6007 <4. 2. 2021>.
Revijalni članki s področja, tekoča periodika in druga učna gradiva // actual scientific papers in the field, current periodicals, other teaching materials.

Cilji in kompetence:	**Objectives and competences:**
Študent: - pozna zakonitosti in mehanizme odpornosti proti protimikrobnim sredstvom; - je usposobljen za pravilno izbiro ter uporabo različnih metod za spremljanje, vrednotenje in kritično presojanje pojava večkratno odpornih mikroorganizmov v kliničnih in nekliničnih okoljih; - je usposobljen za analizo tveganj širjenja odpornih mikroorganizmov, genov za odpornost in zaviralnih snovi v institucijah z različno dejavnostjo: na področju zdravstva, socialnega varstva, farmacevtske proizvodnje, živilstva, ekologije in trajnostnega razvoja; - zna ustrezno ravnati in pravilno obravnavati protimikrobne snovi, razkužila, biocide, substance s težkimi kovinami, snovi, ki spremenijo površinsko napetost, zlasti z vidika njihove vloge pri onesnaževanju okolja; - zna predvideti možne neželene vplive nekontrolirane uporabe protimikrobnih snovi, biocidov za okolje in zdravje;	The student is: - familiar with the legalities and mechanisms of resistance to antimicrobial agents; - qualified for the proper selection and use of various methods for monitoring, evaluation and critical assessment of the appearance of multiple resistant microorganisms in clinical and non-clinical environments; - qualified to analyze the risks of spreading resistant microorganisms, resistance genes and inhibition residues in institutions with different activities: in the fields of health, social care, pharmaceutical production, food production, ecology and sustainable development; - He can handle and properly deal with antimicrobials, disinfectants, biocides, heavy metal substances, surfactants especially in terms of their role in polluting the environment; - can predict possible adverse effects of uncontrolled use of antimicrobials, biocides for the environment and human health;

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje Razumevanje vpliva človeka na ekosistem in kompleksnih soodvisnosti ter zakonitosti procesov v okolju (zrak, tla in voda) s stališča širjenja onesnažil in genov za odpornosti. Uporaba Sinteza medicinskih, sanitarnih, inženirskih in zdravstvenih principov in tehnik skupaj z znanjem naravoslovja ter trajnostnega razvoja za reševanje specifičnih problemov. Pridobljena znanja in uporabljene pristope je študent sposoben uporabiti pri samostojnem razvojnem in raziskovalnem delu Refleksija Študent je sposoben samostojno definirati problem, načrtovati vsebino raziskovalnega dela, predvideti metode dela ter postaviti raziskovalne cilje. Prenosljive spretnosti Sinteza teoretičnega znanja različnih bazičnih področij znanosti pri reševanju praktičnih problemov iz prakse. Prenosljive spretnosti	Knowledge and Comprehension Understanding the human impact to the environment as well as the complex relationships between processes in the environment (air, soil and water) from the view of spreading pollutants and genes for resistance. Application Synthesis of medical, sanitary, engineering and health principles and techniques together with knowledge on fundamental environmental principles and sustainable development to solve particular problems. The student will be able to use the acquired knowledge and used approaches for independent research and development in this field of Analysis Student is able to define problems, propose the content of a research project, suggest research methods and state its goals Skill-transference Ability The synthesis of theoretical knowledge from different fields of basic science in solving problems from practice.

Študent je sposoben kritično analizirati in povezovati literaturne podatke, sintetizirati različna znanja, zagovarjati rezultate ter sodelovati v diskusiji.	

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, diskusijske delavnice predstavljenih seminarjev, demonstracija in laboratorijske vaje.	Lectures, discussion workshops of the presented seminars.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ustni in/ali pisni izpit;	50,00 %	Written or oral examination;
Priprava in zagovor seminarja;	20,00 %	Preparation of the short project
Vsebinska priprava manjšega projekta	30,00 %	Written seminar and its presentation;

Reference nosilca/Lecturer's references:

KARMEN GODIČ TORKAR:

ŠUNTA, Urška, ŽITNIK, Miha, CONCETTA FINOCCHIARO, Noemi, GRIESSLER BULC, Tjaša, **GODIČ TORKAR, Karmen**. Faecal indicator bacteria and antibiotic-resistant ß-lactamase producing Escherichia coli in blackwater : a pilot study. *Arhiv za higijenu rada i toksikologiju*. [Print ed.]. 2019, vol. 70, no. 2, str. 140-148, graf. prikazi. ISSN 0004-1254

GODIČ TORKAR, Karmen, BEDENIĆ, Branka. Antimicrobial susceptibility and characterization of metallo-ß-lactamases, extended-spectrum ß-lactamases, and carbapenemases of Bacillus cereus isolates. Microbial pathogenesis, ISSN 0882-4010, maj 2018, vol. 118, str. 140-145, doi: 10.1016/j.micpath.2018.03.026.

GODIČ TORKAR, Karmen, IVIĆ, Sanja. Surveillance of bacterial colonisation on contact surfaces in different medical wards. Arhiv za higijenu rada i toksikologiju. [Print ed.]. 2017, vol. 68, no. 2, str. 116-126, graf. prikazi. ISSN 0004-1254. http://hrcak.srce.hr/183263, DOI: 10.1515/aiht-2017-68-2892.

GODIČ TORKAR, Karmen, DRAŽETIČ, Mirjana. The microbial contamination and the presence of ß-lactamase producing Gram-negative bacteria in the water and on the surfaces of public recreation water facilities. *International journal of environmental health research*, ISSN 0960-3123, 2017, vol. 27, no. 4, str. 293-305,

GODIČ TORKAR, Karmen, BEDENIĆ, Branka, PLEČKO, Vanda. Antimicrobial susceptibility and the in vitro postantibiotic effects of vancomycin and ciprofloxacin against *Bacillus cereus* isolates. *Journal of chemotherapy*, ISSN 1120-009X, 2016, vol. 28, iss. 3, str. 151-158.

BEDENIĆ, Branka, BEADER, Nataša, **GODIČ TORKAR, Karmen**, PRAHIN, Esmina, MIHALJEVIĆ, Ljiljana, ĆAĆIĆ, Marko, VRANEŠ, Jasmina. Postantibiotic effect of colistin alone and combined with vancomycin or meropenem against *Acinetobacter* spp. with well defined resistance mechanisms. *Journal of chemotherapy*, ISSN 1120-009X, 2016, vol. 28, iss. 5, str. 375-382.

JERNEJA AMBROŽIČ AVGUŠTIN:

SKOK, Sara, KOGOVŠEK, Blaž, TOMAZIN, Rok, ŠTURM, Samo (avtor, fotograf), **AMBROŽIČ, Jerneja**, MULEC, Janez (avtor, fotograf). Antimicrobial resistant Escherichia coli from karst waters, surfaces and bat guano in Slovenian caves *Acta carsologica*, letn. 49, št. 2/3, str. 265-279.

MOGROVEJO, Diana C., PERINI, Laura, GOSTINČAR, Cene, SEPČIĆ, Kristina, TURK, Martina, **AMBROŽIČ, Jerneja**, BRILL, Florian H. H., GUNDE-CIMERMAN, Nina. Prevalence of antimicrobial resistance and hemolytic phenotypes in culturable Arctic bacteria. *Frontiers in microbiology*, 3 Apr. 2020, vol. 3, article 570, str. 1-13.

ZUPANČIČ, Jerneja, TURK, Martina, ČRNIGOJ, Miha, **AMBROŽIČ, Jerneja**, GUNDE-CIMERMAN, Nina. The dishwasher rubber seal acts as a reservoir of bacteria in the home environment. *BMC microbiology*, 2019, vol. 19, no. 300, str. 1-15.

AMBROŽIČ, Jerneja, PETRIČ, Patricia, PAŠIĆ, Lejla. Screening the cultivable cave microbial mats for the production of antimicrobial compounds and antibiotic resistance. *International journal of speleology*, 2019, vol. 48, no. 3, str. 295-303.

