Odessa national medical university
Medical faculty № 1
Department of clinical immunology, genetics and medical biology

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

Scope	30 hours (1 credits ECTS)
Semesters, year of education	VII and VIII semesters, 4th year of education
Days, time, place	According to the approved schedule
Lecturers	Shevelenkova Alla Vladimirovna: Ph.D. (Medicine), associate professor Chesnokova Marina Mikhalivna: Ph.D. (Medicine), associate professor Smetyuk Olena Oleksiivna: Ph.D. (Medicine), associate professor Tkachova Olena Mykolayivna: Ph.D. (Biology), associate professor
Contact telephone number	Shevelenkova Alla Vladimirovna: (098)367-62-20 Chesnokova Marina Mikhalivna: (048)728-54-74 Smetyuk Olena Oleksiivna: (048)728-54-74 Tkachova Olena Mykolayivna: (068)663-23-95
E-mail	Shevelenkova Alla Vladimirovna: *shevel2003@ukr.net* Chesnokova Marina Mikhalivna: *marchesn2005@gmail.com* Smetyuk Olena Oleksiivna: *smetyukelena*@gmail.com Tkachova Olena Mykolayivna: *en.tkachova@gmail.com*
Work space	Auditoria of of clinical immunology, genetics and medical biology department, Olhiivska str., 4
Supervision	*Face-to-face*: every Thursday – from 14:00 till 17:00, every Saturday – from 09:00 till 13:00. *For distance online studying consultations*: every Thursday – from 14:00 till 17:00, 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 carried out by phone, e-mail and *Microsoft Teams, Zoom, Telegram, Viber* platforms.

COURSE ANNOTATION

The subject of study of the discipline are directions of application of molecular-genetic technologies in practical medicine.

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 students of I-III courses of such disciplines as "Medical Biology", "Biological and Bioorganic Chemistry", "Histology", "Pathological Physiology", "Microbiology".

In turn, the discipline "Modern problems of molecular biology" lays the foundations for the study of such disciplines as "Pediatrics", "Obstetrics and Gynecology", "Oncology", "Internal Medicine".

The aim of the discipline. The purpose of teaching the discipline "Modern problems of molecular biology" is the formation of knowledge, competencies, practical skills and abilities to use modern molecular genetic technologies in the diagnosis and treatment of human diseases.

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 human activity 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 the achievements of molecular biology in practical medicine

Learning outcomes for discipline:

Upon completion of the study of the discipline "Modern problems of molecular biology" students must ***know:***

- molecular mechanisms of storage and realization of hereditary information;
- principles of regulation of gene expression in eukaryotes;
- peculiarities of the organization of the human genome;
- modern methods of studying the genome;
- molecular mechanisms of mutations;
-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 carcinogenesis;
- modern methods of molecular genetic diagnostics and their use in medicine;
- the concept of biotechnology, cell and genetic engineering;
- transgenic organisms, usage in biotechnology and medicine;
- potential environmental consequences of the use of genetically modified organisms;
- cloning of cells and organisms, importance in biology and medicine;
- principles of gene therapy, its achievements and prospects.
- ethical issues of molecular genetic and cellular technology.

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

- explain to the patient the possibilities and limitations of molecular-genetic methods of diagnosis;
- to analyze the electrophoregram of DNA and determine the presence of DNA of the pathogen of infectious diseases, mutations in human genes.

COURSE DESCRIPTION

Forms and methods of education.

The discipline "Modern problems of molecular biology" will be taught in the form of practical classes (20 hours), independent work of students (10 hours).

During the teaching of the discipline ""Modern problems of molecular biology"" will be used: dialogues in the systems "teacher-student" and "student-student", problem teaching, explanatory-illustrative, reproductive and heuristic methods.

Individual and group consultations are provided through face-to-face meetings, telephone communication, using *e-mail*, social networks, *Microsoft Teams* platforms.

The content of the discipline. List of the topics.

