UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Molekularno biološke metode v prehrani in živilstvu**
Course title:	**Molecular biology methods in nutrition and food science**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Prehrana**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Nutrition**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**5**	**/**	**/**	**15**	**95**	**5**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Polona Jamnik

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

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

Vsebina:	**Content (Syllabus outline):**

- Molekularne metode določanja gensko spremenjenih organizmov v živilih - Proteomske metode za ugotavljanje kakovosti in varnosti živil ter vpliva prehrane na izražanje proteinov (nutriproteomika) - Uporabnost različnih principov in molekularnih metod identifikacije, tipizacije in kvantifikacije mikroorganizmov in/ali njihovih produktov v živilih in živilsko-prehranski verigi z namenom sledenja kontaminacije - Novejši metodološki pristopi testiranja delovanja protimikrobnih naravnih snovi - Metode za metagenomske in transkriptomske analize za ugotavljanje vpliva prehrane na mikrobioto gostitelja - Molekularne metode za analize fermentiranih mlečnih izdelkov in probiotičnih izdelkov (živila, prehranska dopolnila)	- Molecular methods of identifying genetically modified organisms in food - Proteomic methods for determining food quality and safety and the effect of nutrition on protein expression (nutriproteomics) - Application of different principles and methods for identification, typification and quantification of micro-organisms in food and food chain to trace contamination - Novel methodological approaches for testing action of natural antimicrobial compounds - Methods for metagenomic and transcriptomic analysis to study the impact of diet on the microbiota of the host - Molecular methods for the analysis of fermented dairy products and probiotic products (food, dietary supplements)

Temeljni literatura in viri / Readings:

Izbrana poglavja iz: ŽEL, Jana, MILAVEC, Mojca, MORISSET, Dany, PLAN, Damien, EEDE, G. van den, GRUDEN, Kristina. How to reliably test for GMOs, (Springer briefs in food, health, and nutrition). New York [etc.]: Springer, 2012. X, 100 str., ilustr. ISBN 978-1-4614-1389-9. [COBISS.SI-ID 2460239]

Izbrana poglavja iz: Foodomics : advanced mass spectrometry in modern food science and nutrition. edited by Alejandro Cifuentes A. (ed.). Hoboken, New Jersey, John Wiley & Sons, 2013, 560 str.

MONNET, Christophe, BOGOVIČ MATIJAŠIĆ, Bojana. Application of PCR-based methods to dairy products and to non-dairy probiotic products. V: HERNÁNDEZ-RODRÍGUEZ, Patricia (ur.), RAMIREZ GOMEZ, Arlen Patricia (ur.). *Polymerase chain reaction*. [Rijeka: Intech, cop. 2012], str. 11-50, doi: 10.5772/36897.

Quantitative real-time PCR in applied microbiology / ur. Martin Filion, Norfolk : Caister Academic Press, cop. 2012, 242 str.

Gastrointestinal microbiology/ ur. OUWEHAND, Arthur C., VAUGHAN Elaine E., CRC Press, 2013, 432 str.

Revialni in originalni znanstveni članki s področja/Review and original scientific articles from the field.

Cilji in kompetence:	**Objectives and competences:**
Namen predmeta je: - pridobiti znanje o molekularnih metodah za določanje gensko spremenjenih organizmov - spoznati proteomske metode in njihovo uporabo za aplikacije v živilstvu in prehrani - spoznati molekularne metode za sledenje mikrobne kontaminacije v živilih in živilsko-	The aim of the course is: - to get knowledge about molecular methods for identifying genetically modified organisms in food - to learn about proteomic methods and their application in food science and nutrition - to learn about molecular methods for tracing

prehranski verigi in novejše metode za testiranje delovanja naravnih protimikrobnih snovi - spoznati sodobne metode za ugotavljanje kakovosti probiotikov in fermentiranih mlečnih izdelkov - spoznati pristope, ki omogočajo ugotavljanje vplivov prehrane na mikrobioto prebavil	microbial contamination in food and food chain and novel methods for testing action of natural antimicrobial compounds - to learn about modern methods for determination of the quality of probiotics and fermented milk products - to learn about approaches that allow assessment of the impact of diet on gastrointestinal microbiota

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent se bo seznanil s principi molekularno bioloških metod in bo usposobljen za njihovo izvedbo za različne aplikacije na področju živilstva in prehrane.	Knowledge and understanding: The student will be acquainted with the principles of molecular biology methods and be able to use them for different applications in the field of food science and nutrition.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminar, diskusije.	Lectures, seminar, discussions.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• izpit • seminar	70 30	• exam • seminar

Reference nosilca / izvajalcev / Lecturer's references:

PETELINC, Tanja, POLAK, Tomaž, **JAMNIK, Polona**. Insight into the molecular mechanisms of propolis activity using a subcellular proteomic approach. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, str. 11502-11510, doi: 10.1021/jf4042003. [COBISS.SI-ID 4320376]

SLATNAR, Ana, JAKOPIČ, Jerneja, ŠTAMPAR, Franci, VEBERIČ, Robert, **JAMNIK, Polona.** The effect of bioactive compounds on in vitro and in vivo antioxidant activity of different berry juices. *PloS one*, ISSN 1932-6203, 2012, vol. 7, issue 10, str. 1-8, ilustr. http://dx.doi.org/10.1371/journal.pone.0047880, doi: 10.1371/journal.pone.0047880. [COBISS.SI-

