

MINISTRY OF HEALTH PROTECTION OF UKRAINE

ODESSA NATIONAL MEDICAL UNIVERSITY

Department of general and clinical epidemiology and biosafety

I APPROVE



Vice-rector for scientific and pedagogical work

Eduard BURIACHKIVSKYI

September 1, 2023

**WORKING PROGRAM OF EDUCATIONAL DISCIPLINE
"MOLECULAR GENETIC STUDIES IN THE EPIDEMIOLOGY OF
INFECTIOUS DISEASES"**

Level of higher education: second (master's)

Branch of knowledge: 22 "Health care"

Specialty: 222 "Medicine"

Educational and professional program: Medicine

2023

The work program is compiled on the basis of the educational and professional program "Medicine" for the training of specialists of the second (master's) level of higher education in the specialty 222 "Medicine" of the field of knowledge 22 "Health care", approved by the Scientific Council of ONMedU (protocol No. 8 of June 29, 2023).

Developers:

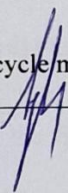
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The work program was approved at the meeting of the department of general and clinical epidemiology and biosafety
Protocol No. 1 dated August 28, 2023.

Head of the department  Mykola GOLUBYATNYKOV

Agreed with the guarantor of the OPP  Valery MARICHEREDA

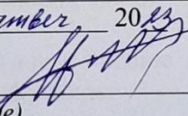
Approved by the subject cycle commission for medical and biological disciplines of ONMedU
Protocol No. ___ of "___" _____ 2023.

Head of the subject cycle methodical commission for medical and biological disciplines of ONMedU  Leonid GODLEVSKYI

Reviewed and approved at the meeting of the department

of general and clinical epidemiology and biosafety with course of microbiology and virology

Protocol No. *1* of "*1*" *September*, 20*23*

Head of the department  Mykola GOLUBYATNYKOV
(signature) (First Name Surname)

Reviewed and approved at the meeting of the department

Protocol No. ___ of "___" _____ 20__

Head of Department _____
(signature) (First Name Surname)

1. Description of the academic discipline:

Name of indicators	Characteristics of the academic discipline	
	Full-time education	
The total number of: Credits - 3 Hours - 90 Content subdivisions - 1	Mandatory	
	A year of training	5
	Semester	IX -X
	Lectures	0
	Practical training	30 hours
	Independent work	60 hours
	Including individual tasks	0
	Final control form	test

2. The purpose and tasks of the educational discipline

The purpose of teaching of the academic discipline Acquaintance of applicants with modern molecular genetic research, using the example of PCR and its varieties

Task:

1. To increase the theoretical level of knowledge regarding modern diagnostics of pathogens of an infectious nature.
2. Formulate knowledge of safety techniques when working with microorganisms of I-IV pathogenicity groups,
3. Familiarize with the methodology of intralaboratory and external quality control of molecular genetic research.
3. Formulate knowledge about molecular genetic research
4. Familiarize with the rules of collection, delivery and storage of samples of biological material of patients and samples of environmental objects

The process of studying the discipline is aimed at forming elements of the following competencies:

IR. The ability to solve typical and complex problems, including those of a research and innovation nature in the field of medicine. Ability to continue learning with a high degree of autonomy.

- General (GC):

- GC 1. Ability to abstract thinking, analysis and synthesis
- GC 3. Ability to apply knowledge in practical situations
- GC 4. Knowledge and understanding of the subject area and understanding of professional activity
- GC 5. Ability to adapt and act in a new situation
- GC 6. Ability to make informed decisions
- GC 7. Ability to work in a team
- GC 8. Ability to interpersonal interaction
- GC 10. Ability to use information and communication technologies
- GC 11. Ability to search, process and analyze information from various sources
- GC 16. The ability to evaluate and ensure the quality of the work performed

Special (SC):