ZORMAN-ROJS, Olga, ZDOVC, Irena, DOVČ, Alenka, ŽGAJNAR, Jaka, SLAVEC, Brigita, KRAPEŽ, Uroš, **AMBROŽIČ, Jerneja**. Presence and distribution of extended-spectrum and AmpC beta-lactamases-producing Escherichia coli on poultry farms in Slovenia. *The Journal of Applied Poultry Research*, ISSN 1056-6171, 2019, vol. 28, no. 1, str. 200-209.

KRIŽMAN, Manja, **AMBROŽIČ, Jerneja**, ZDOVC, Irena, GOLOB, Majda, TRKOV, Marija, JAMNIKAR CIGLENEČKI, Urška, BIASIZZO, Majda, KIRBIŠ, Andrej. Antimicrobial resistance and molecular characterization of extended-spectrum B-lactamases and other Escherichia coli isolated from food of animal origin and human intestinal isolates. *Journal of food protection*, 2017, vol. 80, no. 1, str. 113-120.

TREBŠE POLONCA:
BABIĆ, Sanja, ČIŽMEK, Lara, MARŠAVELSKI, Aleksandra, MALEV, Olga, PFLIEGER, Maryline, STRUNJAK-PEROVIĆ, Ivančica, TOPIĆ POPOVIĆ, Natalija, ČOŽ-RAKOVAC, Rozelindra, **TREBŠE, Polonca**. Utilization of the zebrafish model to unravel the harmful effects of biomass burning during Amazonian wildfires. *Scientific reports*, ISSN 2045-2322, 2021, vol. 11, str. 1-12.
TARTARO BUJAK, Ivana, BAVCON KRALJ, Mojca, KOSYAKOV, Dmitry, UL'YANOVSKII, Nikolai, LEBEDEV, Albert T., **TREBŠE, Polonca**. Photolytic and photocatalytic degradation of doxazosin in aqueous solution. *Science of the total environment*. 2020, 740, 140131-1-1401316-8, ISSN 0048-9697.
LEBEDEV, Albert T., BAVCON KRALJ, Mojca, POLYAKOVA, Olga V., DETENCHUK, Elena Andreevna, POKRYSHKIN, Sergey Alexandrovich, **TREBŠE, Polonca**. Identification of avobenzone by-products formed by various disinfectants in different types of swimming pool waters. *Environment international*. [Print ed.]. 2020, vol. 137, str. 105495-1-105495-8, ilustr. ISSN 0160-4120.
BAVCON KRALJ, Mojca, FORTUNA, Anja, ABRAM, Anže, **TREBŠE, Polonca**. Dish handwashing : an overlooked source of contamination. *Environmental chemistry letters*, ISSN 1610-3653, 2019, [v tisku], ilustr. https://link.springer.com/article/10.1007/s10311-019-00918-5,
BAVCON KRALJ, Mojca, FORTUNA, Anja, ABRAM, Anže, **TREBŠE, Polonca**. Dish handwashing : an overlooked source of contamination. *Environmental chemistry letters*, ISSN 1610-3653, 2019, [v tisku], ilustr. https://link.springer.com/article/10.1007/s10311-019-00918-5, doi: 10.1007/s10311-019-00918-5.
ŽABAR, Romina, SARAKHA, Mohamed, LEBEDEV, Albert T., POLYAKOVA, Olga V., **TREBŠE, Polonca.** Photochemical fate and photocatalysis of 3,5, 6-trichloro-2-pyridinol, degradation product of chlorpyrifos. Chemosphere, ISSN 0045-6535. [Print ed.], 2016, vol. 144, str., graf. prikazi, doi: 10.1016/j.chemosphere.2015.09.030

ANJA KLANČNIK:
KLANČNIK, Anja, ŠIMUNOVIĆ, Katarina, KOVAČ, Jasna, SAHIN, Orhan, WU, Zuowei, VUČKOVIĆ, Darinka, ABRAM, Maja, ZHANG, Qijing, SMOLE MOŽINA, Sonja. The anti-Campylobacter activity and mechanisms of pinocembrin action. *Microorganisms*, ISSN 2076-2607, 2019, vol. 7, iss. 12, str. 1-15, ilustr. https://doi.org/10.3390/microorganisms7120675, doi: 10.3390/microorganisms7120675.
ŠIMUNOVIĆ, Katarina, SAHIN, Orhan, KOVAČ, Jasna, SHEN, Zhangqi, **KLANČNIK, Anja**, ZHANG, Qijing, SMOLE MOŽINA, Sonja. (-)-[alpha]-Pinene reduces quorum sensing and Campylobacter jejuni colonization in broiler chickens. *PloS one*, ISSN 1932-6203, 2020, vol. 15, iss. 4, str. 1-16, e0230423, ilustr., doi: 10.1371/journal.pone.0230423.
KLANČNIK, Anja, ŠIMUNOVIĆ, Katarina, STERNIŠA, Meta, RAMIĆ, Dina, SMOLE MOŽINA, Sonja, BUCAR, Franz. Anti-adhesion activity of phytochemicals to prevent Campylobacter jejuni biofilm formation on abiotic surfaces. *Phytochemistry reviews*, ISSN 1568-7767, 2021, vol. 20, str. 55-84, ilustr., doi: 10.1007/s11101-020-09669-6.
KLANČNIK, Anja, ŠIKIĆ POGAČAR, Maja, TROŠT, Kajetan, TUŠEK-ŽNIDARIČ, Magda, MOZETIČ VODOPIVEC, Branka, SMOLE MOŽINA, Sonja. Anti-Campylobacter activity of resveratrol and an extract from waste Pinot noir grape skins and seeds, and resistance of C. jejuni planktonic and biofilm cells, mediated via the CmeABC efflux pump. *Journal of applied microbiology*. Jan. 2017, vol. 122, iss. 1, str. 65-77, ilustr. ISSN 1364-5072. DOI: 10.1111/jam.13315.
KURINČIČ, Marija, **KLANČNIK, Anja**, SMOLE MOŽINA, Sonja. Epigallocatechin gallate as a modulator of Campylobacter resistance to macrolide antibiotics. *International journal of antimicrobial agents*. [Print ed.]. 2012, vol. 40, issue 5, str. 467-471. ISSN 0924-8579. DOI: 10.1016/j.ijantimicag.2012.07.015.
KLANČNIK, Anja, SMOLE MOŽINA, Sonja, ZHANG, Qijing. Anti-Campylobacter activities and resistance mechanisms of natural phenolic compounds in Campylobacter. *PloS one*. 2012, vol. 7, no. 12, str. 1-10, e51800. ISSN 1932-6203. DOI: 10.1371/journal.pone.0051800

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Mikrobiologija in biotehnologija kvasovk
Course title:	Microbiology and biotechnology of yeasts

Študijski programi in stopnja	**Študijska smer**	**Letnik**	**Semestri**
Bioznanosti, tretja stopnja, doktorski	mikrobiologija		Celoletni

Univerzitetna koda predmeta/University course code: 0566746

Predavanja	**Seminar**	**Vaje**	**Klinične vaje**	**Druge oblike študija**	**Samostojno delo**	**ECTS**
10	25	0	0	0	90	5

Nosilec predmeta/Lecturer:	Neža Čadež

Izvajalci predavanj:	Neža Čadež
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij	General prerequisits to enrol in doctoral study