ID 7298169]

JAMNIK, Polona, RASPOR, Peter, JAVORNIK, Branka. A proteomic approach for investigation of bee products : royal jelly, propolis and honey. *Food technology and biotechnology*, ISSN 1330-9862, 2012, vol. 50, no.3, str. 270-274. [COBISS.SI-ID 4118136]

PETELINC, Tanja, POLAK, Tomaž, DEMŠAR, Lea, RASPOR, Peter, **JAMNIK, Polona**. Antioxidative activity of propolis extract in yeast cells. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2011, vol. 59, issue 21, str. 11449-11455, doi: 10.1021/jf2022258. [COBISS.SI-ID 3949176]

ZAKRAJŠEK, Teja, RASPOR, Peter, **JAMNIK, Polona**. Saccharomyces cerevisiae in the stationary phase as a model organism - characterization at cellular and proteome level. *Journal of proteomics*, ISSN 1874-3919, 2011, vol. 74, str. 2837-2845, doi: 10.1016/j.jprot.2011.06.026. [COBISS.SI-ID 3927928]

JAMNIK, Polona, MEGLEN, Maja, RASPOR, Peter, POKLAR ULRIH, Nataša. Identification of various substrate-binding proteins of the hyperthermophylic archaeon Aeropyrum pernix K1. *World journal of microbiology & biotechnology*, ISSN 0959-3993, 2010, issue 9, vol. 26, str. 1579-1586, doi: 10.1007/s11274-010-0333-7. [COBISS.SI-ID 3750008]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Prehrana neprežvekovalcev in neprežvekovalcev**
Course title:	**Nutrition of ruminants and non-ruminants**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Prehrana**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Nutrition**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**5**	**15**	**/**	**15**	**80**	**5**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Janez Salobir

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Na predhodno končanih študijskih programih skupno vsaj 30 KT s področja prehrane, biokemije in fiziologije ljudi oz. višjih živali.	At least 30 ECTS gained in previously completed study programs in the fields of nutrition, biochemistry and the physiology of humans or higher animals.

Vsebina:	**Content (Syllabus outline):**

Vsebina predmeta se prilagaja trenutnim aktualnim temam s področja prehrane prežvekovalcev in neprežvekovalcev predvsem s področij: - Potrebe po hranilih: sodobne metode vrednotenje energije, aminokislin in mineralov. - Prebavila: potek prebave … - Interakcije med prehrano in zdravstvenim stanjem (prebavila, imunski sistem …). - Interakcije med prehrano in okoljem: zmanjšanje obremenjevanja okolja s pomočjo prehrane (encimi, GMO …), vpliv prehrane na izločanje toplogrednih plinov, - Učinki nekaterih krmil in krmnih dodatkov v prehrani: klasični, rastlinski ekstrakti. - Antinutritivne snovi in toksini: delovanje, vpliv na zdravje, preprečevanje. - Vpliv prehrane na kakovost živalskih proizvodov: prehranski vplivi na senzorično in prehransko (funkcionalno) vrednost živalskih proizvodov - Načrtovanje in izvedba prehranske raziskave: *in vivo*, *in vitro*, *in sacco*. Posamezne teme vključujejo tudi spoznavanje z raziskovalnimi metodami. Nekatere analitske metode pa bodo predstavljene v okviru laboratorijskih vaj.	The content is adapted to current topical themes from the field of nutrition of non-ruminants, primarily the fields of: - needs for food: contemporary methods of assessing energy, amino acids and minerals. - interaction between food and health state (digestive and immune system etc.) - interaction between food and the environment: reduction of burden on the environment with the aid of food (enzymes, GMO, greenhouse gasses etc.) - effects of some feed and feed additives: mainly the effects and operation of classical feed additives (probiotics, organic acids, plant extracts) - antinutritive substances and toxins: mode of action, impact on health, prevention - influence of feed on the quality of animal products: food influence on sensoric and nutritional (functional) value of animal products - planning and implementation of nutrition research: : *in vivo*, *in vitro*, *in sacco* Individual themes also include familiarity with research methods. Some analytical methods will be presented within the framework of laboratory practicals.

Temeljni literatura in viri / Readings:

- Cheeke P. Comparative Animal Nutrition and Metabolism. CABI, UK, 2010, 352 s.
- Mosenthin R, Zentek J, Žebrowska T. Biology of Nutrition in Growing Animals. Elsevier, 2007, 640 s.
- Revijalni članki s področja, tekoča periodika, druga učna gradiva.

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je, da študenti preko predavanj, izdelave seminarske naloge in dela v laboratoriju obdelajo posamezne aktualne teme v prehrani živali. Pri tem se naučijo reševati prehranske probleme na ravni oskrbe, proizvodnosti živali, zdravstvenim stanjem prebavil, imunskim sistemom, okoljem oz. varovanjem okolja, specifik delovanja nekaterih krmil in krmnih dodatkov v prehrani neprežvekovalcev. Študenti z izbranimi praktičnimi laboratorijskimi vajami spoznajo nekatere analitske pristope k reševanju	The aim of the subject is that by means of lectures, preparation of seminar tasks and work in the laboratory, students work on individual topical themes in the nutrition of ruminants and non-ruminants. They learn to solve nutritional problems on the level of supply, animal breeding, health state of the digestive organs, immune system, environment or protection of the environment, the specifics of mode of action of some feeds and feed additives in the animal nutrition. Students get to know some analytical approaches to resolving research problems of

