

Course title: GENETIC TRANSFORMATIONS

ECTS credit allocation (and other scores): 2

Semester: spring

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

Branch of science: Natural sciences

Language: English

Number of hours per semester: 30 h.

Course coordinator/ Department and e-mail: Agata Żmijewska; Department of Animal Anatomy and Physiology;  
agata.zmijewska@uwm.edu.pl

Type of classes: practical classes and lectures

---

#### Substantive content

**CLASSES:** Multiplication of transformed bacteria in liquid media. Isolation of plasmid DNA. Restriction digestion and ligation. Bacterial transformation and color selection of transformants. CRISPR-Cas9 bacterial modification. Confirmation of the genetic status of knock-out animals. Suppression of gene expression in cells with siRNA and comparison of the efficacy of different cell transfection reagents. Genetic diseases in humans and animals. The use of gene therapy in the treatment of hereditary diseases. Genetic modifications – the possibility of using them in livestock breeding. The use of transgenic animals for the production of biopreparations.

**LECTURES:** Molecular basis of genetic transformation and transfection of organisms - DNA cloning, types of vectors used to introduce DNA sequences into the host genome and their properties, vector markers. Use of bacteria to produce recombinant proteins. Cell lines – production, types and use in physiological and pathophysiological research. Transgenesis – obtaining animals. Gene expression silencing using various methods.

**LEARNING PURPOSE:** Acquire knowledge and the understanding the different methods used in genetic transformations, the proper interpretation of results and the use of specialized literature to describe and report on issues related to genetic transformations.

---

On completion of the study programme the graduate will gain:

**KNOWLEDGE:** Student knows molecular mechanisms and techniques of genetic transformation and transfection; methods for obtaining transgenic animals, including knockout animals, and their role in breeding, pharmacy and biomedicine; the use of gene therapy in the treatment of genetic diseases in humans and animals.

**SKILLS:** Student will be expected to multiply and transform bacteria and evaluate the transformants; confirm the genetic status of knockout animals; design experiments using genetic transformation and transfection methods and evaluate the utility of modern transformation/transfection methods in breeding, pharmacy and medicine; present the results of his/her own research or that of other authors/scientists.

**SOCIAL COMPETENCIES:** Students work with biological material in compliance with the principles of occupational health and safety, in a team or independently; analyze the results of biological experiments and draw conclusions based on the knowledge gained; deepen and continuously update knowledge in the field of genetic transformations.

---

Basic literature: 1. Robert Lanza Robert Langer Joseph P. Vacanti, Principles of Tissue Engineering, Wyd. Fourth edition. London : Academic Press., R. 2014

2. Pinkert, Carl A. , editor, Transgenic animal technology : a laboratory handbook, Wyd. Saint Louis: Elsevier, R. 2014

3. J. Sambrook, D. W. Russell, Molecular Cloning a laboratory manual, Tom 1-3, Wyd. Cold Spring Harbor Laboratory Press, R. 2001

Supplementary literature: the newest literature recommended by the coordinator of the subject

---

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 32 h.

Student's independent work: 18 h.