- SC1. Ability to collect medical information about the patient and analyze clinical data
- SC2. Ability to determine the necessary list of laboratory and instrumental studies and evaluate their results
- SC3. Ability to establish a preliminary and clinical diagnosis of the disease
- SC6. Ability to determine the principles and nature of treatment and prevention of diseases
- SC11. Ability to solve medical problems in new or unfamiliar environments in the presence of incomplete or limited information, taking into account aspects of social and ethical responsibility

SC14. Ability to plan and carry out preventive and anti-epidemic measures for infectious diseases

SC16. Ability to maintain medical documentation, including electronic forms

Program learning outcomes (PLO):

PLO 1. Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.

PLO 2. Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care.

PLO 3. Specialized conceptual knowledge, which includes scientific achievements in the field of health care and is the basis for conducting research, critical understanding of problems in the field of medicine and related interdisciplinary problems.

PLO 19. Plan and implement a system of anti-epidemic and preventive measures regarding the occurrence and spread of diseases among the population.

PLO 20. Analyze the epidemiological situation and carry out measures for mass and individual, general and local prevention of infectious diseases.

Expected learning outcomes. As a result of studying the academic discipline, the applicant must:

- Know:

Principles of molecular genetic methods in the diagnosis of infectious diseases.

- The principle of PCR.
- Stages of conducting PCR.
- The problem of contamination.
- Principles of modern laboratory diagnostics of acute diarrheal diseases
- The nature of mutations and their solutions in modern genetics.
- Principles of modern laboratory diagnostics of zoonotic infections
- Principles of molecular-epidemiological monitoring of pathogen resistance mechanisms
- Methods of DNA sequencing

Be able:

- Apply methods of molecular genetic diagnostics.
- Use the results of phylogenetic analysis for diagnosis.

Master the skills:

- Conducting molecular and genetic monitoring of pathogens of infectious diseases

3. Content of the academic discipline

Content module I.

Topic 1. Molecular genetic methods in the diagnosis of infectious diseases. The principle of PCR. The history of the discovery and development of this method.

Topic 2 Stages of conducting PCR. The problem of contamination.

Topic 3 Modern methods used in the identification of pathogens of infectious diseases.

Topic 4. The nature of mutations and their solutions in modern genetics.

Topic 5 Ensuring the safety and quality of laboratory diagnosis of infections when using molecular genetic research.

Topic 6 Improved quantitative version of real-time PCR and other types of PCR. Nucleic acids - structure and structure of DNA.

Topic 7 Molecular and genetic monitoring of pathogens of infectious diseases.

- Topic 8. Dangerous infectious diseases in the work of medical workers and their molecular genetic diagnosis**
- Topic 9 Modern laboratory diagnostics of acute diarrheal diseases.**
- Topic 10. Viral hepatitis with parenteral and enteral transmission. Molecular and genetic methods of diagnosis.**
- Topic 11. Modern laboratory diagnostics of zoonotic infections.**
- Topic 12. Use of phylogenetic analysis methods for molecular genetic typing of pathogens using the example of tularemia infection**
- Topic 13. Molecular and epidemiological monitoring of mechanisms of resistance of HCAI pathogens to antimicrobial drugs**
- Topic 14. Isothermal PCR for rapid diagnosis of a person with a contagious SARS-COV-2 infection**
- Topic 15. Methods of DNA sequencing and methods of their use to study the function of genomes**

