Odessa National Medical University
Faculty of Medicine № 1
Department of Clinical Immunology, Genetics and Medical Biology

SYLLABUS
OF THE EDUCATIONLA DICIPLINE
"MODERN PROBLEMS OF MOLECULAR BIOLOGY"

Scope	90 hours (3 ECTS credits).
Semesters, year of study	II semester, 1st year of education
Days, time, place	Days, time, place (auditorium number) of all types of study activities (lectures, seminars) on the subject "Modern problems of molecular biology" are determined according to the approved schedule.
Teachers	Shevelenkova Alla Vladimirovna: Ph.D. (Medicine), associate professor Chesnokova Marina Mikhalivna: Ph.D. (Medicine), associate professor Smetyuk Olena Oleksiivna: Ph.D. (Medicine), associate professor Glamazdina Nelli Mykolayivna: Ph.D. (Biology), associate professor Tkachova Olena Mykolayivna: Ph.D. (Biology), associate professor Kondrusina Olena Vasylivna: teaching assistant
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Work space	Auditoria of department of clinical immunology, genetics and medical biology, Olhiivska str., 4
Supervision	*Face-to-face*: every Tuesday – from 14:00 till 16:00, every Saturday – from 09:00 till 13:00. *For distance online studying consultations*: every Tuesday – from 14:00 till 16:00, every Saturday – from 09:00 till 13:00 on the *Microsoft Teams, Zoom, Telegram, Viber* platforms

COMMUNICATION

Communication with students will be carried out through face-to-face meetings, by phone, e-mail. In case of transition to distance online learning, communication with students will be provided by phone, e-mail and platforms Microsoft Teams, Zoom, Telegram, and Viber.

COURSE ANNOTATION

The subject of study of the discipline is the biological basis of human life at the molecular -genetic level.

Prerequisites and postrequisites of the course. The place of discipline in the educational program.

The discipline "Modern problems of molecular biology" is based on previously studied by graduates in secondary general school such a discipline as "Biology".

The discipline "Modern problems of molecular biology" is integrated with the following disciplines: medical biology, biological and bioorganic chemistry, pathological physiology, microbiology, virology and immunology.

The purpose of the discipline.

The purpose of teaching the discipline "Modern problems of molecular biology" is the formation of knowledge and practical skills in human molecular biology for further mastering by students of a block of disciplines that provide scientific and professional training.

Tasks of the discipline.

The main tasks of studying the discipline "Modern problems of molecular biology" are:

- to explain the patterns of manifestations of the life-sustaining activity of the human organism at the molecular-genetic and cellular levels;
- to determine the manifestations of the general biological laws during human ontogenesis;
- to understand the molecular-genetic basis for the development of hereditary and multifactorial diseases and prospects for the application of molecular biology achievements in practical medicine.

Expected results.

Upon complotting of the study of the discipline "Modern problems of molecular biology" the student must know:

- structure and function of nucleic acids;
- mechanisms of intercellular signaling and transmembrane transport;
- organization of structural genes of eukaryotes;
- molecular mechanisms and significance of the processes of replication, repair, recombination;
- molecular mechanisms of realization of hereditary information;
- principles of regulation of gene expression in pro- and eukaryotes;
- features of the organization of genomes of viruses, prokaryotes, eukaryotes;
- modern methods of studying the human genome;
- molecular mechanisms of mutational variation;
- mutagens and methods of their research, mechanisms of action of antimutagens;

- molecular mechanisms of cell differentiation, characteristics of stem cells;
- regulation of the cell cycle, molecular mechanisms of tumor development;
- modern methods of molecular genetic diagnostics and their use in medicine;
- the concept of biotechnology, cell and genetic engineering;
- transgenic organisms, the possibility of their use in biotechnology and medicine;
- potential environmental consequences of the usage of genetically modified organisms;
- cloning of cells and organisms, importance in biology and medicine;
- principles of gene therapy, its achievements and prospects.

Upon completing of the study of the discipline "Modern problems of molecular biology" the student must be able to:

- identify (schematically) the primary structure of the protein, the number of amino acids, the molecular weight of the polypeptide by the nucleotide sequence of the gene encoding it;
- determine changes in the structure of the protein due to gene mutations;
- determine the types of gene mutations in case studies and diagrams, types of chromosomal and genomic mutations during analysis of karyotypes;
- to analyze the electrophoregram of DNA and to detect the presence of DNA of infectious diseases agents and mutations in human genes.