Topic 1. Subject and tasks of molecular biology. Macromolecules as objects of molecular biology.

Topic 2. Gene expression and its regulation

Topic 3. Structural organization of the human genome.

Topic 4. Molecular mechanisms of ontogenesis. Stem cells, somatic cell reprogramming

Topic 5. Regulation of the cell cycle. Fundamentals of oncogenetics.

Topic 6. Problems of mutagenesis and molecular mechanisms of hereditary diseases.

Topic 7. Molecular genetic methods of diagnosis.

Topic 8. Methods of genetic engineering. Transgenic organisms.

Topic 9. Gene therapy.

Topic 10. Cloning of organisms. Differential credit.

List of recommended literature materials:

1. Main literature

1 Molecular biology of the cell by Bruce Alberts [et al] 6th edition – 2015 -1464 pp

2. Additional literature

1 Clevio Nobrega, Liliana Mendonca, Carlos A.Matos. A Handbook of Gene and Cell Therapy- Springer, 2020. – 188 pp.

3 Emery's Elements of medical genetics. 15th ed. / Peter Turnpenny, Sian Ellard. – Elsevier, 2017. – 400 pp.

2 Essential Cell Biology by Bruce Alberts [et al] 4th edition – 2014 – 864 pp.

4 Genetics in medicine. - 7th edition/Robert L/Nussbaum, Roderick R. McInnes, Huntington F. Willard. – 2007 – 585 p.

5 Lynn B. Jorde, John C. Carey, Michael J. Bamshad. Medical genetics. 5th ed. Elsevier, 2016. 356 pp.

6 Read A., Donnai D. New clinical genetics. A guide to genomic medicine. 4th ed. Scion Publishing Ltd, UK, 2021.
7 Speicher M. R., Antonarakis S. E., Motulsky F. G. Vogel and Motulsky's human genetics. Problems and approaches. 4th ed. Springer, 2010. 981 pp.
8 Young Ian.D. Medical genetics. -2nd ed. -Oxford university press, 2010. - 304 p.

Information resources:

1. https://ghr.nlm.nih.gov and https://www.ncbi.nlm.nih.gov/books US National Biotechnology Information Center (NCBI) database, which presents biomedical books, NCBI manuals, etc., and provides access to genetics resources like *GeneReviews* (*https://www.ncbi.nlm.nih.gov/books/NBK1116/*) an international point-of-care resource for busy clinicians, provides clinically relevant and medically actionable information for inherited conditions in a standardized journal-style format, covering diagnosis, management, and genetic counseling for patients and their families
2. http://omim.org/OMIM (Online Mendelian Inheritance in Man) – An Online Catalog of Human Genes andGenetic Disorde
3. https://genetics.thetech.org/genetics-news The tech interactive
4. https://phys.org/biology-news/-bPhys.org internet news portal provides the latest news on science.
5. http://www.sci-news.com/news/biology - Sci-News.com provides the latest science news from around the world, covering breaking news in astronomy and astrophysics, archaeology, paleontology, medicine, biology, physics, genetics & more
6. https://scitechdaily.com/news/biology/ - link to the most thought-provoking, well researched online items in the world of science and technology

EVALUATION

The grade for the discipline is determined on the basis of the sum of grades of current academic performance (arithmetic mean of current performance), which the student receives by assessing theoretical knowledge, practical skills and abilities in accordance with the lists defined by the curriculum and results of differential credit test.

Methods of current control.

The current educational activity on practical lesson is accessed by a four-point (traditional) scale. It is planned to write abstracts, presentations at practical classes.

The value of the **"excellent"** mark. The student shows special creative abilities, is able to acquire knowledge independently, finds and processes the necessary information without the teacher's help, is able to use gained knowledge and skills for making a decision in unusual situations, convincingly argues answers, independently reveals own talents and penchants.

The value of the **"good"** mark. The student is fluent in the studied amount of material, applies it in practice, freely does case studies in standard situations, independently corrects mistakes, which number is insignificant.