raziskovalnih problemov prehrane živali.	feed of animals through selected practical laboratory exercises.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predviden študijski rezultat je usposobitev študenta za s problematiko in vrsto neprežvekovalcev povezanim načrtovanjem in izvedbo prehranske raziskave. Predviden študijski rezultat je kandidata usposobiti za izvedbo raziskav s področja prehrane živali. Kandidat naj bi bil po opravljenem izpitu sposoben kritičnega presojanja rezultatov lastnih raziskav in aktualnih pojavov povezanih s prehrano živali.	Knowledge and understanding: The intended learning outcome is to qualify the student for planning and implementing research connected with these problems in animal nutrition. The intended learning outcome is to qualify the candidate for carrying out research in the field of animal nutrition. The candidate should be capable after passing the examination of critical judgement of the results of his or her own research and current phenomena connected with the nutrition of animals.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja (10 ur) in seminar (5 ur) potekajo v predavalnici. Laboratorijske vaje (15 ur) v manjših skupinah v laboratoriju. Konzultacije (15 ur) v manjših skupinah.	Lectures (10 hours) and seminar (5 hours): in the classroom. Practical tutorials: laboratory work (15 hours) in small groups in the laboratory. Consultations (15 hours) in small groups.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ocena izpita: - Ustni/pisni izpit - Seminarsko delo	 60 % 40 %	Exam score: - Written/oral exam - seminar work

Reference nosilca / izvajalcev / Lecturer's references:

Janez Salobir

1. TREBUŠAK, Tina, LEVART, Alenka, SALOBIR, Janez, PIRMAN, Tatjana. Effect of Ganoderma lucidum (Reishi mushroom) or Olea europaea (olive) leaves on oxidative stability of rabbit meat fortified with n-3 fatty acids. *Meat science*, ISSN 0309-1740. [Print ed.], 2014, vol. 96, no. 3, str. 1275-1280. [COBISS.SI-ID 3320968], [JCR, SNIP]
2. VOLJČ, Mojca, LEVART, Alenka, ŽGUR, Silvester, SALOBIR, Janez. The effect of [alpha]-

tocopherol, sweet chestnut wood extract and their combination on oxidative stress in vivo and oxidative stability of meat in broilers. *British Poultry Science*, ISSN 0007-1668, 2013, vol. 54, no. 1, str. 144-156. [COBISS.SI-ID 3176840], [JCR, SNIP, WoS]

3. PLEVNIK, Alja, SALOBIR, Janez, LEVART, Alenka, KOTNIK, Tina, NEMEC SVETE, Alenka. Oxidative stress markers in canine atopic dermatitis. *Research in Veterinary Science*, ISSN 0034-5288, 2012, vol. 92, no. 3, str. 469-470, [COBISS.SI-ID 3356538], [JCR, SNIP, WoS]
4. VOLJČ, Mojca, FRANKIČ, Tamara, LEVART, Alenka, NEMEC, Marija, SALOBIR, Janez. Evaluation of different vitamin E recommendations and bioactivity of [alfa]-tocopherol isomers in broiler nutrition by measuring oxidative stress in vivo and the oxidative stability of meat. *Poultry science*, ISSN 0032-5791, 2011, vol. 90, no. 7, str. 1478-1488. [COBISS.SI-ID 2888840], [JCR, SNIP, WoS]
5. FRANKIČ, Tamara, LEVART, Alenka, SALOBIR, Janez. The effect of vitamin E and plant extract mixture composed of carvacrol, cinnamaldehyde and capsaicin on oxidative stress induced by high PUFA load in young pigs. *Animal*, ISSN 1751-7311, 2010, vol. 4, no. 4, str. 572-578. [COBISS.SI-ID 2543240], [JCR, SNIP, WoS]
6. FRANKIČ, Tamara, SALOBIR, Karl, SALOBIR, Janez. The comparison of in vivo antigenotoxic and antioxidative capacity of two propylene glycol extracts of Calendula officinalis (marigold) and vitamin E in young growing pigs. *Journal of animal physiology and animal nutrition*, ISSN 0931-2439, 2009, vol. 93, str. 688-694, [COBISS.SI-ID 2356616], [JCR, SNIP, WoS]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Prehrana**
Course title:	**Nutrition**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Prehrana**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Nutrition**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
20	**10**	**/**	**30**	**/**	**190**	**10**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Janez Salobir

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Na predhodno opravljenem oz. opravljenih študijskih programih skupno vsaj 60 KT s področja prehrane, hrane, biokemije ali fiziologije ljudi ali višjih živali.	A total of at least 60 CP in the fields of nutrition, biochemistry or physiology of people or higher animals in previously completed study programmes.