COURSE DESCRIPTION

Forms and methods of teaching.

Totally, 90 hours have been allocated for the studying of the discipline "Modern Problems of Molecular Biology" (3 ECTS credits).

The discipline "Modern problems of molecular biology" will be presented in the form of lectures (10 hours) and seminars.

During the teaching of the discipline "Modern problems of molecular biology" various teaching methods will be used: dialogues in the systems "teacher-student" and "student-student", lecture notes, classroom work in the textbook – workbook (album) for seminars, abstracts preparing, public presentation during seminars.

The course "Modern Problems of Molecular Biology" includes individual and group consultations, which will be carried out through face-to-face meetings, telephone communication, use of e-mail, social networks, Zoom platforms and/or Microsoft Teams.

The content of the discipline.

List of topics:

Topic 1. Subject and objectives of molecular biology. Molecular mechanisms of intercellular signaling and transmembrane transport.

Topic 2. Macromolecules as objects of molecular biology study. DNA replication, DNA repair, DNA recombination.

Topic 3. Gene expression and its regulation

Topic 4. Structural organization of genomes of viruses and cellular organisms.

Topic 5. Molecular mechanisms of ontogenesis, genetic control of embryonic development. Epigenetic regulation of cellular processes.

Topic 6. Stem cells, reprogramming of somatic cells

Topic 7. The concept of reparative medicine. Cell engineering.
Topic 8. Regulation of the cell cycle. Apoptosis.
Topic 9. Fundamentals of oncogenetics.
Topic 10. Problems of mutagenesis and molecular mechanisms of hereditary diseases.
Topic 11. Researching of nucleic acids. Methods of DNA diagnosis.
Topic 12. Methods of genetic engineering.
Topic 13. Gene therapy.
Topic 14. Transgenic organisms.
Topic 15. Cloning of organisms. Credit.

List of recommended literature materials:

1. Main literature

1. Wilson and Walker's principles and techniques of biochemistry and molecular biology : textbook / K. Wilson, J. Walker, A. Hofmann, S. Clokie. – 8th ed., ed. by A. Hofmann, S. Clokie. – Cambridge University Press, 2018. – 929 p. : il.
2. Molecular Cell Biology : textbook / H. Lodish, A. Berk, C. Kaiser [et al]. – 9th ed., rev. and upd. – NY : W. H. Freeman, 2021. – 3691 p. : il.
3. Essential Cell Biology : textbook / B.M. Alberts, D. Bray, K. Hopkin [et al]. – 4th ed., rev. and upd. – NY : Garland Publishing, Inc., 2019. – 862 p.

2. Informational resources:

1. OMIM (Online Mendelian Inheritance in Man) – An Online Catalog of Human Genes and Genetic Disorders http://omim.org/
2. The tech interactive: https://genetics.thetech.org/genetics-news
3. https://www.nature.com/
4. US National Biotechnology Information Center (NCBI) database, which presents biomedical books, NCBI manuals, etc., and provides access to genetics resources such as GeneReviews https://www.ncbi.nlm.nih.gov/books

EVALUATION

Grading

The grade for the discipline is determined on the basis of the sum of grades of current academic activity (arithmetic mean of current activity), which the student receives when assessing theoretical knowledge, practical skills and abilities according to the lists defined by the curriculum.

Methods of current control.

The current educational activity of the student at seminars is scored on a 4-point (traditional) scale. It is planned to write essays, presentations at seminars. At the seminar, students must be interviewed at least once in 3-4 classes (not more than 50% of students). At the end of each lesson, the teacher must announce the students' grades, make an appropriate entry in the gradebook.

At the end of the discipline, the current activity is calculated - the average current score (arithmetic mean of all current grades on a traditional scale, rounded to two decimal places). In the last practical session, the teacher is obliged to provide

information to students about the results of their current academic activity and academic debt (if present). To increase the average score in the discipline, the current grades "3" or "4" are not rearranged.

The grade "excellent" is given to student who shows special creative abilities, is able to acquire knowledge independently, without help of the teacher, finds and processes the necessary information, is able to use the acquired knowledge and skills for decision-making in unusual situations, convincingly argues answers, independently reveals own talents and inclinations.

