

## PREHRANA – TEORETIČNI PREDMETI

### UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Molekularno biološke metode v prehrani in živilstvu
<b>Course title:</b>	Molecular biology methods in nutrition and food science

<b>Študijski programi in stopnja</b>	<b>Študijska smer</b>	<b>Letnik</b>	<b>Semestri</b>
Bioznanosti, tretja stopnja, doktorski	prehrana		Celoletni

**Univerzitetna koda predmeta/University course code:** 3825

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	5	0	0	15	95	5

**Nosilec predmeta/Lecturer:** Polona Jamnik

<b>Izvajalci predavanj:</b>	Polona Jamnik, Anja Klančnik, Sonja Smole Možina, Jana Žel
<b>Izvajalci seminarjev:</b>	
<b>Izvajalci vaj:</b>	
<b>Izvajalci kliničnih vaj:</b>	
<b>Izvajalci drugih oblik:</b>	
<b>Izvajalci praktičnega usposabljanja:</b>	

**Vrsta predmeta/Course type:** teoretični/theoretical

<b>Jeziki/Languages:</b>	<b>Predavanja/Lectures:</b>	Angleščina, Slovenščina
	<b>Vaje/Tutorial:</b>	Angleščina, Slovenščina

<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>	<b>Prerequisites:</b>
Splošni pogoji za vpis na doktorski študij.	General conditions for enrollment in doctoral studies.

<b>Vsebina:</b>	<b>Content (Syllabus outline):</b>
<ul style="list-style-type: none"><li>- Molekularne metode določanja gensko spremenjenih organizmov v živilih</li><li>- Proteomske metode za ugotavljanje kakovosti in varnosti živil ter vpliva prehrane na izražanje proteinov (nutriproteomika)</li><li>- 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</li></ul>	<ul style="list-style-type: none"><li>- Molecular methods of identifying genetically modified organisms in food</li><li>- Proteomic methods for determining food quality and safety and the effect of nutrition on protein expression (nutriproteomics)</li><li>- Application of different principles and methods for identification, typification and quantification of micro-organisms in food and food chain to trace contamination</li></ul>

<ul style="list-style-type: none"> <li>- Novejši metodološki pristopi testiranja delovanja protimikrobnih naravnih snovi</li> <li>- Metode za metagenomske in transkriptomске analize za ugotavljanje vpliva prehrane na mikrobioto gostitelja</li> <li>- Molekularne metode za analize fermentiranih mlečnih izdelkov in probiotičnih izdelkov (živila, prehranska dopolnila)</li> </ul>	<ul style="list-style-type: none"> <li>- Novel methodological approaches for testing action of natural antimicrobial compounds</li> <li>- Methods for metagenomic and transcriptomic analysis to study the impact of diet on the microbiota of the host</li> <li>- Molecular methods for the analysis of fermented dairy products and probiotic products (food, dietary supplements)</li> </ul>
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### Temeljna 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](https://doi.org/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:

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-prehranski verigi in novejšie 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

### Objectives and competences:

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 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:

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.

### Intended learning outcomes:

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/Weight**

**Assessment:**

• izpit	70,00 %	• exam
• seminar	30,00 %	• seminar

**Reference nosilca/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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 hyperthermophilic 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](https://doi.org/10.1007/s11274-010-0333-7). [COBISS.SI-ID 3750008]

RANDHAWA, Gurinder Jit, SINGH, Monika, MORISSET, Dany, SOOD, Payal, **ŽEL, Jana**. Loop-mediated isothermal amplification : rapid visual and real-time methods for detection of genetically modified crops. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, no. 47, str. 11338-11346. <http://dx.doi.org/10.1021/jf4030085>, doi: [10.1021/jf4030085](https://doi.org/10.1021/jf4030085). [COBISS.SI-ID 3059023]

MORISSET, Dany, ŠTEBIH, Dejan, MILAVEC, Mojca, GRUDEN, Kristina, **ŽEL, Jana**. Quantitative analysis of food and feed samples with droplet digital PCR. *PloS one*, ISSN 1932-6203, 2013, vol. 8, issue 5, str. e62583-1-e62583-

9. <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0062583>;jsessionid=DF4F7162FA7C190252A6F73DBD180ECA, doi: [10.1371/journal.pone.0062583](https://doi.org/10.1371/journal.pone.0062583). [COBISS.SI-ID 2785359]

RUTTINK, Tom, MORISSET, Dany, VAN DROOGENBROECK, Bart, LAVRAČ, Nada, EEDE, G. van den, **ŽEL, Jana**, DE LOOSE, Marc. Knowledge-technology-based discovery of unauthorized genetically modified organisms. *Analytical and bioanalytical chemistry*, ISSN 1618-2642, 2010, vol. 396, no. 6, str. 1951-1959. <http://dx.doi.org/10.1007/s00216-009-3218-6>, doi: [10.1007/s00216-009-3218-6](https://doi.org/10.1007/s00216-009-3218-6). [COBISS.SI-ID 23118375]

QUERCI, Maddalena, BULCKE, Marc Van den, **ŽEL, Jana**, EEDE, G. van den, BROLL, Hermann. New approaches in GMO detection. *Analytical and bioanalytical chemistry*, ISSN 1618-2642, 2010, issue 6, vol. 296, str. 1991-2002. <http://dx.doi.org/10.1007/s00216-009-3237-3>, doi: [10.1007/s00216-009-3237-3](https://doi.org/10.1007/s00216-009-3237-3). [COBISS.SI-ID 2128207]

BUH GAŠPARIČ, Meti, TENGS, Torstein, LA PAZ, Jose Luiz, HOLST-JENSEN, Arne, PLA, Maria, ESTEVE, Teresa, **ŽEL, Jana**, GRUDEN, Kristina. Comparison of nine different real-time PCR chemistries for qualitative and quantitative applications in GMO detection. *Analytical and bioanalytical chemistry*, ISSN 1618-2642, 2010, vol. 396, no. 6, str. 2023-2029. <http://dx.doi.org/10.1007/s00216-009-3418-0>, doi: [10.1007/s00216-009-3418-0](https://doi.org/10.1007/s00216-009-3418-0). [COBISS.SI-ID 2164047]

**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]

TOPLAK, Nataša, KOVAČ, Minka, PISKERNIK, Saša, **SMOLE MOŽINA, Sonja**, JERŠEK, Barbara. Detection and quantification of *Campylobacter jejuni* and *Campylobacter coli* using real-time multiplex PCR. *Journal of applied microbiology*, ISSN 1364-5072, 2012, vol. 112, issue 4, str. 752-764, doi: [10.1111/j.1365-2672.2012.05235.x](https://doi.org/10.1111/j.1365-2672.2012.05235.x). [COBISS.SI-ID 4039288]

