Course Unit Descriptor

Study Programme: Bachelor Academic Studies in Biochemistry

Course Unit Title: Biochemistry of antioxidant systems

Course Unit Code: IB-607

Name of Lecturer(s): Associate Professor Marija Lesjak

Type and Level of Studies: Bachelor of Science Degree

Course Status (compulsory/elective): Elective

Semester (winter/summer): Summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims: To introduce students to the latest scientific knowledge about the biochemical and physiological roles of reactive species in human organism, oxidative stress development and development of chronic diseases.

Learning Outcomes: Students are expected to identify and describe reactive species in the cell, how they are produced and their roles in the development of chronic diseases. Student should be able to explain mechanisms of antioxidant defence and experimental methods for their characterisation.

Syllabus:

Theory

The phenomenon of oxygen toxicity in aerobic organisms. Activation of oxygen and formation of reactive species: superoxide anion radical, hydroxyl radical, singlet oxygen, organic peroxides peroxy- and alkoxy- radicals, carboxyl radical, nitrogen oxides, thiyl radicals, etc. Cellular sources of reactive species. Physiological significance of reactive species. Oxidative stress. Mechanisms of free radical toxicity: lipid peroxidation, oxidative damage of proteins, nucleic acids and carbohydrates. Antioxidant mechanisms of cells: antioxidant enzymes and non-enzymatic cellular antioxidants. Exogenous antioxidants. Experimental methods for determination of reactive species level and characterisation of antioxidant systems. Pathological changes in the cell and the organism as a result of oxidative stress. Reactive species and chronic diseases.

Practice

Determination of chosen sample potential to neutralize DPPH•, superoxide anion radical and hydroxyl radical. FRAP and AEAC assays.

Required Reading:

1. Halliwell, B., Gutteridge, J. (2007): *Free Radicals in Biology and Medicine, fourth edition.* Oxford University Press, NY, USA.
2. Eberhardt, M. K. (2001): *Reactive Oxygen Metabolites: Chemistry and Medical Consequences.* CRC Press LLC, Florida, USA.
3. Relevant scientific papers from the field

Weekly Contact Hours: 5 (75)	**Lectures:** 2 (30)	**Practical work:** 3 (45)

Teaching Methods: Lectures, laboratory work, consultations, e-learning

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	**Final exam**	points
Active class	10	written exam	60

participation			
Practical work	15	oral exam	
Preliminary exam(s)	/	…….	
Seminar(s)	15		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			