Code: 04-2-10

RECENT BIOTECHNOLOGICAL METHODS

ECTS: 5

Course coordinator: Prof. Dr. Igor Križaj

Lecturers: Prof. Dr. Radovan Komel, Prof. Dr. Igor Križaj

No. of hours: 125  Lectures: 10  Seminar: 20
Lab. work: 10  Other: 85

2. Entry requirements:
General conditions for enrolment in doctoral studies.

3. Objectives of the course and intended learning outcomes:
(competences)
Educational aims: The basic educational aim is to acquaint students with methods and techniques of contemporary biochemistry and molecular biology with a special stress on those that are used in ‘new biotechnology’.

Intended learning outcome: The intended learning outcome is that the student gets to know or deepens knowledge of methods in the field of analysis of proteins and nucleic acids and he or she is oriented to the use of these in basic or applicative research in the field of his or her research or development work. The subject guides the student to independent planning of analytical procedures, solving problems by organising and planning experimental work.

4. Syllabus outline:
Isolation and purification of nucleic acids (storing and homogenising tissue; colouring molecules, centrifuging; electrophoresis and isolation of DNA/RNA; chromatographic methods, enrichment of RNA, subtraction hybridisation). Production of a genetic library/bank (obtaining fragments of DNA, partial restriction, PCR, insertion and cloning of DNA in various host cells, selection of recombinant clones, genomic and cDNA libraries; representativeness of libraries). Searching gene libraries (producing gene-specific DNA/RNA probes and their marking, hybridisation of colonies/plaque use of PCR, expression libraries; reverse genetics, chromosomes).

Determining nucleotide sequences (methods according to Sanger, Maxam and Gilbert, direct PCR method). Characterisation of nucleic acids (restriction analysis, Southern and Western transfer; seeking similarities in nucleotide sequences; analysis of genetic mutations and polymorphisms). Mutagenesis (chance and directed/site specific; mutagenesis with oligonucleotides, PCR mutagenesis; protein engineering). Expressing alien genes (fusion proteins, secretion; identification and analysis of mRNA, RT-PCR, qPCR; analysis of genes – hybridisation in situ, FISH; analysis of interactions promoter-protein (CAT), technique of remainder on electrophoresis gels, ‘DNA footprinting’; demonstration of phage; quasi duo-hybrid system; differences in gene expression, differential demonstration; micrornetworks and DNA microchips). Transgenesis in eucaryonts (methods; gene silencing). Bioinformatics and the Internet.

Purifying proteins: sources; homogenisation; types and principles of liquid...
5. Literature (in the case of books and monographs, study sources are only selected chapters from them):

- Lecture notes.
- Additional literature:
- Current scientific periodicals.

6. Teaching methods:
Lectures, demonstrations in the laboratory, consultations.

7. Assessment methods:
Oral examination.

8. References:

Križaj Igor

Komel Radovan