4. STRUCTURE OF THE ACADEMIC DISCIPLINE:

No	Topic name	Number of hours		
		In total	software	SRS
1	Molecular genetic methods in the diagnosis of infectious diseases. The principle of PCR. The history of the discovery and development of this method.	6	2	4
2	Stages of conducting PCR. The problem of contamination.	6	2	4
3	Modern methods used in the identification of pathogens of infectious diseases.	6	2	4
4	The nature of mutations and their solutions in modern genetics.	6	2	4
5	Ensuring the safety and quality of laboratory diagnosis of infections when using molecular genetic research.	6	2	4
6	Advanced quantitative real-time PCR and other types of PCR. Nucleic acids - structure and structure of DNA.	6	2	4
7	Molecular and genetic monitoring of pathogens of infectious diseases.	6	2	4
8	Dangerous infectious diseases in the work of medical workers and their molecular genetic diagnosis	6	2	4
9	Modern laboratory diagnostics of acute diarrheal diseases.	6	2	4
10	Viral hepatitis with parenteral and enteral transmission. Molecular and genetic methods of diagnosis.	6	2	4
11	Modern laboratory diagnostics of zoonotic infections.	6	2	4
12	Use of phylogenetic analysis methods in molecular genetic typing of pathogens on the example of tularemia infection	6	2	4
13	Molecular-epidemiological monitoring of mechanisms of resistance of HCAI pathogens to antimicrobial drugs.	6	2	4
14	Isothermal PCR for rapid diagnosis of a person with a contagious SARS-COV-2 infection.	6	2	4
15	Methods of DNA sequencing and how to use them to study the function of genomes	6	2	4
Total hours per chapter		90	30	60

5. Topics of lectures / seminars / practical / laboratory classes

5.1. Topics of lectures

Lectures are not provided.

5.2. Topics of seminar classes

Seminar classes are not provided.

5.3. Topics of practical classes

No	TOPIC	Number of hours
1	Molecular genetic methods in the diagnosis of infectious diseases. The principle of PCR. The history of the discovery and development of this	2
2	Stages of conducting PCR. The problem of contamination.	2
3	Modern methods used in the identification of pathogens of infectious diseases.	2
4	The nature of mutations and their solutions in modern genetics.	2
5	Ensuring the safety and quality of laboratory diagnosis of infections when using molecular genetic research.	2
6	Advanced quantitative real-time PCR and other types of PCR. Nucleic acids - structure and structure of DNA.	2
7	Molecular and genetic monitoring of pathogens of infectious diseases.	2
8	Dangerous infectious diseases in the work of medical workers and their molecular genetic diagnosis	2
9	Modern laboratory diagnostics of acute diarrheal diseases.	2
10	Viral hepatitis with parenteral and enteral transmission. Molecular and genetic methods of diagnosis.	2
11	Modern laboratory diagnostics of zoonotic infections.	2
12	Use of phylogenetic analysis methods in molecular genetic typing of pathogens on the example of tularemia infection	2
13	Molecular-epidemiological monitoring of mechanisms of resistance of HCAI pathogens to antimicrobial drugs.	2
14	Isothermal PCR for rapid diagnosis of a person with a contagious SARS-COV-2 infection.	2
15	Methods of DNA sequencing and how to use them to study the function of genomes	2
In total		30

5.4. Topics of laboratory classes

Laboratory classes are not provided.

6. Independent work of a student of higher education

No	TOPIC	hours
1	Molecular genetic methods in the diagnosis of infectious diseases. The principle of PCR. The history of the discovery and development of this	4
2	Stages of conducting PCR. The problem of contamination.	4

3	Modern methods used in the identification of pathogens of infectious diseases.	4
4	The nature of mutations and their solutions in modern genetics.	4
5	Ensuring the safety and quality of laboratory diagnosis of infections when using molecular genetic research.	4
6	Advanced quantitative real-time PCR and other types of PCR. Nucleic acids - structure and structure of DNA.	4
7	Molecular and genetic monitoring of pathogens of infectious diseases.	4
8	Dangerous infectious diseases in the work of medical workers and their molecular genetic diagnosis	4
9	Modern laboratory diagnostics of acute diarrheal diseases.	4
10	Viral hepatitis with parenteral and enteral transmission. Molecular and genetic methods of diagnosis.	4
11	Modern laboratory diagnostics of zoonotic infections.	4
12	Use of phylogenetic analysis methods in molecular genetic typing of pathogens on the example of tularemia infection	4
13	Molecular-epidemiological monitoring of mechanisms of resistance of HCAI pathogens to antimicrobial drugs.	4
14	Isothermal PCR for rapid diagnosis of a person with a contagious SARS-COV-2 infection.	4
15	Methods of DNA sequencing and how to use them to study the function of genomes	4
In total		60

7. Teaching methods

Practical training: conversation, solving situational problems, practicing skills for working with medical documentation.

