

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Proteazni degradom v napredovanju raka
<b>Course title:</b>	Protease Degradome in Cancer Progression

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Nanoznanosti in nanotehnologije, 3. stopnja	Bioznanosti	1	1
Nanoscience and nanotechnologies, 3 <sup>rd</sup> cycle	Biosciences	1	1

**Vrsta predmeta / Course type** Izbirni / Elective

**Univerzitetna koda predmeta / University course code:** NANO3-895

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Druge oblike Other	Samost. delo Individ. work	ECTS
15	15			15	105	5

*\*Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov, sicer se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transferred to individual work.*

**Nosilec predmeta / Lecturer:** Prof. dr. Tamara Lah Turnšek

**Jeziki / Predavanja / Lectures:** slovenščina, angleščina / Slovenian, English  
**Languages: Vaje / Tutorial:**

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

Zaključena druga stopnja bolonjskega študija ali diploma univerzitetnega študijskega programa. Potrebna so osnovna znanja biokemije, biologije in še posebej celične oz. molekularne biologije.

**Prerequisites:**

Completed Bologna second cycle study program or an equivalent pre-Bologna university study program. Basic knowledge of biochemistry, biology and specifically cell biology and molecular biology is needed.

**Vsebina:**

Vsebinsko je predmet razčlenjen na več tematik s področja biologije tumorjev. Poudarjena je vloga matičnih celic v raku in v določenih aspektih tudi vloga proteaznega degradoma.

Epidemiologija raka in biomarkerji – pomen proteoliznega sistema kot pokazatelji poteka bolezni

Potek karcinogeneze: ključne molekularne spremembe v tumorskih celicah (onkogeni, tumorski supresorski geni in ostale vrste genskih sprememb, signaliziranje in epigenetika)

**Content (Syllabus outline):**

The course is divided in several themes in the field of tumour biology. The role of stem cells in cancer is emphasized and in certain aspects also the role of protease degradome.

Epidemiology of cancer and biomarkers – the impact of proteolytic system as biomarkers of the disease progression

Carcinogenesis process: The key molecular changes in tumour cells (oncogenes, tumour suppressor genes and other genetic alterations, signalling and epigenetic signalling)

Vloga in pomen matičnih celic v nastanku, razvoju in zdravljenju raka – celična terapija

Patobiološke značilnosti tumorskih (matičnih) celic: vrste in stopnje malignosti – mehanizmi signaliziranja in molekularne osnove teh patobioloških procesov

Napredovanje raka in pregled vloge proteaznega degradoma v teh procesih

The role and impact of stem cells in initiation, development and treatment of cancer – cell therapy

Pathobiological changes in the tumour (stem) cells: Cell types, degrees of malignancy, signaling mechanisms and molecular basis of these biological processes

Tumour progression and an overview of the role of protease degradation in these processes

### Temeljna literatura in viri / Readings:

Izbrana poglavja iz naslednjih knjig: / Selected chapters from the following books:

**Tannock IF, Breslow RG, Hill RP, and Harrington L, *The Basic Science of Oncology*, McGraw-Hill MedPubl Div, 2013. ISBN: 978-0-07-181349-5 electronic and ISBN: 978-0-07-174520-8, MHID: 0-07-174520-3.**

**Weinberg RA- *The Biology of Cancer*, Garland Science, Taylor & Francis Group, LLC, USA., 2007. ISBN: 0-8153-4078-8**

**Dylan E et al. (eds): *Cancer Degradome - Proteases and Cancer Biology*, Springer. ISBN-978-0-387-69056-8**

**Lah, T. T., Durán Alonso, M. B., & Van Noorden, C. J. F. (2006). Antiprotease therapy in cancer: hot or not? *Expert Opinion on Biological Therapy*, 6(3), 257–79. <http://doi.org/10.1517/14712598.6.3.257>**

**Verbovšek, U., Van Noorden, C. J. F., & Lah, T. T. (2015). Complexity of cancer protease biology: Cathepsin K expression and function in cancer progression. *Seminars in Cancer Biology*. <http://doi.org/10.1016/j.semcan.2015.08.010>**

**Breznik, B., Motaln, H., & Turnšek, T. L. (2016). Proteases and cytokines as mediators of interactions between cancer and stromal cells in tumours. *Biological Chemistry*, 0(0). <http://doi.org/10.1515/hsz-2016-0283>**

Nature Reviews Cancer – review articles on selected topics in the field of proteases & cancer

### Cilji in kompetence:

Cilj predmeta je seznaniti študenta s področja bioznanosti o pomenu znanstvenih izsledkov, tako neposredno v razumevanju poteka bolezni in posredno v klinični uporabnosti preko prenosa znanj v farmacevtsko tehnologijo in njeno uporabo v onkologiji.