Vsebina:	**Content (Syllabus outline):**
Zimologija; splošne lastnosti kvasovk; naravni habitati, pregled industrijske uporabe, pomen za bazične raziskave, pomen za zdravje in povzročitelji bolezni; biotska raznovrstnost, klasifikacija, identifikacija, njihova evolucija in adaptacija kvasovk v različnih habitatih z uporabo genomike. Glavne morfološke lastnosti kvasovk in zgradba kvasne celice. Glavne fiziološke lastnosti kvasovk, esencialni elementi za rast, sprejem nutrientov, sestava substratov za kultivacijo kvasov. Načini vegetativne rasti kvasovk, celični cikel kvasovk in molekularni dejavniki celičnega cikla, načini spolne reprodukcije kvasovk. Rast populacije kvasovk, primerjava kolonijske rasti in rasti v tekočem mediju, strategije kultivacije in ohranjanja kvasovk, fizikalno-kemijski pogoji za rast kvasovk, stresi okolja, smrt kvasovk, interakcije z drugimi organizmi. Metabolizem in njegova regulacija, primarni in sekundarni metaboliti, zimocidnost.	Zymology; general characteristics of yeasts, natural habitats, review of industrial applications, importance for basic research, clinical importance; biotic diversity, classification, evolution and adaptation of yeasts on different habitats by using genomics. Yeasts morphological characteristics and structure of yeast cell. Physiological characteristics, essential elements for their growth, nutrient transport and composition of media for their cultivation. Modes of vegetative growth, cell cycle and its molecular mechanisms, modes of yeasts sexual reproduction. Yeast population growth, difference between growth on solid and in liquid media, modes of cultivation, preservation, physical-chemical conditions for growth, stress factors, cell death, interactions with other organisms. Metabolism, their regulation, primary and secondary metabolites, killer activity. Technological importance in modern biotechnology, recombinant yeast technology, alternative approaches

Tehnološki pomen v sodobni biotehnologiji, rekombinantne tehnologije kvasovk, pregled alternativnih pristopov pridobivanja novih nekonvencionalnih kvasovk za industrijsko uporabo, pomen kvasovk pri proizvodnji hrane in pijače, proizvodnja biomase, proizvodnja bio-etanola, proizvodnja ekstracelularnih polisaharidov, proizvodnja encimov.	for industrial use of non-conventional yeasts, yeast importance for food and beverage production, biomass production, bio-ethanol production, extracellular polysaccharides and enzyme production.

Temeljna literatura in viri/Readings:

Feldmann, H. 2012. Yeast: Molecular and Cell Biology, 2nd Edition, Wiley, 464 str.
Bokulich, N.A., Bamforth, C.W. 2017. Brewing Microbiology: Current Research, Omics and Microbial Ecology. Caister Academic Press, 338 str.
Buzzini, P., Lachance, M.A., Yurkov, A. Yeasts in Natural Ecosystems: Ecology/Diversity, Springer, 293/499 str. ter revijalni članki s področja.

Cilji in kompetence:	**Objectives and competences:**
Temeljni izobraževalni cilj je celovito zanje in razumevanje mikrobiologije in biotehnologije kvasovk, kar je osnova za samostojno raziskovalno delo. Koncept predmeta procesno združuje komplementarna znanja iz področij mikrobiologije in biotehnologije, s čimer zagotavlja povezovanje sodobnih metodoloških pristopov za izrabo industrijskih mikroorganizmov v tradicionalni in sodobni industriji.	Educational goal is a comprehensive knowledge and understanding of yeasts microbiology and biotechnology as a basis for independent research. The concept of the course combines complementary knowledge in the fields of microbiology and biotechnology and ensures integration of contemporary methodological approaches for manipulation with industrial microorganisms in traditional and modern industry.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predviden študijski rezultat je kandidata usposobiti za izvedbo raziskav, rezultati katerih bodo predstavljali pomembne prispevke temeljni ali aplikativni znanosti na področju mikrobiologije.	Intended learning outcome is to educate a candidate to undertake research, which results will represent important contributions to basics or applied science in the field of microbiology.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in seminarji.	Lectures and seminars

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ustni izpit	70,00 %	Oral exam
Seminarska naloga	30,00 %	Seminar work

Reference nosilca/Lecturer's references:

1. KOSEL, Janez, RASPOR, Peter, ČADEŽ, Neža. Maximum residue limit of fungicides inhibits the viability and growth of desirable non-Saccharomyces wine yeasts. *Australian journal of grape and wine research*. 2019, vol. 25, iss. 1, str. 43-52.
2. PONTES, Ana, ČADEŽ, Neža, GONÇALVES, Paula, SAMPAIO, José Paulo. A quasi-domesticate relic hybrid population of Saccharomyces cerevisiae x S. paradoxus adapted to olive brine. *Frontiers in genetics*. May 2019, vol. 10, article 449, str. 1-14.
3. STEENWYK, Jacob L., OPULENTE, Dana A., KOMINEK, Jacek, SHEN, Xing-Xing, ZHOU, Xiaofan, LABELLA, Abigail L., BRADLEY, Noah P., EICHMAN, Brandt F., ČADEŽ, Neža, LIBKIND, Diego, DEVIRGILIO, Jeremy, HULFACHOR, Amanda Beth, KURTZMAN, C. P., HITTINGER, Chris Todd, ROKAS, Antonis. Extensive loss of cell-cycle and DNA repair genes in an ancient lineage of bipolar budding yeasts. *PLoS biology*. [Online ed.]. 2019, vol. 17, iss. 5, str. 1-38.
4. ČADEŽ, Neža, BELLORA, Nicolas, ULLOA, Ricardo, HITTINGER, Chris Todd, LIBKIND, Diego. Genomic content of a novel yeast species Hanseniaspora gamundiae sp. nov. from fungal stromata (Cyttaria) associated with a unique fermented beverage in Andean Patagonia, Argentina. *PloS one*. 2019, vol. 14, iss. 1, str. 1-19.

5. SHEN, Xing-Xing, OPULENTE, Dana A., … ČADEŽ, Neža, LIBKIND, Diego, ROSA, Carlos, DEVIRGILIO, Jeremy, HULFACHOR, Amanda Beth, GROENEWALD, Marizeth, KURTZMAN, C. P., HITTINGER, Chris Todd, ROKAS, Antonis. Tempo and mode of genome evolution in the budding yeast subphylum. *Cell*. 2018, vol. 175, iss. 6, str. 1533-1545.
6. KOSEL, Janez, ČADEŽ, Neža, SCHULLER, Dorit, CARRETO, Laura, DUARTE, Ricardo Franco-, RASPOR, Peter. The influence of Dekkera bruxellensis on the transcriptome of Saccharomyces cerevisiae and on the aromatic profile of synthetic wine must. FEMS Yeast Research. [Online ed.]. 2017, vol. 17, iss. 4, f. 1-11,

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Dinamika mikrobnih genomov
Course title:	Dynamics of microbial genomes

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Bioznanosti, tretja stopnja, doktorski	mikrobiologija		Celoletni

Univerzitetna koda predmeta/University course code: 0566747

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	20	0	0	0	95	5

Nosilec predmeta/Lecturer:	Marjanca Starčič Erjavec
Izvajalci predavanj:	Marjanca Starčič Erjavec, Darja Žgur Bertok
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	teoretični /theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General criteria for enrollment in PhDstudies

Vsebina:	Content (Syllabus outline):
Dinamika mikrobnih genomov z različnimi prerazporeditvami in horizontalnimi prenosi DNA ter evolucija novih patogenov. • Mutageneza, rekombinacija in horizontalni prenosi DNA. • Struktura genomov, stalni in pogrešljivi del genomov, pangenom. • Genomski otoki, otoki patogenosti, metagenomski otoki. • Mobilni genetski elementi in mehanizmi horizontalnih prenosov DNA (transpozoni, plazmidi, integrativni konjugativni elementi, virusi). • Obrambapredtujo DNA.	Dynamics of microbial genomes including DNA rearrangements along with horizontal DNA transfer and evolution of novel pathogens. • Mutagenesis, recombination and horizontal DNA transfer. • Genome structure, core and dispensible genome, pangenome. • Genomic islands, pathogenicity islands, metagenomic islands. • Mobile genetic elements and mechanisms of in horizontal DNA transfer (transposons, plasmids integrative conjugative elements, viruses). • Defense mechanisms protecting against foreign DNA.

Temeljna literatura in viri/Readings:

-Madigan MT, Martinko JM, Bender KS, Buckley DH, Stahl D. 2015. BrockBiologyofMicroorganisms. 14th ed., Pearson.