Independent work: independent work with the textbook, independent work with the bank of test tasks Step-2, independent solution of situational tasks.

8. Forms of control and assessment methods (including criteria for evaluating learning outcomes)

Current control: oral survey, testing, assessment of performance of practical skills, solution of situational tasks, assessment of activity in class.

Final control: balance

Evaluation of the current educational activity in a practical session:

- Evaluation of theoretical knowledge on the subject of the lesson:
 - methods: survey, solving a situational problem;
 - the maximum score is 5, the minimum score is 3, the unsatisfactory score is 2.
- Evaluation of practical skills and manipulations on the subject of the lesson:
 - methods: assessment of the correctness of the performance of practical skills
 - the maximum score is 5, the minimum score is 3, the unsatisfactory score is 2.

The grade for one seminar session is the arithmetic average of all components and can only have a whole value (5, 4, 3, 2), which is rounded according to the statistical method.

Current assessment criteria for practical training:

Rating	Evaluation criteria
Perfectly "5"	It is presented to the applicant when he shows deep, solid and systematic knowledge in the scope of the curriculum, answers all questions without mistakes, reasonably formulates conclusions, using materials presented for independent work of the applicant, competently and consistently, with knowledge of the methodology, completed practical work ; using scientific terms and concepts correctly.
Fine "4"	The acquirer reveals the main content of the educational material; gives incomplete definitions of concepts; admits inaccuracies when using scientific terms, vaguely formulates conclusions, performed practical work, but made minor mistakes during the research.
Satisfactorily "3"	The applicant reproduces the basic educational material, but makes significant mistakes when presenting it, gives simple examples, definitions of concepts are insufficient, characterizes general issues of social medicine.
Unsatisfactorily "2"	The applicant discloses the content of the educational material fragmentarily, makes gross mistakes in the definition of concepts and when using terminology, did not complete the practical work.

Credit is given to the applicant who completed all tasks of the work program of the academic discipline, took an active part in practical classes, completed and defended an individual assignment and has an average current grade of at least 3.0 and has no academic debt.

Assessment is carried out in the last class before the beginning of the examination session (with the tape system of learning. The grade for the assessment is the arithmetic mean of all components on a traditional four-point scale and has a value that is rounded to 2 (two) decimal places using the statistical method.

9. Distribution of points received by students of higher education

The obtained average score for the academic discipline for applicants who have successfully mastered the work program of the academic discipline is converted from a traditional four-point scale to points on a 200-point scale, as shown in the table:

Conversion table of a traditional assessment into a multi-point scale

Traditional four-point scale	Multipoint 200-point scale
Excellent ("5")	185 - 200
Good ("4")	151 - 184
Satisfactory ("3")	120-150
Unsatisfactory ("2")	Below 120

A multi-point scale (200-point scale) characterizes the actual success of each applicant in learning the educational component. The conversion of the traditional grade (average score for the academic discipline) into a 200-point grade is performed by the information and technical department of the University.

According to the obtained points on a 200-point scale, the achievements of the applicants are evaluated according to the ECTS rating scale. Further ranking according to the ECTS rating scale allows you to evaluate the achievements of students from the educational component who are studying in the same course of the same specialty, according to the points they received.