MAVRI, Ana, **SMOLE MOŽINA, Sonja**. Involvement of efflux mechanisms in biocide resistance of *Campylobacter jejuni* and *Campylobacter coli*. *Journal of medical microbiology*, ISSN 0022-2615, 2012, vol. 61, pt. 6, str. 800-808, doi: [10.1099/jmm.0.041467-0](https://doi.org/10.1099/jmm.0.041467-0). [COBISS.SI-ID 4053112]

KURINČIČ, Marija, KLANČNIK, Anja, **SMOLE MOŽINA, Sonja**. Effects of efflux pump inhibitors on erythromycin, ciprofloxacin and tetracycline resistance in *Campylobacter* spp. isolates. *Microbial drug resistance*, ISSN 1076-6294, 2012, vol. 18, issue 5, str. 492-501, doi: [10.1089/mdr.2012.0017](https://doi.org/10.1089/mdr.2012.0017). [COBISS.SI-ID 4097912]

TRNČIKOVA, Tereza, PISKERNIK, Saša, KACLÍKOVA, Eva, **SMOLE MOŽINA, Sonja**, KUČHTA, Tomáš, JERŠEK, Barbara. Characterization of *Staphylococcus aureus* strains isolated from food produced in Slovakia and Slovenia with regard to the presence of genes encoding for enterotoxins. *Journal of food and nutrition research*, ISSN 1336-8672, 2010, vol. 49, no. 4, str. 215-220. [COBISS.SI-ID 3806328]

KLANČNIK, Anja, PISKERNIK, Saša, JERŠEK, Barbara, **SMOLE MOŽINA, Sonja**. Evaluation of diffusion and dilution methods to determine the antibacterial activity of plant extracts. *Journal of microbiological methods*, ISSN 0167-7012. [Print ed.], 2010, issue 2, vol. 81, str. 121-126, doi: [10.1016/j.mimet.2010.02.004](https://doi.org/10.1016/j.mimet.2010.02.004). [COBISS.SI-ID 3752312]

KLANČNIK, Anja, GUZEJ, Bernarda, JAMNIK, Polona, VUČKOVIČ, Darinka, ABRAM, Maja, **SMOLE MOŽINA, Sonja**. Stress response and pathogenic potential of *Campylobacter jejuni* cells exposed to starvation. *Research in Microbiology*, ISSN 0923-2508. [Print ed.], 2009, issue 5, vol. 160, str. 345-352, doi: [10.1016/j.resmic.2009.05.002](https://doi.org/10.1016/j.resmic.2009.05.002). [COBISS.SI-ID 3635064]

KURINČIČ, Marija, **KLANČNIK, Anja**, SMOLE MOŽINA, Sonja. Epigallocatechin gallate as a modulator of *Campylobacter* resistance to macrolide antibiotics. *International journal of antimicrobial agents*, ISSN 0924-8579. [Print ed.], 2012, vol. 40, issue 5, str. 467-471, doi: <http://dx.doi.org/10.1016/j.ijantimicag.2012.07.015>. [COBISS.SI-ID 4119160]

**KLANČNIK, Anja**, GRÖBLACHER, Barbara, KOVAČ, Jasna, SMOLE MOŽINA, Sonja. Anti-*Campylobacter* and resistance-modifying activity of *Alpinia katsumadai* seed extracts. *Journal of applied microbiology*, ISSN 1364-5072, 2012, vol. 113, issue 5, str. 1249-1262, doi: [10.1111/j.1365-2672.2012.05424.x](https://doi.org/10.1111/j.1365-2672.2012.05424.x). [COBISS.SI-ID 4120696]

**KLANČNIK, Anja**, SMOLE MOŽINA, Sonja, ZHANG, Qijing. Anti-*Campylobacter* activities and resistance mechanisms of natural phenolic compounds in *Campylobacter*. *PloS one*, ISSN 1932-6203, 2012, vol. 7, no. 12, str. 1-10, e51800, doi: [10.1371/journal.pone.0051800](https://doi.org/10.1371/journal.pone.0051800). [COBISS.SI-ID 4160120]

PISKERNIK, Saša, **KLANČNIK, Anja**, TANDRUP RIEDEL, Charlotte, BRØNDSTED, Lone, SMOLE MOŽINA, Sonja. Reduction of *Campylobacter jejuni* by natural antimicrobials in chicken meat-related conditions. *Food control*, ISSN 0956-7135. [Print ed.], 2011, vol. 22, issue 5, str. 718-724, doi: [10.1016/j.foodcont.2010.11.002](https://doi.org/10.1016/j.foodcont.2010.11.002). [COBISS.SI-ID 3836280]

**KLANČNIK, Anja**, GUZEJ, Bernarda, HADOLIN KOLAR, Majda, ABRAMOVIČ, Helena, SMOLE MOŽINA, Sonja. In vitro antimicrobial and antioxidant activity of commercial rosemary extract formulations. *Journal of food protection*, ISSN 0362-028X, 2009, vol. 72, no. 8, str. 1744-1752. [COBISS.SI-ID 3604088]

ŠIKIĆ POGAČAR, Maja, **KLANČNIK, Anja**, SMOLE MOŽINA, Sonja, CENCIČ, Avrelija. Attachment, invasion, and translocation of *Campylobacter jejuni* in pig small-intestinal epithelial cells. *Foodborne pathogens and disease*, ISSN 1535-3141, 2010, issue 5, vol. 7, str. 589-595, doi: [10.1089/fpd.2009.0301](https://doi.org/10.1089/fpd.2009.0301). [COBISS.SI-ID 3737720]

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

**Predmet:** Klinična prehrana  
**Course title:** Clinical nutrition

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

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

0

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	35	0	0	0	80	5

**Nosilec predmeta/Lecturer:** Evgen Benedik

**Izvajalci predavanj:** Evgen Benedik  
**Izvajalci seminarjev:**  
**Izvajalci vaj:**  
**Izvajalci kliničnih vaj:**  
**Izvajalci drugih oblik:**  
**Izvajalci praktičnega usposabljanja:**

**Vrsta predmeta/Course type:** teoretični/theoretical

**Jeziki/Languages:**

Predavanja/Lectures:	Slovenščina
Vaje/Tutorial:	Slovenščina

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

Splošni pogoji za vpis na doktorski študij

**Prerequisites:**

General conditions for enrollment in doctoral studies

**Vsebina:**

Pojem prehranskega statusa  
Proces prehranske obravnave:  
- Presejalni testi za ugotavljanje prehranske ogroženosti  
- Prehranski pregled  
Ocena prehranskega statusa in vloga kliničnih podatkov (zdravstveno stanje)  
Antropometrične meritve, indeksi in meritve telesne sestave ter uporaba normativov  
Metode ugotavljanja prehranskega vnosa  
- Metoda jedilnika prejšnjega dne  
- Metoda ocenjene ali tehtane količine obroka  
- Papirni prehranski dnevniki