-Snyder L, Peters JE, Henkin TM, Champness W. 2013. MolecularGeneticsofBacteria. 4th ed., ASM.
- Watson JD, Baker TA, Bell SP, Gann A, Levine M, Losick R. 2014. MolecularBiologyofthe Gene. 7th ed., PearsonColdSpringHarborLaboratoryPress.
Revijalni članki s področja in druga učna gradiva bodo dostopna preko spletne učilnice./Journalarticlesandotherotherteachingmaterialswillbeavailable in theonlineclassroom.

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je povezati razumevanje strukture genomov in genetskih elementov z mehanizmi, ki omogočajo dinamiko mikrobnega genoma ter dejavniki okolja, ki vplivajo na to dinamiko. Vsebine predmeta so nadgradnja celično-bioloških, biokemijskih in genetskih predmetov na 1. in 2. stopnji. Pridobljena znanja dajejo študentom osnovo za poglobljeno razumevanje dinamike mikrobnih genomov, potrebno za njegovo doktorsko disertacijo.	The goal of the course is for students to understand the connection of the structure of genomes and genetic elements with the mechanism that conduct the dynamics of the microbial genomes and environmental factors that affect the dynamics of genomes. The course content is an upgrading of first and second level courses dealing with cell biology, biochemistry and genetics. The obtained knowledge will provide the student an in depth understanding of the dynamcis of microbial genomes that is required for his/her PhD thesis.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent bo pridobil znanje in razumevanje o strukturi genomov, genetskih elementih in mehanizmih horizontalnega genskega prenosa, njihovi uravnavi ter dejavnikih okolja, ki vplivajo na dinamiko mikrobnih genomov	Knowledge and understanding: Students will acquire the knowledge and understanding of genome structure, genetic elements and mechnism of horizontal gene transfer, the regulation and the environmental factors that shape the dynamics of microbial genomes.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Pouk je organiziran s predavanji, konzultacijami; seminarsko delo.	Lectures, consultations, seminar.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
izpit	50,00 %	exam
seminar	50,00 %	seminar

Reference nosilca/Lecturer's references:

prof. dr. Marjanca Starčič Erjavec

1. RAIMONDI, Stefano, RIGHINI, Lucia, FRANCESCO, Candeliere, MUSMECI, Eliana, BONVICINI, Francesca, GENTILOMI, Giovanna, **STARČIČ ERJAVEC, Marjanca**, AMARETTI, Alberto, ROSSI, Maddalena. Antibioticresistance, virulence factors, phenotyping, andgenotypingof E. coli isolatedfromthefecesofhealthysubjects. *Microorganisms*, ISSN 2076-2607, 2019, vol. 7, iss. 8, str. 1-18, ilustr. https://doi.org/10.3390/microorganisms7080251, doi: 10.3390/microorganisms7080251. [COBISS.SI-ID 5151311].
2. MASLENNIKOVA, Irina L., KUZNETSOVA, Marina V., TOPLAK, Nataša, NEKRASOVA, Irina V., ŽGUR-BERTOK, Darja, **STARČIČ ERJAVEC, Marjanca**. Estimationofthe bacteriocin ColE7 conjugation-based ˝kill˝ - ˝anti-kill˝ antimicrobial systemby real-time PCR, fluorescence stainingandbioluminescenceassays. *Letters in appliedmicrobiology*, ISSN 0266-8254, 2018, vol. 67, iss. 1, str. 47-53, ilustr. https://doi.org/10.1111/lam.12884, doi: 10.1111/lam.12884. [COBISS.SI-ID 4688463].
3. VADNOV, Maruša, BARBIČ, Damjana, ŽGUR-BERTOK, Darja, **STARČIČ ERJAVEC, Marjanca**. Escherichia coli isolatedfromfecesofbrownbears (Ursusarctos) have a lowerprevalenceof human extraintestinal pathogenic E. coli virulence-associatedgenes. *Canadianjournalofveterinaryresearch = : Revuecanadienne de recherchevétérinaire*, ISSN 0830-9000, 2017, vol. 81, no. 1, str. 59-63. [COBISS.SI-ID 4164431].
4. **STARČIČ ERJAVEC, Marjanca**, PETKOVŠEK, Živa, KUZNETSOVA, Marina V., MASLENNIKOVA, Irina L., ŽGUR-BERTOK, Darja. Strain ŽP - thefirstbacterialconjugation-based ˝kill˝ - ˝anti-kill˝ antimicrobial system. *Plasmid*, ISSN 0147-619X, 2015, vol. 82, str. 28-34, doi: 10.1016/j.plasmid.2015.10.001.

5. **STARČIČ ERJAVEC, Marjanca**, ŽGUR-BERTOK, Darja. Virulence potentialfor extraintestinal infectionsamongcommensal Escherichia coli isolatedfromhealthyhumans - the Trojan horsewithinourgut. *FEMS microbiologyletters*, ISSN 0378-1097. [Printed.], 2015, vol. 362, iss. 5, str. 1-9, doi: 10.1093/femsle/fnu061. [COBISS.SI-ID 3326031].
6. PAŠIĆ, Lejla, AMBROŽIČ, Jerneja, **STARČIČ ERJAVEC, Marjanca**, HERZOG-VELIKONJA, Blagajana, PODLESEK, Zdravko, ŽGUR-BERTOK, Darja. Twotalesofprokaryoticgenomicdiversity : Escherichia coli andhalophiles. *Foodtechnologyandbiotechnology : journaloftheFacultyofFoodTechnologyandBiotechnologyUniversityof Zagreb*, ISSN 1330-9862, 2014, vol. 52, no. 2, str. 158-169. [COBISS.SI-ID 3178575].

prof. dr. Darja Žgur-Bertok

1. MOLAN, Katja, PODLESEK, Zdravko, HODNIK, Vesna, BUTALA, Matej, OSWALD, Eric, **ŽGUR-BERTOK, Darja**. The Escherichia coli colibactin resistance protein ClbS is a novel DNA binding protein that protects DNA from nucleolytic degradation. *DNA Repair*, ISSN 1568-7856. [Online ed.], 2019, vol. 79, str. 50-54. https://www.sciencedirect.com/science/article/pii/S1568786418303021?via%3Dihub, doi: 10.1016/j.dnarep.2019.05.003. [COBISS.SI-ID 5079119],
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, ilustr. https://doi.org/10.1111/lam.12884, doi: 10.1111/lam.12884. [COBISS.SI-ID 4688463],
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. [COBISS.SI-ID 4164431],
4. **.**PODLESEK, Zdravko, BUTALA, Matej, ŠAKANOVIĆ, Aleksandra**, ŽGUR-BERTOK, Darja**. Antibiotic induced bacterial lysis provides a reservoir of persisters. *Antonie van Leeuwenhoek : International journal of general and molecular microbiology*, ISSN 0003-6072, 2016, vol. 109, iss. 4, 523-528. http://dx.doi.org/10.1007/s10482-016-0657-x, doi: 10.1007/s10482-016-0657-x. [COBISS.SI-ID 3751503],
5. **ŽGUR-BERTOK, Darja**. The SOS response modulates bacterial pathogenesis. V: BRUIJN, Frans J. de (ur.). *Stress and environmental regulation of gene expression and adaptation in bacteria*. Hoboken: J. Wiley & Sons. cop. 2016, str. 553-560. [COBISS.SI-ID 4121167],
6. KAMENŠEK, Simona, BROWNING, Douglas F., PODLESEK, Zdravko, BUSBY, Steve J. W., **ŽGUR-BERTOK, Darja**, BUTALA, Matej. Silencing of DNase colicin E8 gene expression by a complex nucleoprotein assembly ensures timely colicin induction. *PLOS genetics*, ISSN 1553-7390. [Print ed.], 2015, vol. 11, no. 6, str. 1-16, ilustr., doi: 10.1371/journal.pgen.1005354. [COBISS.SI-ID 3511887],

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Mikrobiologija hrane
Course title:	Microbiology of food

Študijski programi in stopnja	**Študijska smer**	**Letnik**	**Semestri**
Bioznanosti, tretja stopnja, doktorski	mikrobiologija		Celoletni

Univerzitetna koda predmeta/University course code:	0594918

Predavanja	**Seminar**	**Vaje**	**Klinične vaje**	**Druge oblike študija**	**Samostojno delo**	**ECTS**
10	20			10	85	5

Nosilec predmeta/Lecturer:	Sonja Smole Možina

Izvajalci predavanj:	Maja Rupnik, Sonja Smole Možina
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij.	General conditions for enrolment in doctoral studies.

