



VILNIAUS KOLEGIJA/UNIVERSITY OF APPLIED SCIENCES
STUDY SUBJECT/MODULE PROGRAMME (SSMP)
CHEMICAL ANALYSIS

Entitlement Biotechnology, 3 cr.

Prerequisites

B1 level of English language, Organic chemistry, biochemistry

Main aim

Provide students with the knowledge of biotechnology science and application of its methods in various spheres of activity, the use of microorganisms in heterologous protein synthesis, technological aspects of gene engineering and protein synthesis.

Summary

The aim of the subject is to acquaint students with key areas of biotechnology science, major biotechnology industries and products, recombinant technologies (cloning, PCR reaction), protein synthesis in eukaryotic and prokaryotic cells. During practical classes students watch the transformation of eukaryotic cells, recombinant protein synthesis in E.coli cell, analyse the results of synthesis, fractionation of proteins in denaturing conditions, polyacrilamide gel.

Learning Outcomes

1. Be able to: express ideas responsibly, critically and consistently, raise problems and solve;
2. Be able to: work independently and carefully, plan and organise independent activities;
3. Be able to define basic concepts of biotechnology; use the proper biochemistry terminology;
4. Be able to assess findings of biochemical analysis methods, reliability and understand their meaning
5. Be able to describe the concept of eukaryotic and prokaryotic cell gene and regulatory features of gene expression; choose the right system for heterologous protein expression;
6. Be able to demonstrate the use of prokaryotic cells in recombinant protein synthesis; describe the role of prokaryotic cells in industrial biotechnology;
7. Be able to define practical aspects of gene engineering and protein expression; prepare samples of life nature objects and their components for practical purposes;
8. Be able to choose the right sample and sample preparation method for life nature objects and their components; describe the use of eukaryotic cells and mammalian cells in industrial biotechnology;
9. Be able to summarise antibody synthesis technology using hybridoma cells.

Syllabus

1. Biotechnology: trends and objectives.
2. Prokaryotic cell gene regulation (structure of prokaryotic gene – basic elements, from DNA to the final product).

3. Eukaryotic cell gene regulation (structure of eukaryotic gene – basic elements, from DNA to the final product).
4. The use of prokaryotic cells in recombinant protein synthesis. Application of gene regulation principles for protein expression. Main vectors, strains and cloning methods (PCR reaction).
5. Industrial production methods of prokaryotic cells and industrial biosynthesis.
6. Transformation of E. coli cells, recombinant protein synthesis while growing cells in flasks.
7. Fractionation of proteins in denaturing conditions (sample preparation, electrophoresis, gel development and scanning).
8. Protein expression in yeast. Use of *S.cerevisiae* or *P. Pastoris* yeast for protein synthesis.
9. The use of mammalian cells in protein synthesis. Industrial cultivation of mammalian cells.
10. Hybridoma cells: application in antibody production, ways of cultivation..

Evaluation procedure of knowledge and abilities

Cumulative assessment (intermediate settlements, Practical classes/laboratory work, self-study, examination)