Vsebina:	**Content (Syllabus outline):**

Vsebino predmeta predstavljajo aktualne teme iz naslednjih področij: - Prehrana tkiv, organov, sistemov: spoznavanje in vrednotenje kazalnikov oskrbe in prehranskih potreb z vidika oskrbe in delovanja posameznih organov in sistemov. - Prehrana v življenjskih obdobjih: pomen nekaterih hranil v občutljivih življenjskih obdobjih: npr. oskrba z aminokislinami, maščobnimi kislinami, minerali pri otrocih, ostarelih… - Prehrana in mikrobiologija prebavil: vplivi na razvoj mikrobne združbe prebavil, interakcije med zaužitimi snovmi, mikrobno združbo prebavil in prebavili, vpliv na tkiva in sisteme, prehranska manipulacija mikrobne združbe. - Prehrana, živila in zdravje: vloga nekaterih hranil in učinkovin (sekundarni rastlinski metaboliti) ter živil pri pojavnosti civilizacijskih bolezni. - Klinična prehrana: Prehranska podpora pri različnih bolezenskih stanjih in motnjah hranjenja ter vloga nekaterih hranil pri zdravljenju raka in pri kritično bolnih. - Prehranska kakovost in varnost: npr. toksini plesni ipd. - Sodobne raziskovalne metode v prehrani: uporaba nutrigenomskih in metabolomskih metod pri proučevanju vpliva prehrane na produkcijo specifičnih genskih produktov in odzivnost metabolnih poti zaradi povezav z zdravjem ljudi oz. zdravjem in proizvodnostjo živali.	The contents of the course are current subjects from the following fields: - Nutrition of tissues, organs and systems: relevant markers of requirements and supply of different organs and systems. - Nutrition and the life cycle: importance of some nutrients in vulnerable life periods: e.g., supply of amino acids, fatty acids, minerals etc. in infants, adults. - Nutrition and microbiology of the gut: effect of nursing on the development of microbial ecosystems, interactions between ingested nutrients, microbial population and the gut, the effects on tissues and systems, nutritional manipulations. - Nutrition and health: importance of some nutrients and active substances (e.g. secondary plant metabolites) in some chronic diseases (e.g. cardiovascular diseases, obesity, cancer). - Clinical nutrition: the importance of some nutrients and nutritional support therapy in various disease states, in critically ill patients and in the case of eating disorders. - Quality and safety: e.g., toxins etc. - Current research methods in nutritional research: the use of nutrigenomic and metabolomic methods in relation to human and animal health.

Temeljni literatura in viri / Readings:

- Erdman J.W., MacDonald I.A., Zeisel S.H. Present Knowledge in Nutrition. Wiley-Blackwel; 10th edition, 2012, 1328 s.
- Revijalni članki s področja, tekoča periodika, druga učna gradiva

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

Cilj predmeta je, da študent s pomočjo predavanj, seminarskega in laboratorijskega dela ter konzultacij poglobi znanje na področju aktualnih raziskovalnih problemov prehrane ljudi in živali. Ob tem je cilj predmeta tudi osvajanje nekaterih sodobnih raziskovalnih metod v prehrani. Študent pridobi tovrstno znanje na različnih primerih prehranskih raziskav.	By means of lectures, seminars and laboratory work and consultations, the student will obtain knowledge of current topics in nutritional research into human and also animal nutrition. At the same time, modern nutritional research methods will be presented and discussed.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Predviden študijski rezultat je usposobitev študenta za kritično ocenjevanje prehranskih raziskav ter vpogled v njihovo načrtovanje in izvajanje.	The intended outcome of the course is to qualify the student for critical evaluation of nutritional research and to introduce them into planning and performing of research.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja (20 ur) in seminar (10 ur) potekajo v predavalnici. Laboratorijske vaje (30 ur) v manjših skupinah v laboratoriju.	Lectures (20 hours) and seminar (10 hours): in the classroom. Practical tutorials: laboratory work (30 hours) in small groups in the laboratory.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ocena izpita: - Ustni/pisni izpit - Seminarsko delo	 60 % 40 %	Exam score: - Written/oral exam - seminar work

Reference nosilca – izvajalca / Lecturer's references:

Janez Salobir

7. TREBUŠAK, Tina, LEVART, Alenka, SALOBIR, Janez, PIRMAN, Tatjana. Effect of Ganoderma lucidum (Reishi mushroom) or Olea europaea (olive) leaves on oxidative stability of rabbit meat fortified with n-3 fatty acids. *Meat science*, ISSN 0309-1740. [Print ed.], 2014, vol. 96, no. 3, str. 1275-1280. [COBISS.SI-ID 3320968], [JCR, SNIP]
8. TOMAŽIN, Urška, FRANKIČ, Tamara, VOLJČ, Mojca, REZAR, Vida, LEVART, Alenka, SALOBIR, Janez. The potency of [alfa]- and [gama]-tocopherol, and their combination, in reducing dietary induced oxidative stress in vivo and improving meat lipid stability in broilers. *Archiv für Geflügelkunde*, ISSN 0003-9098, 2013, vol. 77, no. 4, str. 266-274. [COBISS.SI-ID 3290248], [JCR, SNIP]
9. VOLJČ, Mojca, LEVART, Alenka, ŽGUR, Silvester, SALOBIR, Janez. The effect of [alpha]-tocopherol, sweet chestnut wood extract and their combination on oxidative stress in vivo and

oxidative stability of meat in broilers. *British Poultry Science*, ISSN 0007-1668, 2013, vol. 54, no. 1, str. 144-156. [COBISS.SI-ID 3176840], [JCR, SNIP, WoS]