Vsebina:	**Content (Syllabus outline):**
Glavni vsebinski sklopi predmeta so naslednji: - izbrana poglavja iz mikrobne ekologije hrane in živilskih procesov oz. konzerviranja hrane - aktualni epidemiološki podatki o prenosu mikrobnih povzročiteljev okužb vzdolž proizvodno-oskrbovalne prehranske verige (nacionalni, EU-EFSA/ECDC, Med-Vet-Net, PulseNet, in druge podatkovne baze, specifične za posamezne patogene) - novi mikroorganizmi prenosljivi s hrano oz. vzdolž proizvodno-oskrbovalno prehranske verige in njihovo obvladovanje - alimentarne intoksikacije z bakterijskimi in glivnimi (miko)toksini - novejše metode za zagotavljanje sledljivosti mikroorganizmov in/ali njihovih toksinov v hrani. - rezistenca na protimikrobna sredstva pri patogenih mikroorganizmih, povzročiteljih kvarjenja ali indikatorskih mikroorganizmih v primarni in sekundarni proizvodnji hrane.	The main points in the contents of the subject are as follows: - selected topics from microbial ecology of foods, food processing and food preservation, - current epidemiological data (national, EU-EFSA/ECDC, Med-Vet-Net, PulseNet and others, specific for some foodborne pathogens), - emerging microorganisms: viruses, bacteria and eucaryotic causative agents (fungi, protozoa) along food production-food supply chain, - alimentary intoxications with bacterial and fungal (myco)toxins, - new methods for ensuring traceability of microorganisms, - resistance to antimicrobial agents of food-related pathogenic microorganisms, food spoilage or indicator microorganisms.

Temeljna literatura in viri/Readings:

Microorganisms in Foods (izbrana poglavja). International Commission on Microbiological Specifications for Foods (ICMSF) and Springer, New York, 2011 , 400 str.
Food Microbiology: Fundamentals and Frontiers (4. izd.) Doyle M.P. (ur.), Buchanan R.L. (ur). ASM Press, 2013 (izbrana poglavja).
Quantitative Microbiology in Food Processing: Modeling the Microbial Ecology. de Souza Sant'Ana A.(ur). 2017. (izbrana poglavja).
Rozman, V., Bogovič Matijašić, B., Smole Možina, S. Antimicrobial resistance of common zoonotic bacteria in the food chain : an emerging threat. V: KUMAR, Yashwant (ur.). *Antimicrobial resistance : a global threat*. London: IntechOpen. cop. 2019, str. 13-32.
Drugi pregledni članki s področja in tekoča periodika.

Cilji in kompetence:	**Objectives and competences:**
- Poglobitev znanja slušatelja o živilih kot kompleksnih sistemih, ki so lahko vzrok alimentarnim infekcijam in intoksikacijam; - Razumevanje epidemioloških in ekoloških parametrov ter (bio)kemijskih sprememb živil na praktičnih primerih in na poglobljenem raziskovalnem nivoju; - Uporaba pridobljenega znanja za uspešno preprečevanje neželenih okužb in kvarjenja hrane.	The basic aim is deepening the student's knowledge of foods as complex systems which can cause alimentary infections and intoxications; - Understanding epidemiological and ecological parameters and (bio)chemical changes in foods on practical examples and on research level for successful prevention of undesirable infections and food spoilage.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predviden študijski rezultat je kandidata usposobiti za izvedbo nalog in opravljanje raziskav, katerih rezultati bodo predstavljali pomembne prispevke temeljni ali aplikativni znanosti na področju ekologije in epidemiologije mikroorganizmov hrane.	The intended learning outcome is to qualify the candidate for carrying out the mentioned tasks and performing research, the results of which will make an important contribution to basic and applicative science in the field of ecology and epidemiology of food microorganisms

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, samostojna priprava seminarjev oz. projektov in njihova (javna) predstavitev.	Lectures, seminar and project work of the students in a written form and joined with oral presentation in the group.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ocena seminarskega dela	50,00 %	Assessment of the seminar work
Ocena izpita	50,00 %	Written examination

Reference nosilca/Lecturer's references:

Sonja Smole Možina

FRAS ZEMLJIČ, Lidija, POKLAR ULRIH, Nataša, STERNIŠA, Meta, **SMOLE MOŽINA, Sonja**, PLOHL, Olivija, KRAŠEVAC GLASER, Tjaša, VOLMAJER VALH, Julija. Pullulan-chitosan coatings onto polyethylene foils for the development of active packaging material. *Cellulose chemistry and technology*, ISSN 0576-9787, 2019, vol. 53, no. 1/2, str. 121-132, ilustr. http://www.cellulosechemtechnol.ro/pdf/CCT1-2(2019)/p.121-132.pdf.

SKROZA, Danijela, ŠIMAT, Vida, **SMOLE MOŽINA, Sonja**, KATALINIĆ, Višnja, BOBAN, Nataša, GENERALIĆ MEKINIĆ, Ivana. Interactions of resveratrol with other phenolics and activity against food-borne pathogens. *Food science & nutrition*, ISSN 2048-7177, 2019, vol. 7, str. 2312-2318, ilustr., doi: 10.1002/fsn3.1073.

GENERALIĆ MEKINIĆ, Ivana, LJUBENKOV, Ivica, **SMOLE MOŽINA, Sonja**, ABRAMOVIČ, Helena, ŠIMAT, Vida, KATALINIĆ, Ana, NOVAK, Tina, SKROZA, Danijela. Abiotic factors during a one-year vegetation period affect sage phenolicmetabolites, antioxidants and antimicrobials. *Industrial crops and products*, ISSN 0926-6690, 2019, vol. 141, str. 1-7, [no.] 111741, ilustr., doi: 10.1016/j.indcrop.2019.111741.

KLANČNIK, Anja, ŠIMUNOVIĆ, Katarina, KOVAČ, Jasna, SAHIN, Orhan, WU, Zuowei, VUČKOVIĆ, Darinka, ABRAM, Maja, ZHANG, Qijing, **SMOLE MOŽINA, Sonja**. The anti-Campylobacter activity and mechanisms of pinocembrin

action. *Microorganisms*, ISSN 2076-2607, 2019, vol. 7, iss. 12, str. 1-15, ilustr. https://doi.org/10.3390/microorganisms7120675, doi: 10.3390/microorganisms7120675.
ŠPORIN, Monika, AVBELJ, Martina, KOVAČ, Boris, **SMOLE MOŽINA, Sonja**. Quality characteristics of wheat flour dough and bread containing grape pomace flour. *Food science and technology international*, ISSN 1082-0132, 2018, vol. 24, no. 3, str. 251-263, ilustr., doi: 10.1177/1082013217745398.
STERNIŠA, Meta, DVOŘÁK, Petr, LUNDA, Roman, LINHARTOVÁ, Zuzana, **SMOLE MOŽINA, Sonja**, MRÁZ, Jan. Bleeding of common carp (Cyprinus carpio) improves sensory quality of fillets and slows oxidative and microbiological changes during refrigerated aerobic storage. *Food technology and biotechnology : journal of the Faculty of Food Technology and Biotechnology University of Zagreb*, ISSN 1330-9862, 2018, vol. 56, no. 4, str. 524-532, ilustr., doi: 10.17113/ftb.56.04.18.5792.