**Content (Syllabus outline):**

The concept of nutritional status  
The nutrition care process (nutritional evaluation):  
- Malnutrition risk screening  
- Nutritional assessment  
Assessment of nutritional status and the role of clinical data (health status)  
Anthropometrical measurements, indices and measurements of body composition and the use of normative  
Methods for assessment of dietary intake:  
- 24-hour Dietary Recall (24-hr)  
- Estimated/Weighted Food Record  
- Paper based-Dietary Records

<p>- Elektronski prehranski dnevniki - Vprašalniki pogostosti uživanja živil Uporaba računalniških programov za izračun in ovrednotenje prehranskega vnosa (Prodi Expert plus, Nemčija; Odprta platforma za klinično prehrano, OPKP). Primerjava vnosa energije in hranil s prehranskimi priporočili (D-A-CH Referenčne vrednosti za vnos hranil, ESPGHAN, ESPEN, WHO) in interpretacija rezultatov. Organizacija vrtčevske/šolske prehrane in prehrane odraslih (tudi prehrane v domovih za ostarele) v relaciji z zagotavljanjem ustreznih diet Plan prehranske obravnave Prehranska podpora in terapija Spremljanje učinka prehranske podpore in terapije Dokumentacija Klinična prehrana pri različnih bolezenskih stanjih:</p> <ul style="list-style-type: none"> <li>• Pediatrična klinična prehrana</li> <li>• Prehranjenost/podhranjenost</li> <li>• Metabolni sindrom</li> <li>• Motnje hranjenja</li> <li>• Alergije</li> <li>• Intolerance</li> <li>• Odpoved različnih organskih sistemov</li> <li>• Prehrana v intenzivni neki</li> <li>• Prehrana rakavega bolnika</li> <li>• Cistična fibroza</li> <li>• Prehrana pri redkih genetskih in metabolnih boleznih</li> </ul> <p>Etika in prehrana Spretnosti dobrega prehranskega svetovanja</p>	<p>- Electronic based-Dietary Records - Food Frequency Methods, FFQ Use of computer programs to calculate and evaluate the dietary intake (Prodi Expert plus Germany; Open Platform for Clinical Nutrition, OPKP). Comparison of energy and nutrients intake to dietary recommendations (D-A-CH reference values for nutrient intake, ESPGHAN, ESPEN WHO) and interpretation of the results. Organization of kinder garden and school meals as well as meals in restaurants and canteens for adults (included homes for elderly people) Nutritional care plan Nutritional support and therapy Monitoring the effects of nutritional care and therapy Documentation Clinical nutrition in different disease states in population:</p> <ul style="list-style-type: none"> <li>• Paediatric clinical nutrition</li> <li>• Over/Malnutrition</li> <li>• Metabolic syndrome</li> <li>• Eating disorders</li> <li>• Allergies</li> <li>• Intolerances</li> <li>• Failure of different organs</li> <li>• Nutrition in intensive care</li> <li>• Nutrition support of patients with cancer</li> <li>• Cystic fibrosis</li> <li>• Nutrition in rare genetic and metabolic diseases</li> </ul> <p>Ethics and nutrition Counselling skills for dietitians</p>
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#### Temeljna literatura in viri/Readings:

1. Clinical nutrition; knjiga; 2nd ed. - Chichester: Wiley Blackwell, 2012, angleški, ISBN: 978-1-405-16810-6
  2. Dietetic and nutrition case studies; knjiga; Chichester: Wiley Blackwell, 2016; angleški, ISBN 978-1-118-89710-2; 1-118-89710-2
  3. Manual of dietetic practice; knjiga; 5th ed. - Chichester: John Wiley & Sons, cop. 2014; angleški, ISBN 978-0-470-65622-8
- Counselling skills for dietitians; Gable, Judy; Herrmann, Tamara; priročnik; 3rd ed. - [West Sussex]: Wiley Blackwell, cop. 2016; angleški, ISBN 978-1-118-94380-9

#### Cilji in kompetence:

Slušatelj spozna kaj je prehranski status in na podlagi katerih parametrov se ocenijo prehranske potrebe posameznika. Razume, da so prehranske potrebe posameznika odvisne od njegovega presnovnega in prehranskega stanja, starosti (rast) in telesne aktivnosti ter samega bolezenskega stanja.  
Na osnovi prehranske obravnave zna predvideti prehranske potrebe po energiji, makro- in mikrohranilih bolnika.

#### Objectives and competences:

A student learns what the nutritional status is and based on which parameters the nutritional needs of an individual is assessed. She/he understands that the nutritional needs of an individual depend on the metabolic and nutritional status, age (growth), activity level and clinical condition (type of disease etc.).  
Based on nutritional evaluation, she/he is able to foresee the nutritional needs for energy, macro- and micronutrients of a patient.  
He/she understands the concept of nutritional vulnerability, especially hospitalized patients, and is

<p>Razume pojem prehranske ogroženosti, predvsem hospitaliziranih bolnikov, in pozna uporabo presejalnih testov v klinični praksi.</p> <p>Pozna prednosti in slabosti različnih metod za ugotavljanje prehranskega vnosa in jih zna uporabljati.</p> <p>Pozna osnovne antropometričnih meritev ter metod za ugotavljanje sestave telesa.</p> <p>Zna izdelati individualni plan prehranske podpore in terapije pri določenih skupinah bolnikov (alergije, intolerance, diabetes, kronična vnetna črevesna bolezen, ledvična odpoved, ...).</p> <p>Zna spremljati učinke prehranske obravnave in ustrezno prilagajati prehransko podporo in terapijo.</p> <p>Nauči se osnovne komunikacije s pacienti in osnovnih načel etike.</p>	<p>familiar with the use of screening tests in clinical practice.</p> <p>He/she knows the strengths and weaknesses of different methods for determining the dietary intake and knows how to use them.</p> <p>He/she knows the basic of anthropometric measurements and methods for determination of body composition.</p> <p>He/she is capable of creating the individual nutritional support and therapy plan for the patient, especially those who have allergies, intolerances, diabetes and irritable bowel disease and others.</p> <p>He/she knows how to monitor the effect of nutritional evaluation and to adapt the nutrition support and therapy based on the patient's needs.</p> <p>He/she knows the basic communication skills with the patient and the basic of ethics.</p>
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#### **Predvideni študijski rezultati:**

Znanje in razumevanje:

Pridobljeno znanje bo slušatelju omogočilo, da bo znal prepoznati prehransko ogrožene posameznike in bolnike, opredeliti njihovo presovno stanje ter pripraviti okvirni plan prehranske podpore. Razumel bo posamezna bolezenska stanja, kjer ima pri zdravljenju oziroma obvladovanju boleznih prehrana pomembno vlogo (alergije, intolerance, diabetes, ipd.).

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

Knowledge and understanding:

The acquired knowledge will enable the student to recognize individuals or patients with the risk for malnutrition, to assess their metabolic status and prepare the informative plan for nutritional support. The student will be able understand the role of nutrition/diet in the maintenance some specific diseases (allergies, intolerances, diabetes, etc.)