10. PLEVNIK, Alja, SALOBIR, Janez, LEVART, Alenka, TAVČAR-KALCHER, Gabrijela, NEMEC SVETE, Alenka, KOTNIK, Tina. Plasma and skin vitamin E concentration in canine atopic dermatitis. *Veterinary quarterly*, ISSN 0165-2176, 2013, vol. 33, no. 1, str. 2-6, [COBISS.SI-ID 3635578], [JCR, SNIP, WoS]
11. PLEVNIK, Alja, SALOBIR, Janez, LEVART, Alenka, KOTNIK, Tina, NEMEC SVETE, Alenka. Oxidative stress markers in canine atopic dermatitis. *Research in Veterinary Science*, ISSN 0034-5288, 2012, vol. 92, no. 3, str. 469-470, [COBISS.SI-ID 3356538], [JCR, SNIP, WoS]
12. FRANKIČ, Tamara, SALOBIR, Janez. In vivo antioxidant potential of Sweet chestnut (Castanea sativa Mill.) wood extract in young growing pigs exposed to n-3 PUFA-induced oxidative stress. *Journal of the Science of Food and Agriculture*, ISSN 0022-5142, 2011, vol. 91, no. 8, str. 1432-1439, [COBISS.SI-ID 2827144], [JCR, SNIP, WoS]
13. VOLJČ, Mojca, FRANKIČ, Tamara, LEVART, Alenka, NEMEC, Marija, SALOBIR, Janez. Evaluation of different vitamin E recommendations and bioactivity of [alfa]-tocopherol isomers in broiler nutrition by measuring oxidative stress in vivo and the oxidative stability of meat. *Poultry science*, ISSN 0032-5791, 2011, vol. 90, no. 7, str. 1478-1488. [COBISS.SI-ID 2888840], [JCR, SNIP, WoS]
14. FRANKIČ, Tamara, LEVART, Alenka, SALOBIR, Janez. The effect of vitamin E and plant extract mixture composed of carvacrol, cinnamaldehyde and capsaicin on oxidative stress induced by high PUFA load in young pigs. *Animal*, ISSN 1751-7311, 2010, vol. 4, no. 4, str. 572-578. [COBISS.SI-ID 2543240], [JCR, SNIP, WoS]
15. SALOBIR, Janez, PAJK ŽONTAR, Tanja, LEVART, Alenka, REZAR, Vida. The comparison of black currant juice and vitamin E for the prevention of oxidative stress. *International journal for vitamin and nutrition research*, ISSN 0300-9831, 2010, vol. 80, no. 1, str. 5-11. [COBISS.SI-ID 2647688], [JCR, SNIP, WoS]
16. FRANKIČ, Tamara, SALOBIR, Karl, SALOBIR, Janez. The comparison of in vivo antigenotoxic and antioxidative capacity of two propylene glycol extracts of Calendula officinalis (marigold) and vitamin E in young growing pigs. *Journal of animal physiology and animal nutrition*, ISSN 0931-2439, 2009, vol. 93, str. 688-694, [COBISS.SI-ID 2356616], [JCR, SNIP, WoS]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Prehranska biokemija**
Course title:	**Nutritional biochemistry**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Prehrana**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Nutrition**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
20	**30**	**/**	**/**	**20**	**180**	**10**

Nosilec predmeta / Lecturer:	Nosilec: prof. dr. Nataša Poklar Ulrih

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

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

Vsebina:	**Content (Syllabus outline):**

Katabolno-anabolne pretvorbe v različnih fizioloških stanjih organizma; v hranilnem / ne-hranilnem obdobju, telesnem naporu, stradanju, stresu, travmi, izpostavitvi mrazu in odraščanju. Nevralni in hormonski nadzor prebavnih podprocesov: gibanja in izločanja v prebavilih. Prebava ogljikovih hidratov in beljakovin, absorpcija njihovih presnovkov v prebavilih. Prebava in absorpcija lipidov. Biliarni sistem, enterohepatično kroženje žolčnih kislin in urobilinski ciklus. Holesterol v prehrani. Regulacija energijskega metabolizma: možgani in energijski metabolizem, hormonska regulacija, alkohol in poživila, debelost. Najpomembnejše presnovne in prebavne motnje. Vpliv prehrane na zdravje človeka. Nutrigenomika in nutrigenetika. Ateroskleroza. Bolezni srca in ožilja, diabetes. Prehrana in rak. Spojine sekundarnega metabolizma: razdelitev, razširjenost. Pregled in glavne stopnje biosinteznih poti izoprenoidov, fenolnih spojin in taninov. Mesta regulacije. Pomen nekaterih sekundarnih metabolitov, posebno izoprenoidov (kot karotenoidov) in fenolnih spojin (fenolnih kislin, antocianov in flavonoidov) za človeško prehrano. Potencialni biološki učinki. Biorazpoložljivost fenolnih spojin.	Metabolic (catabolic-anabolic) interrelationships in well-fed and starved states, under stress, trauma, body exercise; growing up; under cold conditions. Digestion and absorption: digestive tract, digestion and absorption of proteins, digestion and absorption of carbohydrates, digestion and absorption of lipids; absorption physiology; biliary systems, urobilinogen cycle, enterohepatic circulation of bile acids, diet and cholesterol regulation of energy metabolism: the brain and energy metabolism; hormonic regulation of metabolism, alcohol and drugs, obesity. Nutrigenomic and nutriomics, diet and health: effect of diet and drugs on atherosclerosis, diabetes, cardiovascular disease, diet and cancer. Compounds of secondary metabolism: classification, distribution. Overview of their biosynthetic pathways with regulation. Importance of some secondary metabolites esp. isoprenoids (like carotenoids) and phenolic compounds (like anthocyanins and flavonoids) in human nutrition. Their potential biological activity. Bioavailability of phenolic compounds.