The value of the **"satisfactory"**. The student reproduces a significant part of the theoretical material, shows knowledge and understanding of the basic principles; can analyze the educational material and correct mistakes with the teacher's help, among mistakes there are a significant number of significant ones.

The value of the **"unsatisfactory"**. The student knows the material at the level of individual fragments, which are an insignificant part of the study material.

Assessment of the learning performance of all students is not required in every practical session. At least 50% of students must be evaluated.

In the practical lesson, students must be interviewed at least once in 2-3 practical lessons (not more than 75% of students). At the end of the study, the current performance is calculated as the average current score, ie the arithmetic mean of all grades obtained by the student on a traditional scale, rounded to 2 (two) decimal places. At the last practical lesson, the teacher is obliged to announce to students the results of their current academic performance, academic debt (if any). To improve the average score in the discipline, the current grades "3" or "4" are not rearranged.

If a student gets a minimum grade point average of 3.00 for current performance, even if there are unsatisfactory grades, he receives a credit for the discipline.

Forms and methods of final control.

Final control in the discipline - differential test. Final control in the discipline - differential test. Only those students who do not have academic debts and received an average score for current academic activity of at least 3.00 are admitted to the differential test.

Differential credit is made in the form of a written answer from the student. Each task includes 40 MCQ and 2 theoretical questions. Differential credit is assessed on a four-point scale.

The grade obtained for the answer on the differential credit and the score of the average current performance during the study of the discipline are used to calculate the arithmetic mean, which is the overall grade for the discipline. Conversion of the traditional grade from the discipline to 200-point is performed by in computer center bythe university program "Contingent" according to the formula:

average grade point average (current / discipline) x 40

In the student's record book the teacher enters the grade in the discipline on the traditional and 200-point scales. The multi-point scale characterizes the actual success of each student in mastering the discipline.

Traditional mark	points
«5»	185-200
«4»	151-184
«3»	120-150

The grade on a 200-point scale then is ranked on a rating scale (ECTS).

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 society, performance of student's scientific work.

INDEPENDENT WORK OF A STUDENT

Students' independent work, which is provided by the topic of the lesson along with the classroom work, is assessed during the current control of the topic in the relevant lesson.

IWS topics:

1. Modern reparative medicine, cell engineering
2. Genetic danger of environmental pollution. Commutagens and antimutagens.

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 built 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 practical classes and received grades not less than "satisfactory" or rework it (if there are missed classes) have been admitted to the final lesson. Reassignment of unsatisfactory grades and absences is allowed for 2 weeks without the permission of the dean on the days of consultations and practice (Tuesday and Saturday), later - with the permission of 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 seekers provides independent fulfillment of all types of educational tasks, tasks of current and final control of learning outcomes; references to informational sources in the case of using borrowed ideas, developments, statements, information; 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 usage of prohibited auxiliary materials or technical means (cheat sheets, abstracts, headphones, telephones, smartphones, etc.) during control; passing the procedures of control of learning outcomes by fictitious persons.

For violation of academic integrity, students may be held subject to the following academic liability: reduction of evaluation results; repeating of the differential test; appointment of additional control measures (individual tasks, additional control tests, etc.); re-passing the relevant educational component of the educational program, notification of the parents of the applicant for higher education about the committed violation;

Attendance and lateness policy.

Attendance of practical classes is obligate.

The student is allowed to be late for no more than 10 minutes and only for a serious reason

Mobile devices.

Mobile devices can be used during classroom classes only with the permission of the teacher.

Behavior in the classroom.

While in the classroom, friendliness, correctness, respect for the teacher and classmates, tolerance for the opposite point of view, a constructive approach to solving problems, adherence to the ethics of academic relations are important. Teachers and students must be in medical gowns and hats, during face-to-face classes in case of special epidemic regime (adaptive quarantine) - in properly dressed protective medical masks or respirators.