Maja RUPNIK
TKALEC, Valerija, JANEŽIČ, Sandra, SKOK, Barbara, SIMONIČ, Tamara, MESARIČ, Simon, VRABIČ, Tanja, **RUPNIK, Maja**. High Clostridium difficile contamination rates of domestic and imported potatoes compared to some other vegetables in Slovenia. Food microbiology, ISSN 1095-9998, apr. 2019, vol. 78, str. 194-200. https://www.sciencedirect.com/science/article/pii/S0740002018306105, doi: 10.1016/j.fm.2018.10.017.
TREVEN, Primož, MAHNIČ, Aleksander, **RUPNIK, Maja**, GOLOB, Majda, PIRŠ, Tina, BOGOVIČ MATIJAŠIĆ, Bojana, MOHAR LORBEG, Petra. Evaluation of human milk microbiota by 16S rRNA gene next-generation sequencing (NGS) and cultivation/MALDI-TOF mass spectrometry identification. Frontiers in microbiology, ISSN 1664-302X, 2019, vol. 10, art. no. 2612, str. 1-12
KNETSCH, C. W., KUMAR, N., FORSTER, S. C., CONNOR, T. R., BROWNE, H. P., HARMANUS, Celine, SANDERS, I. M., HARRIS, S. R., TURNER, L., MORRIS, T., **RUPNIK, Maja**, et al. Zoonotic transfer of Clostridium difficile harboring antimicrobial resistance between farm animals and humans. Journal of clinical microbiology, ISSN 1098-660X. [Online ed.], march 2018, vol. 56, iss. 3, f. 1-8
TRČEK, Janja, MAHNIČ, Aleksander, **RUPNIK, Maja.** Diversity of the microbiota involved in wine and organic apple cider submerged vinegar production as revealed by DHPLC analysis and next-generation sequencing. International journal of food microbiology, ISSN 0168-1605. [Print ed.], 2016, vol. 223, str. 57-62
RODRIGUEZ DIAZ, C., SEYBOLDT, C., **RUPNIK, Maja**. Non-human C. difficile reservoirs and sources : animals, food, environment. V: MASTRANTONIO, Paola (ur.), RUPNIK, Maja (ur.). Updates on Clostridium difficile in Europe, (Advances in experimental medicine and biology, ISSN 2214-8019, Vol. 1050). Cham: Springer Nature. cop. 2018, str. 227-243,
JANEŽIČ, Sandra, **RUPNIK, Maja**. Development and implementation of whole genome sequencing-based typing schemes for Clostridioides difficile. Frontiers in public health, ISSN 2296-2565, Oct. 2019, vol. 7, article 309, str. 1-7.

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Ekologija in biodiverziteta gliv
Course title:	Fungal ecology and biodiversity

Študijski programi in stopnja	**Študijska smer**	**Letnik**	**Semestri**
Bioznanosti, tretja stopnja, doktorski	mikrobiologija		Celoletni

Univerzitetna koda predmeta/University course code: 0566749

Predavanja	**Seminar**	**Vaje**	**Klinične vaje**	**Druge oblike študija**	**Samostojno delo**	**ECTS**
10	10	10	0	15	80	5

Nosilec predmeta/Lecturer:	Nina Gunde Cimerman
Izvajalci predavanj:	Cene Gostinčar, Nina Gunde Cimerman, Polona Zalar
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij	Fullfillement of general conditions required for graduate study

Vsebina:	**Content (Syllabus outline):**
Vzorci biološke raznovrstnosti gliv	Fungal biodiversity patterns
Metode za ločitev taksonov, zasledovanje vrst, in ocenjevanje raznovrstnosti	Methods for discriminating taxa, monitoring species and assesing fungal diversity
Saprofitske glive	Saprobic fungi
Endofitske glive	Endophytic fungi
Glive v stresnih okoljih	Fungi in stressful environments
Glive v povezavi z živalmi	Fungi associated to animals

Temeljna literatura in viri/Readings:

1. G. M. Mueller, G.F.Bills, M.S.Foster: Biodiversity of Fungi. Inventory and monitoring methods. Elsevier Academic press, 2004, pp. 777.
2. B. Kendrick. Fifth Kingdom. Hackett Publishing Co., 2017, pp.491.

Revijalni članki s področja, tekoča periodika, druga učna gradiva**. /**

1. G. M. Mueller, G.F.Bills, M.S.Foster: Biodiversity of Fungi. Inventory and monitoring methods. Elsevier Academic press, 2004, pp. 777.
2. B. Kendrick. Fifth Kingdom. Hackett Publishing Co., 2017, pp.491.
3. Review articles and other periodical journals from the field.

Cilji in kompetence:	Objectives and competences:
Pridobitev temeljnega znanja za osamitev, karakterizacijo, identifikacijo in shranjevanje gliv. Temelji za razumevanje ekologije gliv.	Basic knowledge for isolation, characterisation, identification and preservation of fungi. Basics for understanding fungal ecology .

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje: Študent spozna in razume osnovne koncepte in teorijo vloge gliv v okolju, od saprotrofnih do patogenih, simbiontskih in parazitskih interakcij, raznovrstnost glivnih združb v različnih mezofilnih in pa tudi ekstremnih okoljih. Študent se nauči zasnovati in izvesti eksperimente s področja glivne ekologije in spozna ustrezne ekološke metode in pristope za ocenjevanje diverzitete.	Knowledge and understanding: Students will learn and understand the basic concepts and theory regarding the role of fungi in the environment, from saprotrophic to symbiotic, pathogenic and parasitic interactions, the diversity of fungal communities in different mesophilic, as well as extreme environments. Students will learn how to plan and perform experiments within the field of fungal ecology. They will learn about the most suitable ecological methods and approaches for evaluating fungal biodiversity.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja, seminarji, individualne konzultacije	Lectures, seminars, individual consultations

Načini ocenjevanja:	Delež/Weight	Assessment:
Teoretični pisni izpit. Pozitivna ocena 51%	100,00 %	Theoretical written exam. Positive grade 51%.

Reference nosilca/Lecturer's references:

Nina Gunde-Cimerman

1.GONZÁLEZ-ABRADELO, Deborah, PÉREZ-LLANO, Yordanis, PEIDRO-GUZMÁN, Heidy, RAYO SÁNCHEZ-CARBENTE, María del, FOLCH-MALLOL, Jorge Luis, ARANDA, Elisabet, VAIDYANATHAN, Vinoth Kumar, CABANA, Hubert, GUNDE-CIMERMAN, Nina, BATISTA-GARCÍA, Ramón Alberto. First demonstration that ascomycetous halophilic fungi (Aspergillus sydowii and Aspergillus destruens) are useful in xenobiotic mycoremediation underhigh salinity conditions. Bioresource technology, ISSN 0960-8524. [Print ed.], 2019, vol. 279, str. 287-296, doi: 10.1016/j.biortech.2019.02.002. [COBISS.SI-ID 4994127]

2. GOSTINČAR, Cene, TURK, Martina, ZAJC, Janja, GUNDE-CIMERMAN, Nina. Fifty Aureobasidium pullulans genomes reveal a recombining polyextremotolerant generalist. Environmental microbiology, ISSN 1462-2912. [Print ed.], 2019, vol. 21, iss. 10, str. 3638-3652. https://doi.org/10.1111/1462-2920.14693, doi: 10.1111/1462-2920.14693. [COBISS.SI-ID 5158991]

3. GOSTINČAR, Cene, SUN, Xiaohuan, ZAJC, Janja, FANG, Chao, YONG, Hou, LUO, Yonglun, GUNDE-CIMERMAN, Nina, SONG, Zewei. Population genomics of an obligately halophilic basidiomycete Wallemia ichthyophaga. Frontiers in microbiology, ISSN 1664-302X, 2019, vol. 10, str. 1-12, ilustr., doi: 10.3389/fmicb.2019.02019. [COBISS.SI-ID 5158479]