Temeljni literatura in viri / Readings:

- T. Brody (1999). Nutritional Biochemistry, Academic Press, San Diego, ZDA, str. 57-128,133-153, 157-258, 273-307, 879-917
- Biochemistry of Plant Secondary Metabolism. (2010). Ed. M. Wink..Wiley-Blackwell, Oxford, United Kingdom, str. 1-19, 92-116, 129-135, 182-193, 223-230, 258-278, 367-370.
- D. S. Seigler. Plant Secondary Metabolism. (1998). Kluwer Academic Publishers, Boston, U.S.A., str. 486-500.
- revijalni članki s področja, tekoča periodika, druga učna gradiva…

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilji: Študenti bodo poglobili znanje o glavnih metaboličnih poteh primarnega in sekundarnega metabolizma, njihovi regulaciji in delovanju posameznih tkiv in organov ter presnovi v različnih bolezenskih stanjih. Študijski rezultati: Vse to naj bi študentom omogočilo razumevanje in povezovanje kompleksnih procesov metabolizma in pravilni prehrani.	Educational outcomes: students will deepen their knowledge of the main metabolic processes of primary and secondary metabolisms, their regulation, function of selected tissues, organs and their metabolic pathways in different diseases. Results: All the above should enable students to understand and connect complex processes of metabolism with proper diet.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje.	Knowledge and understanding.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, priprava seminarjev - timsko delo in debate.	Lectures. Seminars – team work and discussions.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminar	**50**	Seminars
Pisni izpit	**50**	Written examination

Reference nosilca / Lecturer's references:

Prof. dr. Nataša Poklar Ulrih

1. POLAK, Andraž, TAREK, Mounir, TOMŠIČ, Matija, VALANT, Janez, POKLAR ULRIH, Nataša, JAMNIK, Andrej, KRAMAR, Peter, MIKLAVČIČ, Damijan. Electroporation of archaeal lipid membranes using MD simulations. Bioelectrochemistry, ISSN 1567-5394. [Print ed.], 2014, str. [1-9, v tisku], doi: /10.1016/j.bioelechem.2013.12.006. [COBISS.SI-ID 4362104]
2. BUDIME SANTHOSH, Poornima, VELIKONJA, Aljaž, PERUTKOVÁ, Šárka, GONGADZE, Ekaterina, KULKARNI, Mukta Vishwanath, GENOVA, Julia, ELERŠIČ, Kristina, IGLIČ, Aleš, KRALJ-IGLIČ, Veronika, POKLAR ULRIH, Nataša. Influence of nanoparticle-membrane electrostatic interactions on membrane fluidity and bending elasticity. Chemistry and physics of lipids, ISSN 0009-3084. [Print ed.], Feb. 2014, vol. 178, str. 52-62, ilustr., doi: 10.1016/j.chemphyslip.2013.11.009. [COBISS.SI-ID 4329848]
3. BUDIME SANTHOSH, Poornima, IVANOVA KIRYAKOVA, Sophia, GENOVA, Julia, POKLAR ULRIH, Nataša. Influence of iron oxide nanoparticles on bending elasticity and bilayer fluidity of phosphotidylcholine liposomal membranes. Colloids and surfaces. A, Physicochemical and Engineering Aspects, ISSN 0927-7757. [Print ed.], 2014, str. [1-15 str., sprejeto v objavo], doi: 10.1016/j.colsurfa.2014.02.035. [COBISS.SI-ID 4366712]
4. VIDRIH, Rajko, HRIBAR, Janez, PRGOMET, Željko, POKLAR ULRIH, Nataša. The physico-chemical properties of strawberry tree (Arbutus unedo L.) fruits. Croatian journal of food science and technology, ISSN 1847-3466, 2013, vol. 5, no. 1, str. 29-33. http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=156345. [COBISS.SI-ID 4277624]

5. BATISTA NAPOTNIK, Tina, VALANT, Janez, GMAJNER, Dejan, PASSAMONTI, Sabina, MIKLAVČIČ, Damijan, POKLAR ULRIH, Nataša. Cytotoxicity and uptake of archaeosomes prepared from Aeropyrum pernix lipids. Human and experimental toxicology, ISSN 0960-3271, 2013, vol. 32, no. 9, str. 950-959. http://het.sagepub.com/content/early/2013/02/20/0960327113477875.full.pdf+html, doi: 10.1177/0960327113477875. [COBISS.SI-ID 4203384]
6. PREVC, Tjaša, CIGIĆ, Blaž, VIDRIH, Rajko, POKLAR ULRIH, Nataša, ŠEGATIN, Nataša. Correlation of basic oil quality indices and electrical properties of model vegetable oil systems. Journal of agricultural and food chemistry, ISSN 0021-8561, 2013, vol. 61, str. 11355-11362, doi: 10.1021/jf402943b. [COBISS.SI-ID 4329080]

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Probiotiki**
Course title:	**Probiotics**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Interdisciplinarni doktorski študijski program BIOZNANOSTI 3. stopnja	**Prehrana**	**1,2**	**1,2,3,4**
Interdisciplinary Doctoral Study Programme in BIOSCIENCES 3rd cycle	**Nutrition**	**1,2**	**1,2,3,4**