The grade "good" is given to student, who is fluent in the studied amount of material, applies it in practice, freely solves problems in standard situations, independently corrects mistakes, the number of which is insignificant.

The grade "satisfactory" is given to student, who reproduces a significant part of the theoretical material, shows knowledge and understanding of the basic principles; with the help of the teacher can analyze the educational material, correct mistakes, among which there are a significant number of significant ones.

The grade "unsatisfactory" is given to student, who shows the material at the level of individual fragments, which are an insignificant part of the study material.

Forms and methods of final control.

Final control of the discipline is a credit. Credits is estimated on a two-point scale:

- the grade "done" is given to a student who has completed the curriculum of the discipline, has no academic debt; level of competence - high (creative);

- the grade "not done" is given to a student who has not fulfilled the curriculum of the discipline, has an academic debt (average score below 3.0 and / or absences); level of competence – low (receptive-productive).

In distance online learning, the evaluation of seminars is conducted orally in the form of an interview.

Possibility and conditions for obtaining additional (bonus) points.

The student has an opportunity to receive additional points for such kinds of activity: active participation in work of a student's scientific group, presentation of student's scientific work.

INDEPENDENT WORK OF A STUDENT

Students' independent work includes preparation for seminars, elaboration of educational and scientific literature, writing essays or preparation of presentations on seminar topics. Independent work is evaluated during the current control of the topic in the relevant lesson.

COURSE POLICY

The policy of studying the discipline "Modern problems of molecular biology" is determined by the system of requirements that the teacher imposes on the student in the study of the discipline. Requirements apply to attendance of all types of classes (inadmissibility of absences, delays), rules of conduct in the classroom (active participation, compliance with the required minimum of educational work), incentives and penalties. The policy of the academic discipline is organized taking into account the norms of the legislation of Ukraine on academic integrity, the Statute and provisions of ONMedU, other normative documents.

Deadline and reattempt policy.

Students who have attended all types of classroom sessions (lectures, seminars) and received grades not lower than "satisfactory" are admitted to the final lesson. Reattempt of unsatisfactory grades and absences is allowed during 2 weeks without permission from the dean on the days of consultations and rework (Tuesday and Saturday). Later reattempt is possible with permission from the dean. In case of distance online learning – in the terms determined and agreed with the teacher.

Academic Integrity Policy.

Observance of academic integrity by higher education applicants provides: independent work of all types of educational tasks, tasks of current and final control of learning outcomes (for persons with special educational needs this requirement is applied taking into account their individual opportunities). References to informational sources in the case of using borrowed ideas, developments, statements, information. Compliance with the law on copyright and related rights, providing reliable information on the results of their own educational activities, used research methods and sources of information.

Unacceptable in educational activities for participants of educational process are: the usage of family or work ties to obtain a positive or higher score in the implementation of any form of control over learning outcomes; the usage of prohibited additional materials or technical equipment during control; passing of the control by fictitious persons.

For violation of academic integrity, students may be held subject to the following academic liability: reduction of assessment results; re-assessment; appointment of additional control measures (additional individual tasks, questions, tests, tests), re-passing the relevant educational component of the educational program;

For violation of academic integrity, higher education seekers may be held to the following academic liability: downgrading of the evaluation results of the final practical class, exam; re-assessment; appointment of additional control measures (additional individual tasks, control questions, MCQ), repeated traversal of relevant educational component of the educational program, deprivation of the right to participate in competitions for scholarships, grants, notification of the entity financing the education, potential employers, higher education applicant’s parents about the committed violation, exclusion from the rating of applicants for academic scholarships or accrual of penalty points in such rating; deprivation of academic scholarship, deprivation of benefits provided by ONMedU for tuition fees, expulsion from ONMedU.

Attendance and lateness policy.

Attendance of all types of classroom sessions (lectures, practical classes) is obligate.

Being late for all types of classroom sessions (lectures, practical classes) is prohibited.

Mobile devices.

During all types of classroom sessions (lectures, practical classes), as well as control actions (final practical classes, exam), the usage of headphones, phones, smartphones, tablets is prohibited.

Behavior in the classroom.

Behavior in the classroom during all types of classroom sessions (lectures, practical classes) should be worthy of a student of medical university. Teachers and students should be in medical gowns and hats, during face-to-face classes in a special epidemic regime (adaptive quarantine) - in properly dressed protective medical face masks or respirators.