4. PERINI, Laura, GOSTINČAR, Cene, ANESIO, Alexandre, WILLIAMSON, Christopher, TRANTER, Martyn, GUNDE-CIMERMAN, Nina. Darkening of the Greenland Ice Sheet : fungal abundance and diversity are associated with algal bloom. Frontiers in microbiology, ISSN 1664-302X, 2019, vol. 10, str. 1-14. https://www.frontiersin.org/articles/10.3389/fmicb.2019.00557/full, doi: 10.3389/fmicb.2019.00557. [COBISS.SI-ID 5018447]

5. ZAJC, Janja, GOSTINČAR, Cene, ČERNOŠA, Anja, GUNDE-CIMERMAN, Nina. Stress-tolerant yeasts : opportunistic pathogenicity versus biocontrol potential. Genes, ISSN 2073-4425, 2019, vol. 10, no. 1, str. 1-23. https://www.mdpi.com/2073-4425/10/1/42, doi: 10.3390/genes10010042. [COBISS.SI-ID 4966223]

6. ZALAR, Polona, ZUPANČIČ, Jerneja, GOSTINČAR, Cene, ZAJC, Janja, HOOG, G. S. de, DE LEO, Filomena, AZUA-BUSTOS, Armando, GUNDE-CIMERMAN, Nina. The extremely halotolerant black yeast Hortaea werneckii - a model for intraspecific hybridization in clonal fungi. IMA fungus, ISSN 2210-6340, 2019, vol. 10, no. 3, str. 1-27, ilustr., doi: 10.1186/s43008-019-0007-5. [COBISS.SI-ID 5125711]

Cene Gostinčar

1. GOSTINČAR, Cene, TURK, Martina, ZAJC, Janja, GUNDE-CIMERMAN, Nina. Fifty Aureobasidium pullulans genomes reveal a recombining polyextremotolerant generalist. Environmental microbiology, ISSN 1462-2912. [Print ed.], 2019, vol. 21, iss. 10, str. 3638-3652. https://doi.org/10.1111/1462-2920.14693, doi: 10.1111/1462-2920.14693. [COBISS.SI-ID 5158991]
2. GOSTINČAR, Cene, SUN, Xiaohuan, ZAJC, Janja, FANG, Chao, YONG, Hou, LUO, Yonglun, GUNDE-CIMERMAN, Nina, SONG, Zewei. Population genomics of an obligately halophilic basidiomycete Wallemia ichthyophaga. Frontiers in microbiology, ISSN 1664-302X, 2019, vol. 10, str. 1-12, ilustr., doi: 10.3389/fmicb.2019.02019. [COBISS.SI-ID 5158479]
3. PERINI, Laura, GOSTINČAR, Cene, ANESIO, Alexandre, WILLIAMSON, Christopher, TRANTER, Martyn, GUNDE-CIMERMAN, Nina. Darkening of the Greenland Ice Sheet : fungal abundance and diversity are associated with algal bloom. Frontiers in microbiology, ISSN 1664-302X, 2019, vol. 10, str. 1-14. https://www.frontiersin.org/articles/10.3389/fmicb.2019.00557/full, doi: 10.3389/fmicb.2019.00557. [COBISS.SI-ID 5018447]
4. ZAJC, Janja, GOSTINČAR, Cene, ČERNOŠA, Anja, GUNDE-CIMERMAN, Nina. Stress-tolerant yeasts : opportunistic pathogenicity versus biocontrol potential. Genes, ISSN 2073-4425, 2019, vol. 10, no. 1, str. 1-23. https://www.mdpi.com/2073-4425/10/1/42, doi: 10.3390/genes10010042. [COBISS.SI-ID 4966223]
5. ZALAR, Polona, ZUPANČIČ, Jerneja, GOSTINČAR, Cene, ZAJC, Janja, HOOG, G. S. de, DE LEO, Filomena, AZUA-BUSTOS, Armando, GUNDE-CIMERMAN, Nina. The extremely halotolerant black yeast Hortaea werneckii - a model for intraspecific hybridization in clonal fungi. IMA fungus, ISSN 2210-6340, 2019, vol. 10, no. 3, str. 1-27, ilustr., doi: 10.1186/s43008-019-0007-5. [COBISS.SI-ID 5125711]

6. PERINI, Laura, MOGROVEJO, Diana C., TOMAZIN, Rok, GOSTINČAR, Cene, BRILL, Florian H. H., GUNDE-CIMERMAN, Nina. Phenotypes associated with pathogenicity : their expression in arctic fungal isolates. Microorganisms, ISSN 2076-2607, 2019, vol. 7, no. 12, str. 1-15. http://dx.doi.org/10.3390/microorganisms7120600, doi: 10.3390/microorganisms7120600. [COBISS.SI-ID 5275471],

Polona Zalar

1. ZALAR, Polona, ZUPANČIČ, Jerneja, GOSTINČAR, Cene, ZAJC, Janja, HOOG, G. S. de, DE LEO, Filomena, AZUA-BUSTOS, Armando, GUNDE-CIMERMAN, Nina. The extremely halotolerant black yeast Hortaea werneckii - a model for intraspecific hybridization in clonal fungi. *IMA fungus*. 2019, vol. 10, no. 3, str. 1-27, ilustr. ISSN 2210-6340. DOI: 10.1186/s43008-019-0007-5. [COBISS.SI-ID 5125711].
2. ŠIBANC, Nataša, ZALAR, Polona, SCHROERS, Hans-Josef, ZAJC, Janja, PONTES, Ana, SAMPAIO, José Paulo, MAČEK, Irena. Occultifur mephitis f.a., sp. nov. and other yeast species from hypoxic and elevated CO2 mofette environments. *International journal of systematic and evolutionary microbiology*. 2018, vol. 68, no. 7, str. 2285-2298. ISSN 1466-5026. DOI: 10.1099/ijsem.0.002824. [COBISS.SI-ID 8981625].
3. TURCHETTI, Benedetta, SELBMANN, Laura, GUNDE-CIMERMAN, Nina, BUZZINI, Pietro, SAMPAIO, José Paulo, ZALAR, Polona. Cystobasidium alpinum sp. nov. and Rhodosporidiobolus oreadorum sp. nov. from European cold environments and Arctic region. *Life*. 2018, vol. 8, iss. 2, str. 1-15, ilustr. ISSN 2075-1729. http://www.mdpi.com/2075-1729/8/2/9, DOI: 10.3390/life8020009. [COBISS.SI-ID 4688719].
4. NOVAK BABIČ, Monika, ZUPANČIČ, Jerneja, GUNDE-CIMERMAN, Nina, HOOG, Sybren de, ZALAR, Polona. Ecology of the human opportunistic black yeast Exophiala dermatitidis indicates preference for human-made habitats. *Mycopathologia*. 2018, vol. 183, iss. 1, str. 201-212. ISSN 0301-486X. http://dx.doi.org/10.1007/s11046-017-0134-8, DOI: 10.1007/s11046-017-0134-8. [COBISS.SI-ID 4307791].
5. MARTINELLI, Livia, ZALAR, Polona, GUNDE-CIMERMAN, Nina, AZUA-BUSTOS, Armando, STERFLINGER, Katja, PIÑAR, Guadalupe. Aspergillus atacamensis and A. salisburgensis : two new halophilic species from hypersaline/arid habitats with a phialosimplex-like morphology. *Extremophiles*. 2017, vol. 21, iss. 4, str. 755-773. ISSN 1431-0651. DOI: 10.1007/s00792-017-0941-3. [COBISS.SI-ID 4368975].
6. SKLENÁŘ, F., JURJEVIĆ, Ž., ZALAR, Polona, FRISVAD, Jens Christian, VISAGIE, C.M., KOLAŘÍK, M., HOUBRAKEN, Jos, CHEN, A.J., YILMAZ, N., SEIFERT, Keith A., COTON, M., DÉNIEL, F., GUNDE-CIMERMAN, Nina, SAMSON, R.A., PETERSON, S.W., HUBKA, V. Phylogeny of xerophilic aspergilli (subgenus Aspergillus) and taxonomic revision of section Restricti. *Studies in mycology*. 2017, vol. 88, str. 161-236. ISSN 0166-0616. http://dx.doi.org/10.1016/j.simyco.2017.09.002, DOI: 10.1016/j.simyco.2017.09.002. [COBISS.SI-ID 4445519].