#### **Metode poučevanja in učenja:**

Predavanja, projektno-seminarsko delo in diskusije. Prisotnost pri seminarjih je obvezna.

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

Lectures, project-seminar work and discussions. Attendance at seminars is obligatory.

#### **Načini ocenjevanja:**

#### **Delež/Weight**

#### **Assessment:**

Pisni izpit	70,00 %	Written exam
seminar	30,00 %	seminar

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

##### **Evgen Benedik**

1. OREL, Anija, HOMAN, Matjaž, BLAGUS, Rok, BENEDIK, Evgen, OREL, Rok, FIDLER MIS, Nataša. Nutrition of patients with severe neurologic impairment. *Radiology and oncology*, ISSN 1318-2099. [Print ed.], Dec. 2017, vol. 52, no. 1, str. 83-89, ilustr., doi: [10.1515/raon-2017-0060](https://doi.org/10.1515/raon-2017-0060). [COBISS.SI-ID [33498585](https://www.cobiss.si/id/33498585)], [JCR, SNIP, WoS do 17. 3. 2018: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 23. 12. 2017: št. citatov (TC): 0, čistih citatov (CI): 0]
2. OBERMAJER, Tanja, GRABNAR, Iztok, BENEDIK, Evgen, TUŠAR, Tina, ROBIČ PIKEL, Tatjana, FIDLER MIS, Nataša, BOGOVIČ MATIJAŠIČ, Bojana, ROGELJ, Irena. Microbes in infant gut development : placing abundance within environmental, clinical and growth parameters. *Scientific reports*, ISSN 2045-2322, 11. sep. 2017, vol. 7, art. no. 11230, str. 1-14, ilustr. <https://www.nature.com/articles/s41598-017-10244-x>, doi: [10.1038/s41598-017-10244-x](https://doi.org/10.1038/s41598-017-10244-x). [COBISS.SI-ID [3954568](https://www.cobiss.si/id/3954568)], [JCR, SNIP, WoS do 9. 12. 2018: št. citatov (TC): 4, čistih citatov (CI): 4, Scopus do 30. 11. 2018: št. citatov (TC): 2, čistih citatov (CI): 2]
3. SOLTIROVSKA ŠALAMON, Aneta, BENEDIK, Evgen, BRATANIČ, Borut, VELKAVRH, Manca, ROGELJ, Irena, FIDLER MIS, Nataša, BOGOVIČ MATIJAŠIČ, Bojana, PARO PANJAN, Darja. Vitamin D status and its determinants in healthy Slovenian pregnant women. *Annals of nutrition & metabolism*, ISSN 1421-9697,

2015, vol. 67, no. 2, str. 96-103. <http://www.karger.com/Article/Abstract/439093>, doi: [10.1159/000439093](https://doi.org/10.1159/000439093). [COBISS.SI-ID [3610248](https://www.cobiss.si/record/3610248)], [JCR, SNIP, WoS do 10. 2. 2019: št. citatov (TC): 2, čistih citatov (CI): 2, Scopus do 2. 10. 2016: št. citatov (TC): 1, čistih citatov (CI): 1]

4. BENEDIK, Evgen, KOROUŠIČ-SELJAK, Barbara, HRIBAR, Maša, ROGELJ, Irena, BRATANIČ, Borut, OREL, Rok, FIDLER MIS, Nataša. Comparison of a web-based dietary assessment tool with software for the evaluation of dietary records = Primerjava spletne aplikacije in računalniškega programa za ovrednotenje prehranskih dnevnikov. *Zdravstveno varstvo : Slovenian journal of public health*, ISSN 0351-0026. [Tiskana izd.], 2015, letn. 54, št. 2, str. 91-97, ilustr. <http://www.degruyter.com/view/j/sjph.2015.54.issue-2/sjph-2015-0014/sjph-2015-0014.xml?format=INT>, doi: [10.1515/sjph-2015-0014](https://doi.org/10.1515/sjph-2015-0014). [COBISS.SI-ID [28464423](https://www.cobiss.si/record/28464423)], [JCR, SNIP, WoS do 2. 5. 2015: št. citatov (TC): 0, čistih citatov (CI): 0, Scopus do 1. 11. 2016: št. citatov (TC): 1, čistih citatov (CI): 0]

5. BENEDIK, Evgen, KOROUŠIČ-SELJAK, Barbara, SIMČIČ, Marjan, ROGELJ, Irena, BRATANIČ, Borut, DING, Eric L., OREL, Rok, FIDLER MIS, Nataša. Comparison of paper- and web-based dietary records : a pilot study. *Annals of nutrition and metabolism*, ISSN 0250-6807, 2014, vol. 64, no. 2, str. 156-166, doi: [10.1159/000363336](https://doi.org/10.1159/000363336). [COBISS.SI-ID [1672876](https://www.cobiss.si/record/1672876)], [JCR, SNIP, WoS do 27. 8. 2018: št. citatov (TC): 5, čistih citatov (CI): 4, Scopus do 27. 9. 2018: št. citatov (TC): 3, čistih citatov (CI): 2]

6. BENEDIK, Evgen, SKRT, Mihaela, PODLIPNIK, Črtomir, POKLAR ULRIH, Nataša. Binding of flavonoids to Staphylococcal enterotoxin B. *Food and chemical toxicology*, ISSN 0278-6915, 2014, vol. 74, str. 1-8, doi: [10.1016/j.fct.2014.08.012](https://doi.org/10.1016/j.fct.2014.08.012). [COBISS.SI-ID [4417400](https://www.cobiss.si/record/4417400)], [JCR, SNIP, WoS do 15. 10. 2018: št. citatov (TC): 6, čistih citatov (CI): 4, Scopus do 27. 10. 2018: št. citatov (TC): 6, čistih citatov (CI): 4]

7. TUŠAR, Tina, ŽERDONER, Klavdija, BOGOVIČ MATIJAŠIČ, Bojana, PAVELJŠEK, Diana, BENEDIK, Evgen, BRATANIČ, Borut, FIDLER MIS, Nataša, ROGELJ, Irena. Cultivable bacteria from milk from Slovenian breastfeeding mothers. *Food technology and biotechnology : journal of the Faculty of Food Technology and Biotechnology University of Zagreb*, ISSN 1330-9862, 2014, vol. 52, no. 2, str. 242-247. [http://hrcak.srce.hr/index.php?show=clanak&id\\_clanak\\_jezik=180893](http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=180893). [COBISS.SI-ID [3398024](https://www.cobiss.si/record/3398024)], [JCR, SNIP, WoS do 2. 7. 2018: št. citatov (TC): 4, čistih citatov (CI): 2, Scopus do 27. 5. 2018: št. citatov (TC): 4, čistih citatov (CI): 2]



