

Course specification

Study programme: Bachelor Studies of Biology				
Course: Mechanisms of microbial toxicity				
Course code: OB063				
Teacher: Dr. Jelica Simeunović, Dr. Maja Karaman				
Status of the course: elective				
Nuber of credits: 6				
Requirement: -				
The objective of the course is to familiarize students with: different types of toxic products to microorganisms, exposure routes and basic mechanisms of their action at the level of the cell, organ and the whole organism, the possible negative effects that they can cause on human health, and the different methods used in detection of microbial toxicity				
The outcome of the subject After the successfully completed examinations, students can - understand the basic mechanisms of toxicity of different groups of microorganisms and the way they can negatively affect other organisms - recognize the importance of adequate testing of toxicity mechanisms in order to assess health risks during exposure and to properly formulate and apply methods of microbial toxicity testing				
Contents of the course <i>Theory teaching:</i> The concept of toxicity to microorganisms, microbial toxins and intoxication; Division of microbial toxins by origin, chemical structure and mechanism of action; The basic types of microbial product toxicity mechanisms - the effect on the components and processes in the cell; Functioning of microbial toxins on target organs (dermatotoxicity, enterotoxicity, hepatotoxicity, neurotoxicity, nephrotoxicity, reproductive toxicity, immunotoxicity, genotoxicity); Toxic effect of bacterial toxins acting on the surface of the cell; Toxic effect of bacterial toxins that affect the cell membrane by creating pores; Bacterial toxins that affect intracellular structures and processes (on cytoskeleton, enzymes, protein synthesis, transport); Neurotoxic and hepatotoxic effects of cyanotoxin; Cytotoxic and dermatotoxic effect of cyanotoxins; Reproductive toxicity, immunotoxicity and cyanotoxin genotoxicity; Mechanisms of toxicity of microalbumine toxins; Mycotoxicosis-definition, etymology and basic principles; Mechanisms of action of mycotoxin type aflatoxin, citrinin, ergot alkaloid, fuminozin, ochratoxin, patulin, trichothecene, zearalenone; Biotoxins in bioterrorism; Detection of toxicity of microorganisms in different <i>in vitro</i> (cell lines, microphysiological systems, enzymes) and <i>in vivo</i> assays. <i>Practical teaching:</i> Detection of bacterial endotoxin using LAL test (Limulus Amebocyte Lysate test); Detection of acute and chronic toxic effects of microorganisms in the <i>Artemia salina</i> bioassay; <i>Daphnia magna</i> biotest detection of acute and chronic toxic effects of microorganisms; Detection of acute toxicity of microorganisms in zebrafish-Danio rerio; Examination of the chronic toxicity of microorganisms in the DarT test (Danio rerio); Determination of the toxicity of microorganisms in the enzyme assay PPI (inhibition of enzyme protein phosphatase 1); Determination of neurotoxicity in the enzyme assay AChE (detection of inhibition of acetylcholine esterase enzyme); Determination of the cytotoxic effect of microorganisms using <i>in vitro</i> assays with selected cell lines; Determination of the genotoxic effect <i>in vivo</i> on the <i>D. rerio</i> model; Detection of aflatoxin using an essay based on an immunochromatographic method				
Literature 1. Zorica Bulat (2013): Opšta toksikologija (Basic toxicology), Farmaceutski fakultet, Univerzitet u Beogradu (selected chapters) 2. Simeunović J. (2010): Cijanobakterije i cijanotoksini u površinskim vodama Vojvodine (Cyanobacteria and cyanotoxins in surface freshwaters in Vovodina region). Andrejević K. i Andrejević T.(eds).Beograd, Biblioteka Dissertatio, Zadužbina Andrejević, ISBN: 978-86-7244-903-7, str.120. (selected chapters) 3. Sinovec, Z., Resanović, R., Sinovec, S. (2006): Mikotoksini, pojava, efekti i prevencija, Beograd. 4. Holst, Otto (2011): Microbial toxins: Methods and protocols. Springer, e-book ISBN 978-1-61779-102-4. (selected chapters) 5. Martin Dworkin, Stanley Falkow, Eugene Rosenberg, Karl-Heinz Schleifer, Erko Stackebrandt (2006): The Prokaryotes- A Handbook on the Biology of Bacteria Third Edition Volume 2: Ecophysiology and Biochemistry, Springer. (selected chapters) 6. J.S. Metcalf and G.A. Codd (2014): Cyanobacterial Toxins (Cyanotoxins) in Water, Foundation for Water Research, Allan House, The Listons, UK. 7. I. Chorus (2001): Cyanotoxins Occurrence, Causes, Consequences, Springer, p. 357, ISBN 978-3-642-59514-1. 8. Duarte Diaz (2005): The Mycotoxin Blue Book, Context Products, p 360, ISBN-10: 1899043527. (selected chapters) 9. Stefan Bräse, Franziska Gläser, Carsten Kramer, Stephanie Lindner, Anna M. Linsenmeier, Kye-Simeon Masters, Anne C. Meister, Bettina M. Ruff, Sabilla Zhong (2013) : The Chemistry of Mycotoxins , Springer-Verlag Wien, p.300, e- Book ISBN 978-3-7091-1312				
Number of active classes:				
Lectures: 2	Exercises:	Other forms of teaching: 2	Student research work:	Other :
Methods of teaching Lectures using pp presentations on video beam, exercises, consultations				
Knowledge assessment (maximum score 100)				
Pre-exam obligations	points	Final exam	points	
activity during lectures	2	written exam	-	
practical teaching	20	oral exam	60	
colloquium	18		