The ECTS scale is a relative-comparative rating, which establishes the applicant's belonging to the group of better or worse among the reference group of fellow students (faculty, specialty). An "A" grade on the ECTS scale cannot be equal to an "excellent" grade, a "B" grade

to a "good" grade, etc. When converting from a multi-point scale, the limits of grades "A", "B", "C", "D", "E" according to the ECTS scale do not coincide with the limits of grades "5", "4", "3" according to the traditional scale. Acquirers who have received grades of "FX" and "F" ("2") are not included in the list of ranked acquirers. The grade "FX" is awarded to students who have obtained the minimum number of points for the current learning activity, but who have not passed the final examination. A grade of "F" is assigned to students who have attended all classes in the discipline, but have not achieved a grade point average (3.00) for the current academic activity and are not admitted to the final examination.

Applicants who study in one course (one specialty), based on the number of points scored in the discipline, are ranked on the ECTS scale as follows:

Conversion of the traditional grade from the discipline and the sum of points on the ECTS scale

Evaluation on the ECTS scale	Statistical indicator
A	Top 10% achievers
B	The next 25% of earners
C	The next 30% of earners
D	The next 25% of earners
E	The next 10% of earners

10. Methodological support:

- Working program of the academic discipline
- Syllabus of the academic discipline
- Multimedia presentations
- Methodical developments for practical classes

11. Questions for final control:

1. Molecular genetic methods in the diagnosis of infectious diseases.
2. The principle of PCR.
3. The history of the discovery and development of this method.
4. Stages of conducting PCR.
5. The problem of contamination.
6. Modern methods used in the identification of pathogens of infectious diseases.
7. The nature of mutations and their solutions in modern genetics.
8. Ensuring the safety and quality of laboratory diagnosis of infections when using molecular genetic research.
9. Advanced quantitative real-time PCR and other types of PCR.
10. Nucleic acids - structure and structure of DNA.
11. Molecular and genetic monitoring of pathogens of infectious diseases.
12. Dangerous infectious diseases in the work of medical workers and their molecular genetic diagnosis
13. Modern laboratory diagnostics of acute diarrheal diseases.
14. Viral hepatitis with parenteral and enteral transmission.
15. Molecular and genetic methods of diagnosis.
16. Modern laboratory diagnostics of zoonotic infections.
17. Use of phylogenetic analysis methods in molecular genetic typing of pathogens on the example of tularemia infection
18. Molecular-epidemiological monitoring of mechanisms of resistance of HCAI pathogens to antimicrobial drugs.
19. Isothermal PCR for rapid diagnosis of a person with a contagious SARS-COV-2

infection.

20. Methods of DNA sequencing and how to use them to study the function of genomes

12. Recommended literature

Main:

1. Medical Microbiology, Virology and Immunology : textbook / T. V. Andrianova, V. V. Bobyr, V. V. Danyleichenko etc. ; ed. V. P. Shyrobokov. - Vinnytsia : Nova Knyha, 2019. - 744p.

Additional:

1. Medical microbiology and immunology : textbook / M. Z. Tymkiv, O. P. Korniychuk, S. Y. Pavliy et al. - Vinnytsia : Nova Knyha, 2019. - 416 p.

2. Clinical Immunology and Allergology : atlas Ukrainian and English languages / Yu. I. Bazhora, S. F. Goncharuk, A. V. Kasianenko, A. V. Vachnenko. - 3rd edit. - Vinnytsia : Nova Knyha, 2020. - 272 p.

3. USMLE Step 1: Immunology and Microbiology : Lecture Notes / Editors T. L. Alley, K. Moscatello, C. Keller. - New York : Kaplan, 2019. - 511 p.

13. Electronic information resources

1. Sites on general clinical issues of laboratory diagnostics

<http://medbiol.ru/medbiol/har3/00057f6e.htm>

<http://mewo.ru/tumb/12/98/>

<http://ru.wikipedia.org/>

<http://webcache.googleusercontent.com/>

<http://www.astromeridian.ru/medicina>

2. Sites on issues of morphological research in the laboratory

<http://www.morphology.dp.ua/mp3/respiratory>