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Prehrana
<b>Course title:</b>	Nutrition

<b>Študijski programi in stopnja</b>	<b>Študijska smer</b>	<b>Letnik</b>	<b>Semestri</b>
Bioznanosti, tretja stopnja, doktorski	prehrana		Celoletni

**Univerzitetna koda predmeta/University course code:** 3827

<b>Predavanja</b>	<b>Seminar</b>	<b>Vaje</b>	<b>Klinične vaje</b>	<b>Druge oblike študija</b>	<b>Samostojno delo</b>	<b>ECTS</b>
20	10	0	30	0	190	10

**Nosilec predmeta/Lecturer:** Janez Salobir

<b>Izvajalci predavanj:</b>	Nataša Fidler Mis, Irena Rogelj, Janez Salobir
<b>Izvajalci seminarjev:</b>	
<b>Izvajalci vaj:</b>	
<b>Izvajalci kliničnih vaj:</b>	
<b>Izvajalci drugih oblik:</b>	
<b>Izvajalci praktičnega usposabljanja:</b>	

**Vrsta predmeta/Course type:** teoretični/theoretical

<b>Jeziki/Languages:</b>	<b>Predavanja/Lectures:</b>	Angleščina, Slovenščina
	<b>Vaje/Tutorial:</b>	Angleščina, Slovenščina

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

Na predhodno opravljenem oz. opravljenih študijskih programih skupno vsaj 60 KT s področja prehrane, hrane, biokemije ali fiziologije ljudi ali višjih živali.

**Prerequisites:**

Na predhodno opravljenem oz. opravljenih študijskih programih skupno vsaj 60 KT s področja prehrane, hrane, biokemije ali fiziologije ljudi ali višjih živali.

**Vsebina:**

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...

**Content (Syllabus outline):**

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

<ul style="list-style-type: none"> <li>• 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.</li> <li>• Prehrana, živila in zdravje: vloga nekaterih hranil in učinkovin (sekundarni rastlinski metaboliti) ter živil pri pojavnosti civilizacijskih bolezni.</li> <li>• Klinična prehrana: Prehranska podpora pri različnih bolezenskih stanjih in motnjah hranjenja ter vloga nekaterih hranil pri zdravljenju raka in pri kritično bolnih.</li> <li>• Prehranska kakovost in varnost: npr. toksini plesni ipd.</li> <li>• 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.</li> </ul>	<p>ecosystems, interactions between ingested nutrients, microbial population and the gut, the effects on tissues and systems, nutritional manipulations.</p> <ul style="list-style-type: none"> <li>• 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).</li> <li>• 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.</li> <li>• Quality and safety: e.g., toxins etc.</li> <li>• Current research methods in nutritional research: the use of nutrigenomic and metabolomic methods in relation to human and animal health.</li> </ul>
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#### Temeljna 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:

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.

#### Objectives and competences:

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:

Predviden študijski rezultat je usposobitev študenta za kritično ocenjevanje prehranskih raziskav ter vpogled v njihovo načrtovanje in izvajanje.

#### Intended learning outcomes:

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:

Predavanja (20 ur) in seminar (10 ur) potekajo v predavalnici.  
Laboratorijske vaje (30 ur) v manjših skupinah v laboratoriju.

#### Learning and teaching methods:

Lectures (20 hours) and seminar (10 hours): in the classroom.  
Practical tutorials: laboratory work (30 hours) in small groups in the laboratory.

#### Načini ocenjevanja:

- Ustni/pisni izpit

#### Delež/Weight

60,00 %

#### Assessment:

- Written/oral exam

- Seminarsko delo	40,00 %	- seminar work
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#### Reference nosilca/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. TOMAŽIN, Urška, FRANKIČ, Tamara, VOLIČ, 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]
3. VOLIČ, 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]
4. 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]
5. 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]
6. 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]
7. VOLIČ, 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]
8. 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]
9. 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]
10. 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]

##### Irena Rogelj

1. BOGOVIČ MATIJAŠIČ, Bojana, OBERMAJER, Tanja, LIPOGLAVŠEK, Luka, GRABNAR, Iztok, AVGUŠTIN, Gorazd, ROGELJ, Irena. Association of dietary type with fecal microbiota in vegetarians and omnivores in Slovenia. *European journal of nutrition*, ISSN 1436-6207. [Print ed.], 2014, in press, [COBISS.SI-ID 3303048], [JCR, SNIP]
2. SAGAYA, F. M., HACIN, Biljana, TOMPA, Gorazd, IHAN, Alojz, ŠKRAJNAR, Špela, ČERNE, Manica, HURRELL, Richard, BOGOVIČ MATIJAŠIČ, Bojana, ROGELJ, Irena, VERGÈRES, G. Lactobacillus gasseri K7 modulates the blood cell transcriptome of conventional mice infected with *Escherichia coli* O157:H7. *Journal of applied microbiology*, ISSN 1364-5072, 2014, vol. 116, in press. <http://onlinelibrary.wiley.com/doi/10.1111/jam.12440/abstract>, doi: 10.1111/jam.12440. [COBISS.SI-ID 3338376], [JCR, SNIP]
3. ROBIČ, Tatjana, BENEDIK, Evgen, FIDLER MIS, Nataša, BRATANIČ, Borut, ROGELJ, Irena, GOLJA, Petra. Challenges in determining body fat in pregnant women. *Annals of nutrition and metabolism*, ISSN 0250-6807, 2013, vol. 63, no. 4, str. 341-349. [COBISS.SI-ID 3067727], [JCR, SNIP]

4. VARDJAN, Tinkara, MOHAR LORBEG, Petra, ROGELJ, Irena, ČANŽEK MAJHENIČ, Andreja. Characterization and stability of lactobacilli and yeast microbiota in kefir grains. *Journal of dairy science*, ISSN 0022-0302, 2013, vol. 96, no. 5, str. 2729-2736. [COBISS.SI-ID [3225480](#)], [JCR, SNIP, Scopus]
5. TRACHTOVÁ, Štěpánka, OBERMAJER, Tanja, ŠPANOVA, Alena, BOGOVIČ MATIJAŠIČ, Bojana, ROGELJ, Irena, HORÁK, Daniel, RITTICH, Bohuslav. Magnetic hydrophilic poly(2-hydroxyethyl methacrylate-co-glycidyl methacrylate microspheres for DNA isolation from faeces. V: *Proceedings of the 11th international conference on frontiers of polymers and advanced materials (ICFPAM 2011)*, (Molecular crystals and liquid crystals, ISSN 1542-1406, vol. 555, issue 1, 2012). Philadelphia: Taylor and Francis, 2012, vol. 555, issue 1, str. 263-270, . [COBISS.SI-ID [3012744](#)], [JCR, SNIP, WoS]
6. SAMELIS, John, KAKOURI, Athanasia, PAPPA, Elleni C., BOGOVIČ MATIJAŠIČ, Bojana, GEORGALAKI, Marina D., TSAKALIDOU, Effie, ROGELJ, Irena. Microbial stability and safety of traditional Greek Graviera cheese : characterization of the lactic acid bacterial flora and culture-independent detection of bacteriocin genes in the ripened cheeses and their microbial consortia. *Journal of food protection*, ISSN 0362-028X, 2010, vol. 73, no. 7, str. 1294-1303. [COBISS.SI-ID [2697096](#)], [JCR, SNIP, WoS]