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Mikrobni produkti in energija iz organskih odpadkov
Course title:	Microbial products and energy from organic waste

Študijski programi in stopnja	**Študijska smer**	**Letnik**	**Semestri**
Bioznanosti, tretja stopnja, doktorski	mikrobiologija		Celoletni

Univerzitetna koda predmeta/University course code: 0566750

Predavanja	**Seminar**	**Vaje**	**Klinične vaje**	**Druge oblike študija**	**Samostojno delo**	**ECTS**
15	20	0	0	0	90	5

Nosilec predmeta/Lecturer:	Romana Marinšek Logar

Izvajalci predavanj:	Romana Marinšek Logar
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij.	General requirements for the enrolment in PhD program.

Vsebina:	**Content (Syllabus outline):**
- Anaerobne bioplinske tehnologije (predelava bioplina v toplotno oz. električno energijo). - Biotehnologije za proizvodnjo vodika iz agroživilskih odpadkov. - Rastlinske čistilne naprave za odstranjevanje za predelavo agroživilskih odplak. - Odstranjevanje viškov dušika iz agroživilskih odplak. - Uporaba agroživilskih odpadkov za pridelavo mineralnih gnojil. - Bioremediacijske tehnologije (biostimulacija, bioaugmentacija, landfarming, kompostiranje). - Novejši trendi v anaerobni mikrobni presnovi organskih odpadkov (C1-C6 spojine kot direktni substrati za proizvodnjo zdravil). - Novejše biotehnološke rešitve za proizvodnjo bioetanola in biobutanola iz agroživilskih odpadkov.	- Anaerobic biogas technologies (production of heat and electricity from biogas). - Biotechnologies for production of hydrogen from agro-food waste. - Constructed wetlands for agro-food awste degradation. - Surplus nitrogen removal from agro-food sluries and sewage. - Production of mineral fertilizers from agro-food waste. - Bioremediation technologies (biostimulation. bioaugmentation. Landfarming, composting). - Modern trends in anaerobic microbial degradation of organic waste (C1-C6 compounds as direct substrates for production of pharmaceuticals). - Modern biotechnological solutions for production of bioethanol and biobutanol from agro-food waste.

Temeljna literatura in viri/Readings:

Revijalni in eksperimentalni članki s področja, tekoča periodika, druga učna gradiva bodo dostopna na ŠIS.

Cilji in kompetence:	**Objectives and competences:**
Predmet je namenjen pridobivanju poglobljenega znanja o vrstah, lastnostih in energetskih potencialih odpadnih biomas v kmetijstvu, živilski industriji in na komunalnem področju. Slušatelje poglobljeno seznani z biotehnološkimi postopki, ki so primerni za pridobivanje obnovljive energije iz odpadnih biomas in C1-C6 spojin z visiko dodano vrednostjo ter so hkrati usmerjene (same ali v sklopih) v varovanje in remediacijo okolja. Pridobljeno znanje v kombinaciji z drugimi znanji doktorskega programa omogoča relevantno presojanje ravnanja z odpadki iz agroživilskega področja, načrtovanje ustreznih biotehnoloških postopkov in strategij in operativno vodenje biotehnoloških postopkov za presnovo in stabilizacijo odpadnih organskih biomas v smislu koncepta »zero waste«.	The course is designed to obtain in-depth knowledge about the types, characteristics and energy potential of waste biomass in agriculture, food industry and municipal sector. Students have thorough knowledge of biotechnological processes, which are suitable for the production of renewable energy and C1-C6 compounds with high added value from biomass and waste and are at the same time oriented (alone or in clusters) in the protection and remediation of the environment. Lessons learned in combination with other skills of doctoral program allows assessment of the relevant waste from the agro-food areas, the design of appropriate biotechnological processes and strategies and operational management of biotechnological processes for the degradation and stabilization of waste organic biomass in »zero-waste« concept.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: 1. Razume aerobne in anaerobne postopke razgradnje organske biomase 2. Zna izbrati ustrezen biotehnološki postopek za presnovo/obdelavo izbrane odpadne biomase 3. Zna oceniti potenciale za pridobivanje obnovljive energije iz različnih organskih substratov iz agroživilske industrije 4. Zna oceniti potenciale za pridobivanje surovin z visoko dodano vrednostjo iz različnih virov agroživilske odpadne biomase. 5. Razume biorafinerijske principe na področju presnove odpadnih biomas iz agroživislek industrije 6. Biotehnološke postopke za razgradnjo odpadnih organskih biomas zna ustrezno ekonomično dizajnirati	Knowledge and understanding: 1. The student understands aerobic and anaerobic decomposition processes of organic biomass 2. The sudent can select the appropriate biotechnological process for the degradation / processing of selected waste biomass 3. The student knows how to assess the energy potential of a selected organic substrate agro-food industry. 4. The student knows how to assess the potential for the production of raw materials with high added value from different sources agro-food waste biomass. 5. The student understands the biorafinery principles in the field of waste biomass degradation from agro-food industry 6. The student knows how to design economically the biotechnological processes for the decomposition of organic waste biomass

Metode poučevanja in učenja:	**Learning and teaching methods:**
Pouk je organiziran v obliki predavanj, konzultacij; seminarskega dela.	Lectures, consultations, seminar.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
izpit	50,00 %	exam
seminar	50,00 %	seminar

Reference nosilca/Lecturer's references:

Prof. dr. Romana Marinšek Logar

1. MURI, Petra, **MARINŠEK-LOGAR, Romana**, DJINOVIĆ, Petar, PINTAR, Albin. Influence of support materials on continuous hydrogen production in anaerobic packed-bed reactor with immobilized hydrogen producing bacteria at acidic conditions. *Enzyme and microbial technology*, ISSN 0141-0229. [Print ed.], Apr. 2018, vol. 111, str. 87-96

2. VIDMAR, Beti, **MARINŠEK-LOGAR, Romana**, PANJICKO, Mario, FANEDL, Lijana. Influence of thermal and bacterial pretreatment of microalgae on biogas production in mesophilic and thermophilic conditions. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2017, vol. 64, no. 1, str. 227-236

3. LAVRIČ, Lea, CERAR, Ana, FANEDL, Lijana, LAZAR, Borut, ŽITNIK, Miha, **MARINŠEK-LOGAR, Romana.** Thermal pretreatment and bioaugmentation improve methane yield of microalgal mix produced in thermophilic anaerobic digestate. *Anaerobe*, ISSN 1075-9964, 2017, vol. 46, str. 162-169

4. PANJICKO, Mario, ZUPANČIČ, Gregor Drago, FANEDL, Lijana, **MARINŠEK-LOGAR, Romana**, TIŠMA, Marina, ZELIĆ, Bruno. Biogas production from brewery spent grain as a mono-substrate in a two-stage process composed of solid-state anaerobic digestion and granular biomass reactors. *Journal of cleaner production*, ISSN 0959-6526. [Print ed.], nov. 2017, vol. 166, str. 519-529

5. RAJAPAKSE, Katarina, DROBNE, Damjana, KASTELEC, Damijana, KOGEJ, Ksenija, MAKOVEC, Darko, GALLAMPOIS, C., AMELINA, Hanna, DANIELSSON, Gabriela, FANEDL, Lijana, **MARINŠEK-LOGAR, Romana,** CRISTOBAL, Susana. Proteomic analyses of early response of unicellular eukaryotic microorganism Tetrahymena thermophila exposed to TiO2TiO2 particles. *Nanotoxicology*, ISSN 1743-5390, 2016, vol. 10, no. 5, str. 542-556

6. ČATER, Maša, FANEDL, Lijana, MALOVRH, Špela, MARINŠEK-LOGAR, Romana. Biogas production from brewery spent grain enhanced by bioaugmentation with hydrolytic anaerobic bacteria. *Bioresource technology*, ISSN 0960-8524. [Print ed.], 2015, vol. 186, str. 261-269