
Course title: MOLECULAR BIOLOGY LABORATORY I

ECTS credit allocation (and other scores): 4

Semester: autumn

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 50

Course coordinator/ Department and e-mail: dr hab. Nina Smolińska, prof. UWM, nina.smolinska@uwm.edu.pl,
Department of Animal Anatomy and Physiology

Type of classes: classes and lectures

Substantive content

CLASSES:

Isolation of nucleic acids (RNA, DNA) from animal tissues. Determination of the amount of (spectrophotometric measurement) and quality (spectrophotometric measurement, electrophoresis) derived nucleic acids. Designing primers and probes for PCR or real-time PCR. Analysis of target gene expression using real-time PCR method. Preparation and evaluation of tissue morphology by *in situ* hybridization (ISH). Staining of tissue sections animal. Determine the cellular localization of the transcript using ISH and densitometric analysis of its quantity. Isolation of proteins from animal tissues, their electrophoresis and immunodetection by Western Blotting. Densitometric analysis of the concentration of protein using the computer program GelScan. Determination of protein localization using immunocytochemistry/immunohistochemistry.

LECTURES:

Ways of collecting biological material. The methods of nucleic acids isolation. Methods for quantitative and qualitative analysis of nucleic acids, nucleic acid recovery method from gel. Composition, stages and types of optimization of polymerase chain reaction (PCR). Characteristics of real-time PCR reaction (principles, types, advantages and disadvantages, methods of analysis results). Principles of good design primers and probes for real-time PCR reaction. Nucleic acid hybridization. Types of hybridization probes and methods of marking. Characteristics of the methods of hybridization (dot- blot, Southern, Northern, Western Blotting). Characteristics of the antibodies used in the immunodetection. Methods for labeling and detection of antibodies. Determination of protein localization using immunocyto/immunohistochemistry. Elisa test.

Learning purpose:

Knowledge of research methods of molecular biology used in genetic and proteomic studies. The ability to select and apply known methods of molecular biology and the ability of the proper interpretation of the results. Ability to use online databases and scientific literature to describe and refer issues of molecular biology.

On completion of the study programme the graduate will gain:

Knowledge:

K1 - The student understands the molecular basis of the functioning of eukaryotic organisms

K2 - The student defines and describes the known methods of molecular biology

K3 - The student chooses properly known methods of research in the field of molecular biology in order to

conduct biological experiments

K4 - The student selects the appropriate tools for the analysis of the results

K5 - The student knows the rules of working with biological material and ethical issues in biological research

Skills:

S1 - The student uses a variety of techniques / tools research and supports equipment used in molecular biology

S2 - The student uses of publicly available biological databases

S3 - The student is able to plan and carry out simple experiments using known methods of molecular biology

S4 - The student uses their knowledge in the analysis and formulation of conclusions for the conducted experiments, clearly demonstrates the results their own and literature

Social Competencies:

SC1 - The student acts in accordance with ethical rules

SC2 - The student demonstrates a willingness to work in a group

SC3 - The student is aware of the need to increase knowledge, become familiar with scientific journals and internet resources related to biology / molecular biology

Basic literature:

1) Burton E. Tropp, "Molecular biology: Genes to proteins.", Jones & Bartlett Publishers, 2011

2) Ausubel F. "Short protocols in molecular biology", ISBN, 2002

3) Jeffrey E. Gerst, "RNA Detection and Visualization: Methods and Protocols (Methods in Molecular Biology)", Human Press, 2011

4) different authors, "scientific articles and popular science", 2010-2019

Supplementary literature:

1) Nick A. Saunders and Martin A. Lee, "Real-Time PCR: Advanced Technologies and Applications", Horizon Scientific Press, 2013

2) Sambrook J. & Russel D, "Molecular cloning", ISBN, 2001

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 52

Student's independent work: 48