#### **Nataša Fidler Mis**

1. ROBIČ, Tatjana, BENEDIK, Evgen, FIDLER MIS, Nataša, BRATANIČ, Borut, ROGELJ, Irena, GOLJA, Petra. Challenges in determining body fat in pregnant women. *Annals of nutrition and metabolism*, ISSN 0250-6807, 2013, vol. 63, no. 4, str. 341-349. <http://dx.doi.org/10.1159/000358339>, doi: [10.1159/000358339](http://dx.doi.org/10.1159/000358339). [COBISS.SI-ID [3067727](#)], [JCR, SNIP]
2. KOROUŠIČ-SELJAK, Barbara, STIBILJ, Vekoslava, POGRAJC, Larisa, FIDLER MIS, Nataša, BENEDIK, Evgen. Food composition databases for effective quality nutritional care. V: 9th International Food Data Conference, September 14-17, 2011, Norwich, United Kingdom. FINGLAS, Paul M. (ur.). *Food composition and sustainable diets*, (Food chemistry, ISSN 0308-8146, Vol. 140, no. 3). Amsterdam [etc.]: Elsevier, 2013, vol. 130, no. 3, str. 495-499, [COBISS.SI-ID [26568231](#)], [JCR, SNIP, WoS]
3. FIDLER MIS, Nataša, KOBE, Helena, ŠTIMEC, Matevž. Dietary intake of macro- and micronutrients in Slovenian adolescents : comparison with reference values. *Annals of nutrition and metabolism*, ISSN 0250-6807, 2012, vol. 61, no. 4, str. 305-313, [COBISS.SI-ID [357292](#)], [JCR, SNIP, WoS]
4. KOBE, Helena, KRŽIŠNIK, Ciril, FIDLER MIS, Nataša. Under- and over-reporting of energy intake in Slovenian adolescents. *Journal of Nutrition Education and Behavior*, ISSN 1499-4046, 2012, vol. 44, iss. 6, str. 574-583 [COBISS.SI-ID [28314585](#)], [JCR, SNIP, WoS]
5. KOBE, Helena, ŠTIMEC, Matevž, HLASTAN-RIBIČ, Cirila, FIDLER MIS, Nataša, et al. Food intake in Slovenian adolescents and adherence to the Optimized Mixed Diet : a nationally representative study. *Public health nutrition*, ISSN 1368-9800, 2012, vol. 15, no. 4, str. 600-608, [COBISS.SI-ID [2575077](#)], [JCR, SNIP, WoS]
6. ŠTIMEC, Matevž, KOBE, Helena, SMOLE, Katarina, KOTNIK, Primož, ŠIRCA-ČAMPA, Andreja, ZUPANČIČ, Mirjana, BATTELINO, Tadej, KRŽIŠNIK, Ciril, FIDLER MIS, Nataša. Adequate iodine intake of Slovenian adolescents is primarily attributed to excessive salt intake. *Nutrition research*, ISSN 0271-5317. [Print ed.], 2009, letn. 29, št. 12, str. 888-896, [COBISS.SI-ID [26252249](#)], [JCR, SNIP, WoS]

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

**Predmet:** Prehrana prežvekovalcev in neprežvekovalcev  
**Course title:** Nutrition of ruminants and non-ruminants

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

**Univerzitetna koda predmeta/University course code:** 3828

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

**Nosilec predmeta/Lecturer:** Janez Salobir

**Izvajalci predavanj:** Janez Salobir, Jože Verbič  
**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:**

Na predhodno končanih študijskih programih skupno vsaj 30 KT s področja prehrane, biokemije in fiziologije ljudi oz. višjih živali.

**Prerequisites:**

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:**

Vsebina predmeta se prilagaja trenutnim aktualnim temam s področja prehrane prežvekovalcev in neprežvekovalcev predvsem s področij:

- Potrebe po hranilih: sodobne metode vrednotenja 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,

**Content (Syllabus outline):**

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.)

<p>GMO ...), vpliv prehrane na izločanje toplogrednih plinov,</p> <ul style="list-style-type: none"> <li>- Učinki nekaterih krmil in krmnih dodatkov v prehrani: klasični, rastlinski ekstrakti.</li> <li>- Antinutritivne snovi in toksini: delovanje, vpliv na zdravje, preprečevanje.</li> <li>- Vpliv prehrane na kakovost živalskih proizvodov: prehranski vplivi na senzorično in prehransko (funkcionalno) vrednost živalskih proizvodov</li> <li>- Načrtovanje in izvedba prehranske raziskave: <i>in vivo</i>, <i>in vitro</i>, <i>in sacco</i>.</li> </ul> <p>Posamezne teme vključujejo tudi spoznavanje z raziskovalnimi metodami. Nekatere analitske metode pa bodo predstavljene v okviru laboratorijskih vaj.</p>	<ul style="list-style-type: none"> <li>- effects of some feed and feed additives: mainly the effects and operation of classical feed additives (probiotics, organic acids, plant extracts)</li> <li>- antinutritive substances and toxins: mode of action, impact on health, prevention</li> <li>- influence of feed on the quality of animal products: food influence on sensoric and nutritional (functional) value of animal products</li> <li>- planning and implementation of nutrition research: : <i>in vivo</i>, <i>in vitro</i>, <i>in sacco</i></li> </ul> <p>Individual themes also include familiarity with research methods. Some analytical methods will be presented within the framework of laboratory practicals.</p>
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#### Temeljna literatura in viri/Readings:

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

#### Cilji in kompetence:

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 raziskovalnih problemov prehrane živali.

#### Objectives and competences:

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 feed of animals through selected practical laboratory exercises.

#### Predvideni študijski rezultati:

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.

#### Intended learning outcomes:

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:

Predavanja (10 ur) in seminar (5 ur) potekajo v predavalnici.

#### Learning and teaching methods:

Lectures (10 hours) and seminar (5 hours): in the classroom.