Vrsta predmeta / Course type	teoretični predmet / theoretical course
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	**15**	**10**	**/**	**/**	**90**	**5**

Nosilec predmeta / Lecturer:	Nosilec: Prof. dr. Irena Rogelj

Jeziki / Languages:	**Predavanja / Lectures:**	**slovenski / angleški Slovene / English**
	Vaje / Tutorial:	**slovenski / angleški Slovene / English**

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

Vsebina: **Content (Syllabus outline):**

Razvoj probiotikov za živali in ljudi. Selekcijski kriteriji za probiotike; sposobnost kolonizacije, fiziološke lastnosti, varnost (invazivnost, rezistenca proti antibiotikom, tvorba toksinov, virulentni faktorji, kompetitivnost), tehnološke lastnosti (preživetje tehnoloških postopkov fermentacije, sušenja, liofilizacije, enkapsulacije; obstojnost v različnih matriksih in pogojih skladiščenja,). Mehanizmi delovanja in markerji sledenja: kompeticija za hranila, kompeticija za mesta pripenjanja, protimikrobna in protivirusna aktivnost, komunikacija s črevesnimi celicami, posredna in neposredna regulacija metabolizma, protimutagena aktivnost, uravnavanje imunskega sistema. Teorija obrambe na treh nivojih. Pomen razvoja mikrobioma za zdravje organizma, spremembe mikrobiote prebavil v različnih življenskih obdobjih in pod vplivom zunanjih dejavnikov ter možna preventiva in terapija s probiotiki. Trditve o zdravstvenih učinkih probiotikov (»health claims«); Probiotiki kot funkcionalna živila, prehranska dopolnila in krmni dodatki (prirast, preprečevanje okužb). Probiotiki kot terapevtiki: laktozna intoleranca, črevesne okužbe in vnetja, preprečevanje AAD (antibiotic associated diarhea), rotavirusna driska, *Helicobacter pylori*, urogenitalne okužbe, zaščita mlečne žleze. Vaje: predstavitev klasičnih in genetskih metod proučevanja zgoraj naštetih mehanizmov delovanja probiotikov ter metod, ki se uporabljajo za kontrolo probiotičnih preparatov in probiotičnih živil. Seminarske vaje: načrtovanje in-vivo in kliničnih raziskav.	Development of probiotics for animals and humans. Selection criteria for probiotics: colonisation ability, physiological properties, safety (invasiveness, resistance to antibiotics, formation of toxins, virulence factors, competitiveness), technological properties (survival during technological procedures of fermentation, drying, lyophilisation, encapsulation; resistance in various matrices and storage conditions). Mechanisms of functioning and markers for tracing: competition for nutrients, competititon for attachment sites, antimicrobial and antivirus activity, communication with intestinal cells, indirect and direct regulation of metabolism, antimutagenic activity, balancing the immune system. Theory of defence on three levels. Importance of the development of microbiomes for the health of an organism, changes of intestinal microbiota in various life periods and under the influence of external factors and possible preventive treatment and therapy with probiotics. Claims of the health effects of probiotics (»health claims«); probiotics as functional food, food and feed additives (growth, preventing infection). Probiotics as therapeutics: lactose intolerance; intestinal infections and inflammation, preventing AAD (antibiotic associated diarrhea), rotavirus diarrhea, *Helicobacter pylori*, urogenital infections, protection of mammary gland. Exercises: presentation of classical and genetic methods for studying the probiotics and methods used for control of probiotic preparations and probiotic foods. Seminar exercises: planning *in vivo* and clinical research.

Temeljni literatura in viri / Readings:

- O'Connor, E.B., Barrett, E., Fitzgerald, G., Hill, C., Stanton, C., Ross, R.P. Production of Vitamins, Exopolysaccharides and Bacteriocins by Probiotic Bacteria. In: Probiotic Dairy Products, Tamime, Y.A. (Ed.), Blackwell Publishing Ltd., Oxford, 2005, str. 167-195.
- Ouwehand, A.C., Søndberg Svendsen, L., Leyer, G. Probiotics from Strain to Product. In: Probiotics and Health Claims, Kneifel, W., Salminen, S. (Eds.), Blackwell Publishing Ltd., UK, 2011; 37-49.
- Chassard, C., Grattepanche, F., Lacrois, C. Probiotics and Health Claims: Challenges for Tailoring their Efficacy. In: Probiotics and Health Claims, Kneifel, W., Salminen, S. (Eds.), Blackwell Publishing Ltd., UK, 2011; 49-75.
- Guidelines for the Evaluation of Probiotics in Food. Joint FAO/WHO Working Group Report on Drafting Guidelines for the Evaluation of Probiotics in Food, London, Ontario, Canada, 2002, 11 str.
- tekoča znanstvena periodika

Cilji in kompetence:

Temeljni izobraževalni cilj je poglobiti znanja s celotnega področja probiotikov (funkcionalna živila, prehranska dopolnila, krmni dodatki, terapevtiki), ki bo omogočilo študentu samostojno delo od izbire novih sevov, proučevanja mehanizmov učinkovanja in potrjevanja probiotičnih učinkov (*in-vitro*, *in-vivo*, klinične študije), preverjanja varnosti in tehnoloških lastnosti do možnih aplikacij.