Kompetence študenta z uspešno zaključenim predmetom vključujejo razumevanje osnovnih pojmov eksperimentalne in translacijske onkologije ter poznavanje sodobnih metod zdravljenja, ki temeljijo na principih individualizirane medicine, uporabnih tudi v onkologiji.

### Predvideni študijski rezultati:

Študentje, ki bodo uspešno zaključili ta predmet, bodo pridobili:

### Objectives and competences:

The goal of the course is to familiarize the student with the meaning of scientific achievements, either directly in understanding of the disease progression and indirectly in clinical application via knowledge transfer into pharmaceutical industry and its application in oncology.

The competencies of the students when successfully completing this course would include understanding of basic concepts in experimental and translational oncology as well as the understanding of temporary methods of therapy, based on the principles of individualized medicine, as applied in oncology.

### Intended learning outcomes:

The students successfully completing this course will acquire:

- Osnove nastanka rakavih obolenj – vrste karcinogeneze
- Osnovne klasifikacije rakavih obolenj in epidemiološke pristope v klinični onkologiji
- Molekularne mehanizme napredovanja raka
- Celična biologija raka s poudarkom na matičnih celicah
- Razumevanje kompleksnosti raka, kakor tudi pomen in vpliv raziskovalnega dela v translacijski onkologiji

- Basics on cancer initiation – types of carcinogenesis
- Basics on classification of cancer pathology and epidemiologic approaches in clinical oncology
- Molecular mechanism of cancer progression
- Cell biology of cancer with emphasis on stem cells
- The understanding of the complexity of cancer, and the importance of research in translational oncology

#### Metode poučevanja in učenja:

- Pridobljena teoretična in praktična znanja študent pridobi v izbranih predavanjih in konzultacijah
- Možno je tudi vključevanje v eksperimentalno raziskovanje v laboratorijih

#### Learning and teaching methods:

- The acquired theoretical and practical knowledge are acquired with selective lectures and consultations.
- It is also possible to include the students into experimental research in the laboratory

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Ustni zagovor seminarske naloge	70 %	Oral defence of seminar work
Sodelovanje pri pripravah člankov ali seminarske naloge	30 %	Participation in preparation of scientific articles of seminar work

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

- Podergajs, N., Motaln, H., Rajčević, U., Verbovšek, U., Koršič, M., Obad, N., ... Turnšek, T. L. (2015). Transmembrane protein CD9 is glioblastoma biomarker, relevant for maintenance of glioblastoma stem cells.
- Breznik, B., Motaln, H., Vittori, M., Rotter, A., & Lah, T. (2017). Mesenchymal stem cells differentially affect the invasion of distinct glioblastoma cell lines. <http://doi.org/10.18632/oncotarget.16041>
- Primon, M., Huszthy, P. C., Motaln, H., Talasila, K. M., Miletic, H., Atai, N. A., ... Lah Turnšek, T. (2017). Cathepsin L silencing increases As 2 O 3 toxicity in malignantly transformed pilocytic astrocytoma MPA58 cells by activating caspases 3/7. *Experimental Cell Research*, 356(1), 64–73. <http://doi.org/10.1016/j.yexcr.2017.04.013>
- Verbovšek, U., Van Noorden, C. J. F., & Lah, T. T. (2015). Complexity of cancer protease biology: Cathepsin K expression and function in cancer progression. *Seminars in Cancer Biology*. <http://doi.org/10.1016/j.semcancer.2015.08.010>
- Molina, E. S., Pillat, M. M., Moura-Neto, V., Lah, T. T., & Ulrich, H. (2014). Glioblastoma stem-like cells: approaches for isolation and characterization. *Journal of Cancer Stem Cell Research*, 1(1), 1. <http://doi.org/10.14343/JCSCR.2014.2e1007>