Laboratorijske vaje (15 ur) v manjših skupinah v laboratoriju. Konzultacije (15 ur) v manjših skupinah.	Practical tutorials: laboratory work (15 hours) in small groups in the laboratory. Consultations (15 hours) in small groups.
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Načini ocenjevanja:	Delež/Weight	Assessment:
Ocena izpita: - Ustni/pisni izpit	60,00 %	Exam score: - Written/oral exam
Seminarsko delo	40,00 %	- seminar work

#### Reference nosilca/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]

##### Jože Verbič

1. CHASSAING, Chantal, SIBRA, Cécile, VERBIČ, Jože, HARSTAD, Odd Magne, GOLECKÝ, Jaroslav, MARTIN, Bruno, FERLAY, Anne, CONSTANT, Isabelle, DELAVAL, Carole, HURTAUD, Catherine, ŽNIDARŠIČ PONGRAC, Vida, AGABRIEL, Claire. Mineral, vitamin A and fat composition of bulk milk related to European production conditions throughout the year. *Dairy science & technology*, ISSN 1958-5586, 2016, vol. 96, iss. 5, str. 715-733 [COBISS.SI-ID [5093224](#)], [JCR, SNIP, WoS]
2. COPPA, Mauro, CHASSAING, Chantal, FERLAY, Anne, AGABRIEL, Claire, LAURENT, Claire, BORREANI, Giorgio, BARCAROLO, Roberto, BAARS, Ton, KUSCHE, Daniel, HARSTAD, Odd Magne, VERBIČ, Jože, GOLECKÝ, Jaroslav, DELAVAL, Carole, CHILLIARD, Yves, MARTIN, Bruno. Potential of milk fatty acid composition to predict diet composition and authenticate feeding systems and altitude origin of European bulk milk. *Journal of dairy science*, ISSN 0022-0302, 2015, vol. 98, iss. 3, str. 1539-1551, [COBISS.SI-ID [4608360](#)], [JCR, SNIP, WoS]
3. BOŽIČKOVIČ, Aleksa, GRUBIĆ, Goran, VERBIČ, Jože, ŽNIDARŠIČ, Tomaž, JORDJEVIĆ, Nenad, STOJANOVIĆ, Bojan. A modified method for assessment of the morphological stage of development as a predictor of alfalfa herbage chemical composition and nutritive value. *The Journal of Agricultural Science*, ISSN 0021-8596, 2013, vol. 151, iss. 4, str. 590-598, [COBISS.SI-ID [4114024](#)], [JCR, SNIP, WoS]
4. COPPA, Mauro, FERLAY, Anne, CHASSAING, Chantal, AGABRIEL, Claire, GLASSER, Frédéric, CHILLIARD, Yves, BORREANI, Giorgio, BARCAROLO, Roberto, BAARS, Ton, KUSCHE, Daniel, HARSTAD, Odd Magne, VERBIČ, Jože, GOLECKÝ, Jaroslav, MARTIN, Bruno. Prediction of bulk milk fatty acid composition based on farming practices collected through on-farm surveys. *Journal of dairy science*, ISSN 0022-0302, 2013, vol. 96, iss. 7, str. 4197-4211, [COBISS.SI-ID [4183656](#)], [JCR, SNIP, WoS]

5. LUKAČ, Branko, KRAMBERGER, Branko, MEGLIČ, Vladimir, VERBIČ, Jože. Importance of non-leguminous forbs in animal nutrition and their ensiling properties : a review. *Žemdirbyste*, ISSN 1392-3196, 2012, vol. 99, no. 1, str. 3-8. [COBISS.SI-ID [3819624](#)], [JCR, SNIP, WoS]
6. ŽNIDARŠIČ, Tomaž, VERBIČ, Jože, BABNIK, Drago, VELIKONJA BOLTA, Špela. The effect of supplementing highly wilted grass silage with maize silage, fodder beet or molases on degradation of the diets and the efficiency of microbial protein synthesis in the rumen of sheep. *Italian Journal of Animal Science*, ISSN 1594-4077, 2010, vol. 9, str. 449-459 [COBISS.SI-ID [3482984](#)], [JCR, SNIP, WoS]



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

**Predmet:** Prehranska biokemija  
**Course title:** Nutritional biochemistry

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

**Univerzitetna koda predmeta/University course code:** 3829

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
20	30	0	0	20	180	10

**Nosilec predmeta/Lecturer:** Nataša Poklar Ulrih

<b>Izvajalci predavanj:</b>	Tadej Battelino, Nataša Poklar Ulrih
<b>Izvajalci seminarjev:</b>	
<b>Izvajalci vaj:</b>	
<b>Izvajalci kliničnih vaj:</b>	
<b>Izvajalci drugih oblik:</b>	
<b>Izvajalci praktičnega usposabljanja:</b>	

**Vrsta predmeta/Course type:** teoretični/theoretical

<b>Jeziki/Languages:</b>	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

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

Splošni pogoji za vpis na doktorski študij.

**Prerequisites:**

General conditions for enrolment in doctoral studies.

**Vsebina:**

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 cikel. Holesterol v prehrani. Regulacija energijskega metabolizma: možgani in energijski metabolizem, hormonska regulacija, alkohol in poživila, debelost. Najpomembnejše presnovne in

**Content (Syllabus outline):**

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; hormonal regulation of metabolism, alcohol and drugs, obesity.

<p>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.</p>	<p>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.</p>
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#### Temeljna 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:

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.

#### Objectives and competences:

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:

Znanje in razumevanje.

#### Intended learning outcomes:

Knowledge and understanding.

#### Metode poučevanja in učenja:

Predavanja, priprava seminarjev - timsko delo in debate.

#### Learning and teaching methods:

Lectures. Seminars – team work and discussions.

#### Načini ocenjevanja:

#### Delež/Weight

#### Assessment:

Seminar	50,00 %	Seminars
Pisni izpit	50,00 %	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](https://doi.org/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](https://doi.org/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 phosphatidylcholine 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](https://doi.org/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](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](https://doi.org/10.1177/0960327113477875). [COBISS.SI-ID 4203384]
  6. PREVC, Tjaša, CIGIČ, 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](https://doi.org/10.1021/jf402943b). [COBISS.SI-ID 4329080]

