

Pharmaceutical Biology

MEA-OGL

Supervisor: Dr. Katalin SIPOS associate professor

Description: The 2-semester Biology course provides the essential fundamental molecular biological knowledge for the pharmaceutical students. In the first semester students will study the structure and main functions of the living eukaryotic cells. We will discuss briefly the structural features of prokaryotes as well as viruses. The majority of the topics will deal with the information storage and utilization of the cells, and the regulation of these processes. In the second semester some of the lectures are about the regulation of cell cycle and molecular biology of cancer. The main part of the second semester deals with the essential information on pharmaceutical genetics. This knowledge is important for pharmaceutical students to understand the mechanisms of actions of drugs and research on drug discovery and development.

Syllabus:

1st Semester

Lectures

1. Introduction. (Sipos Katalin Dr.)
2. Building blocks of the cell. (Sipos Katalin Dr.)
3. Genom and gene expression. (Varga Edit)
4. Tools and techniques in molecular biology I. (Poór Viktor Soma)
5. Tools and techniques in molecular biology II. (Poór Viktor Soma)
6. Cellular differentiation. (Poór Viktor Soma)
7. Stem cells. (Poór Viktor Soma)
8. The nucleus and the cellular membranes. (Dudás Réka)
9. Structure of DNA. (Pandur Edina Dr.)
10. Chromosomes and genomes. (Pandur Edina Dr.)
11. Mitochondrium: structure and function. Mitochondrial DNA. (Dudás Réka)
12. Cytoplasmic organelles: endoplasmic reticulum, Golgi apparatus, lysosomes. (Pandur Edina Dr.)
13. Replication I. (Poór Viktor Soma)
14. Replication II. (Poór Viktor Soma)
15. Repair mechanisms. (Poór Viktor Soma)
16. Transcription in prokaryotic cells. (Sipos Katalin Dr.)
17. Eukaryotic transcription: mRNA. (Sipos Katalin Dr.)
18. Eukaryotic transcription: tRNA, rRNA. (Sipos Katalin Dr.)
19. Regulation of transcription. (Sipos Katalin Dr.)
20. Transcription factors. (Pandur Edina Dr.)
21. The genetic code. (Varga Edit)

22. Structure and functions of ribosomes. tRNA. (Pandur Edina Dr.)
23. Steps of translation. (Pandur Edina Dr.)
24. Protein analysing methods I. (Nagy Laura)
25. Protein analysing methods II. (Nagy Laura)
26. Gene regulation: prokaryotes. (Poór Viktor Soma)
27. Regulation of gene expression in eukaryotes I. (Nagy Laura)
28. Regulation of gene expression in eukaryotes II. (Nagy Laura)
29. Posttranslational modifications. (Poór Viktor Soma)
30. Degradation of proteins. (Poór Viktor Soma)
31. Intracellular trafficking of proteins: nucleus, mitochondrion. (Sipos Katalin Dr.)
32. Intracellular trafficking of proteins: ER. (Sipos Katalin Dr.)
33. Intracellular trafficking of proteins: Golgi, lysosomes. (Sipos Katalin Dr.)
34. Antibiotics. (Nagy Laura)
35. Cell cycle I. (Sipos Katalin Dr.)
36. Cell cycle II. (Sipos Katalin Dr.)
37. Mitosis I. (Pandur Edina Dr.)
38. Mitosis II. (Pandur Edina Dr.)
39. Meiosis I. (Poór Viktor Soma)
40. Meiosis. (Poór Viktor Soma)
41. Transport through biological membranes. (Sipos Katalin Dr.)
42. Consultation. (Sipos Katalin Dr.)

Practice

1. Preparation of biological buffers (TE, loading, PAGE, DNA isolation solutions)

Seminars

1. Macromolecules as building blocks of living cells.
2. Separation techniques.
3. Detection in molecular biology.
4. Cytoskeleton.
5. Bases of PCR.
6. Sequencing methods.
7. Transcription: summary.
8. Viruses.
9. Human Genome Project.
10. Molecular biological methods in Pharmaceutical research.
11. Intracellular targeting: summary.
12. Mechanisms of antibiotics.
13. Signal transduction: summary.

2nd Semester:

Lectures

1. Cell signalling pathways. (Pandur Edina Dr.)
2. Intracellular signalling molecules. (Pandur Edina Dr.)
3. Membrane receptor molecules. (Pandur Edina Dr.)
4. Ca, cGMP. (Pandur Edina Dr.)
5. Apoptosis I. (Nagy Laura)
6. Apoptosis II. (Pandur Edina Dr.)
7. Molecular biology of cancer I. (Poór Viktor Soma)
8. Molecular biology of cancer II. (Poór Viktor Soma)

9. Ras. (Pandur Edina Dr.)
10. PI-3 kinase, Jak-STAT. (Pandur Edina Dr.)
11. Basis terms of medical genetics. (Dudás Réka)
12. Organization of the genome. Genetic disorders. (Sipos Katalin Dr.)
13. Chromosomal disorders: in number and structure. (Nagy Laura)
14. Chromosomal disorders: mosaicism, imprinting. (Sipos Katalin Dr.)
15. Autosomal genetic disorders. (Pandur Edina Dr.)
16. Sex chromosome aberrations. (Poór Viktor Soma)
17. Mendelian inheritance I. (Dudás Réka)
18. Mendelian inheritance II. (Dudás Réka)
19. Signal transduction and drugs. (Pandur Edina Dr.)
20. Mitochondrial genetic disorders. (Sipos Katalin Dr.)
21. Multifactorial disorders. (Dudás Réka)
22. Population genetics I. (Varga Edit)
23. Population genetics II. (Varga Edit)
24. Developmental genetics: differentiation. (Poór Viktor Soma)
25. Inborn genetic errors. (Sipos Katalin Dr.)
26. Possibilities of treatments of genetic defects. (Poór Viktor Soma)
27. Consultation. (Sipos Katalin Dr.)
28. Preparation for exam. (Sipos Katalin Dr.)

Practices

1. Microscopic examinations.
2. Examinations of cells under microscope.
3. Isolation of DNA.
4. DNA concentration measurement, agarose gel electrophoresis.
5. Isolation of RNA.
6. RNA concentration measurement. Synthesis of cDNA.
7. Restriction digestion of DNA.
8. Agarose gel electrophoresis of digested DNA.
9. Electronmicroscope (demonstration).
10. Electronmicroscope (demonstration).
11. Real time PCR (demonstration).
12. Cell culture (demonstration).

Seminars

1. Viruses, prions.
2. Signal transduction: summary.
3. Family histories of genetic disorders.
4. Epigenetics.
5. Genetic screening.
6. Apoptosis: summary.
7. Pharmagenetics and pharmacogenomics I.
8. Pharmagenetics and pharmacogenomics II.
9. Methods in cytogenetics.
10. Genetic diseases in adults
11. Genetic diseases: Mendelian inheritance.
12. Other inherited diseases.
13. Pharmaceutical research I.
14. Pharmaceutical research II.
15. Electronic databases.
16. Preparation for exam.