Objectives and competences:

Educational aims: The basic educational aim is to deepen knowledge from the whole field of probiotics (functional food, food and feed additives, therapeutics) which will enable a student to perform independent work, from selection of new strains, studying mechanisms of action and confirming probiotic effects (*in vitro, in vivo,* clinical studies), checking safety and technological properties to possible applications.

Predvideni študijski rezultati:

Znanje in razumevanje:
delovanja probiotikov, njihove možne vloge v razvoju črevesne mikrobiote, vzdrževanju mikrobiote in terapiji pri različnih kliničnih indikacijah

Intended learning outcomes:

Knowledge and understanding:
of probiotic's activity and their possible role in the development of the intestinal microbiota, in maintaining of balanced microbiota and in various clinical indications therapy

Metode poučevanja in učenja:

Predmet se bo izvajal v obliki:
- predavanj, na katerih bodo predavatelji skušali predstaviti celotno področje znanosti o probiotikih s poudarkom na najnovejših odkritjih in metodah proučevanja,
- seminarskih vaj, kjer bodo študentje skupaj z učitelji oblikovali problemsko temo seminarske naloge in
- laboratorijskih vaj, kjer bodo na konkretnih primerih spoznali sodobne metode proučevanja probiotikov.

Learning and teaching methods:

The subject will be taught in the form of:
- lectures, at which the lecturer will try to present the entire field of science of probiotics with a stress on the most recent discoveries and methods of studying probiotics.
- seminar, at which students together with teachers will design problem themes for seminar tasks and
- laboratory exercises at which they will learn contemporary methods of studying probiotics through specific cases.

Načini ocenjevanja: Delež (v %) / **Assessment:**

	Weight (in %)	
Seminar	**30%**	Seminar
Pisni ali ustni izpit	**70%**	Written or oral exam

Reference nosilca / izvajalcev / Lecturer's references:

Irena Rogelj

1. TURKOVÁ, Kristýna, MAVRIČ, Anja, NARAT, Mojca, RITTICH, Bohuslav, ŠPANOVÁ, Alena, ROGELJ, Irena, BOGOVIČ MATIJAŠIĆ, Bojana. Evaluation of *Lactobacillus* strains for selected probiotic properties. *Folia microbiologica*, ISSN 0015-5632. [Print ed.], 2013, vol. 58, issue 4, str. 261-267, doi: 10.1007/s12223-012-0208-4. [COBISS.SI-ID 3147400]
2. TREVEN, Primož, TURKOVÁ, Kristýna, TRMČIĆ, Aljoša, OBERMAJER, Tanja, ROGELJ, Irena, BOGOVIČ MATIJAŠIĆ, Bojana. Detection and quantification of probiotic strain *Lactobacillus gasseri* K7 in faecal samples by targeting bacteriocin genes. *Folia microbiologica*, ISSN 0015-5632. [Print ed.], 2013, vol. 58, no. 6, str. 623-630, doi: 10.1007/s12223-013-0252-8. [COBISS.SI-ID 3222664].
3. NOVAK, Rok, BOGOVIČ MATIJAŠIĆ, Bojana, TERČIČ, Dušan, ČERVEK, Matjaž, GORJANC, Gregor, HOLCMAN, Antonija, LEVART, Alenka, ROGELJ, Irena. Effects of two probiotic additives containing *Bacillus* spores on carcass characteristics, blood lipids and cecal volatile fatty acids in meat type chickens. *Journal of animal physiology and animal nutrition*, ISSN 0931-2439, 2011, vol. 95, no. 4, str. 424-433. http://onlinelibrary.wiley.com/doi/10.1111/j.1439-0396.2010.01068.x/abstract, doi: 10.1111/j.1439-0396.2010.01068.x. [COBISS.SI-ID 2755464].
4. BOGOVIČ MATIJAŠIĆ, Bojana, OBERMAJER, Tanja, ROGELJ, Irena. Quantification of *Lactobacillus gasseri*, *Enterococcus faecium* and *Bifidobacterium infantis* in a probiotic OTC drug by Real-time PCR. *Food control*, ISSN 0956-7135. [Print ed.], 2010, issue 4, vol. 24, str. 419-425. http://dx.doi.org/10.1016/j.foodcont.2009.07.001, doi: 10.1016/j.foodcont.2009.07.001. [COBISS.SI-ID 2476680].
5. KRAMER, Mateja, OBERMAJER, Nataša, BOGOVIČ MATIJAŠIĆ, Bojana, ROGELJ, Irena, KMETEC, Vojko. Quantification of live and dead probiotic bacteria in lyophilised product by real-time PCR and by flow cytometry. *Applied microbiology and biotechnology*, ISSN 0175-7598, 2009, no. 6, vol. 84, str. 1137-1147. http://www.springerlink.com/content/fg45527643638027/, doi: 10.1007/s00253-009-2068-7. [COBISS.SI-ID 2592625].
6. MOHAR LORBEG, Petra, ČANŽEK MAJHENIČ, Andreja, ROGELJ, Irena. Evaluation of different primers for PCR-DGGE analysis of cheese-associated enterococci. *Journal of Dairy Research*, ISSN 0022-0299, 2009, vol. 76, str. 265-271. http://journals.cambridge.org/download.php?file=%2FDAR%2FS0022029909003902a.pdf&code=2bdc0072dc343ec99f1f376d4cb1ef35, doi: 10.1017/S0022029909003902. [COBISS.SI-ID 2445704].