**Prof. dr. Tadej Battelino**

1. KOVAČ, Jernej, MACEDONI-LUKŠIČ, Marta, TREBUŠAK PODKRAJŠEK, Katarina, KLANČAR, Gašper, BATTELINO, Tadej. Rare single nucleotide polymorphisms in the regulatory regions of the superoxide dismutase genes in autism spectrum disorder. *Autism research*, ISSN 1939-3806, 2014, vol. 7, iss. 1, str. 138-144. <http://onlinelibrary.wiley.com/doi/10.1002/aur.1345/abstract>, doi: [10.1002/aur.1345](https://doi.org/10.1002/aur.1345). [COBISS.SI-ID 1272236]
2. DOVČ, Klemen, STARC TELIČ, Saša, LUSA, Lara, BRATANIČ, Nevenka, ŽERJAV-TANŠEK, Mojca, KOTNIK, Primož, AVBELJ, Magdalena, BATTELINO, Tadej, BRATINA, Nataša. Improved metabolic control in pediatric patients with type 1 diabetes : a nationwide prospective 12-year time trends analysis. *Diabetes technology & therapeutics*, ISSN 1520-9156, 2014, vol. 16, no. 1, str. 33-40, ilustr. <http://online.liebertpub.com/doi/abs/10.1089/dia.2013.0182>, doi: [10.1089/dia.2013.0182](https://doi.org/10.1089/dia.2013.0182). [COBISS.SI-ID 31060185]
3. BATTELINO, Tadej, BODE, Bruce W. Continuous glucose monitoring in 2013. *Diabetes technology & therapeutics*, ISSN 1520-9156, 2014, vol. 16, suppl. S1, str. S-11-S-16. <http://online.liebertpub.com/doi/pdfplus/10.1089/dia.2014.1502>, doi: [10.1089/dia.2014.1502](https://doi.org/10.1089/dia.2014.1502). [COBISS.SI-ID 1306284]
4. SEDEJ, Katarina, KOTNIK, Primož, AVBELJ, Magdalena, GROŠELJ, Urh, ŠIRCA-ČAMPA, Andreja, LUSA, Lara, BATTELINO, Tadej, BRATINA, Nataša. Decreased prevalence of hypercholesterolaemia and stabilisation of obesity trends in 5-year-old children : possible effects of changed public health policies. *European journal of endocrinology*, ISSN 0804-4643, Feb. 2014, vol. 170, iss. 2, str. 295-302. <http://ejonline.org/content/early/2013/11/13/EJE-13-0566.long>, doi: [10.1530/EJE-13-0566](https://doi.org/10.1530/EJE-13-0566). [COBISS.SI-ID 31060697]
5. PERME, Tina, POKORN, Marko, MARKELJ, Gašper, AVČIN, Tadej, BATTELINO, Tadej, URŠIČ, Tina, VIDMAR, Ivan, GROSEK, Štefan. Two episodes of systemic capillary leak syndrome in an eight-year-old boy, following influenza A virus infection. *The Pediatric infectious disease journal*, ISSN 0891-3668, Feb. 2014, vol. 33, iss.2, str. 222-224. <http://www.ncbi.nlm.nih.gov/pubmed/?term=Two+episodes+of+systemic+capillary+leak+syndrome+in+an+eight-year-old+boy%2C+following+influenza+A+virus+infection.+A+case+report>, doi: [10.1097/INF.000000000000029](https://doi.org/10.1097/INF.000000000000029). [COBISS.SI-ID 30796505]
6. KÄRNER, J., TREBUŠAK PODKRAJŠEK, Katarina, BRATANIČ, Nevenka, BATTELINO, Tadej, et al. Anti-cytokine autoantibodies suggest pathogenetic links with autoimmune regulator deficiency in humans and mice. *Clinical and experimental immunology*, ISSN 0009-9104, mar. 2013, vol. 171, iss. 3, str. 263-272, doi: [10.1111/cei.12024](https://doi.org/10.1111/cei.12024). [COBISS.SI-ID 757676]

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

**Predmet:** Probiotiki  
**Course title:** Probiotics

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

**Univerzitetna koda predmeta/University course code:** 3830

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
10	15	10	0	0	90	5

**Nosilec predmeta/Lecturer:** Irena Rogelj

**Izvajalci predavanj:** Irena Rogelj  
**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:**

Splošni pogoji za vpis na doktorski študij.

**Prerequisites:**

General conditions for enrolment in doctoral studies.

**Vsebina:**

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

**Content (Syllabus outline):**

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, competition for attachment sites, antimicrobial and antiviral activity, communication with intestinal cells, indirect

<p>neposredna regulacija metabolizma, protimutagena aktivnost, uravnavanje imunskega sistema. Teorija obrambe na treh nivojih.</p> <p>Pomen razvoja mikrobioma za zdravje organizma, spremembe mikrobiote prebavil v različnih življenjskih obdobjih in pod vplivom zunanjih dejavnikov ter možna preventiva in terapija s probiotiki.</p> <p>Trditve o zdravstvenih učinkih probiotikov (»health claims«); Probiotiki kot funkcionalna živila, prehranska dopolnila in krmni dodatki (prirast, preprečevanje okužb).</p> <p>Probiotiki kot terapevtiki: laktозна intoleranca, črevesne okužbe in vnetja, preprečevanje AAD (antibiotic associated diarrhea), rotavirusna driska, <i>Helicobacter pylori</i>, urogenitalne okužbe, zaščita mlečne žleze.</p> <p>Vaje: predstavitev klasičnih in genetskih metod proučevanja zgoraj naštetih mehanizmov delovanja probiotikov ter metod, ki se uporabljajo za kontrolo probiotičnih preparatov in probiotičnih živil.</p> <p>Seminarske vaje: načrtovanje in-vivo in kliničnih raziskav.</p>	<p>and direct regulation of metabolism, antimutagenic activity, balancing the immune system. Theory of defence on three levels.</p> <p>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.</p> <p>Claims of the health effects of probiotics (»health claims«); probiotics as functional food, food and feed additives (growth, preventing infection).</p> <p>Probiotics as therapeutics: lactose intolerance; intestinal infections and inflammation, preventing AAD (antibiotic associated diarrhea), rotavirus diarrhea, <i>Helicobacter pylori</i>, urogenital infections, protection of mammary gland.</p> <p>Exercises: presentation of classical and genetic methods for studying the probiotics and methods used for control of probiotic preparations and probiotic foods.</p> <p>Seminar exercises: planning <i>in vivo</i> and clinical research.</p>
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**Temeljna 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/Weight****Assessment:**

Seminar	30,00 %	Seminar
Pisni ali ustni izpit	70,00 %	Written or oral exam

**Reference nosilca/Lecturer's references:****Irena Rogelj**

1. TURKOVÁ, Kristýna, MAVRIČ, Anja, NARAT, Mojca, RITTICH, Bohuslav, ŠPANOVÁ, Alena, ROGELJ, Irena, BOGOVIČ MATIJAŠIČ, 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](https://doi.org/10.1007/s12223-012-0208-4). [COBISS.SI-ID 3147400]
2. TREVEN, Primož, TURKOVÁ, Kristýna, TRMČIČ, Aljoša, OBERMAJER, Tanja, ROGELJ, Irena, BOGOVIČ MATIJAŠIČ, 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](https://doi.org/10.1007/s12223-013-0252-8). [COBISS.SI-ID 3222664].
3. NOVAK, Rok, BOGOVIČ MATIJAŠIČ, 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](https://doi.org/10.1111/j.1439-0396.2010.01068.x). [COBISS.SI-ID 2755464].
4. BOGOVIČ MATIJAŠIČ, 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](https://doi.org/10.1016/j.foodcont.2009.07.001). [COBISS.SI-ID 2476680].
5. KRAMER, Mateja, OBERMAJER, Nataša, BOGOVIČ MATIJAŠIČ, 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](https://doi.org/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](https://doi.org/10.1017/S0022029909003902). [COBISS.SI-ID 2445704].

