
Course title: TOXICOLOGY

ECTS credit allocation (and other scores): 3

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Medical and health sciences

Language: English

Number of hours per semester: 30

Course coordinator/ Department and e-mail: Prof. Paweł Brzuzan, Department of Environmental Biotechnology,
brzuzan@uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES: Health and Safety regulations, organizational issues, introduction to the subject. User manual of the molecular biology equipment. Pipetting micro volumes of liquids with different physical properties (density, viscosity). Part I. Analysis of gene expression after exposure to model toxic substance (a case study): Total RNA isolation. Spectrophotometric measurement of quantity and purity of the isolated samples. Assessment of RNA integrity. Elimination of genomic DNA from the samples. Reverse transcription. Introduction to nonparametric statistical tests. GenBank search for nucleotide sequences. Polymerase chain reaction (PCR) primers design. Analysis of gene expression using semi-quantitative PCR (SQ-PCR). Analysis of gene expression using real-time quantitative PCR (qPCR). Calculations on raw values, presentation of the obtained results, analysis for statistical significance. Preparation of laboratory report. Overview of the current scientific literature available online. Part II. Polymorphism analysis of genes participating in detoxication mechanism: Isolation of genomic DNA from students' cheek swab. Conventional PCR. Agarose electrophoresis. Analysis and interpretation of the obtained results.

LECTURES: I am introducing the basics of toxicology from a risk analysis perspective. The lectures are organized into 3 basic threads and include the following topics. Toxic chemical risk. Environmental pathways of toxic chemicals. The body's defenses against chemical toxicity. Mechanisms of chemical disease. PCR-based protocols in molecular toxicology.

Learning purpose: to know physiological targets and endpoints, and to explain toxicity of environmental contaminants.

On completion of the study programme the graduate will gain:

Knowledge: about target organs and toxic endpoints for environmental poisons, will understand toxicity mechanisms of various contaminants,

Skills: the graduate will become an expert in various molecular biology laboratory techniques,

Social Competencies: the graduate will be able to explain the community importance of toxicological approaches in human risk assessment.

Basic literature:

Brzuzan P., Woźny M., Toxicology. Student's coursebook, Department of Environmental Biotechnology, d. University of Warmia and Mazury in Olsztyn, Poland, 2020

Penningroth, S., Essentials of Toxic Chemical Risk Science and Society, CRC Press, London, 2010

Walker C. H., Hopkin S. P., Sibly R. M., Peakall B., Principles of Ecotoxicology, Third Edition., CRC Press., 2005

McCarthy J.F., Shugart L.R., Biomarkers of environmental contamination, Lewis Publishers, 1990

Supplementary literature:

Brown T.A, Genomes 3, Garland Science Publishing, 2007

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1.36

Student's independent work: 1.64