

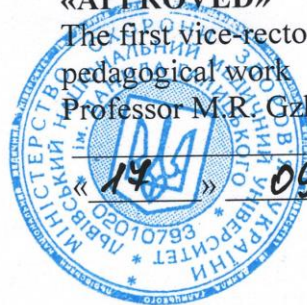
DANYLO HALYTSKY LVIV NATIONAL MEDICAL UNIVERSITY

Department of Microbiology

«APPROVED»

The first vice-rector for scientific and pedagogical work

Professor M.R. Gzhegotsky, MD



2021

WORKING CURRICULUM OF DISCIPLINE

Clinical Microbiology

(elective course)

preparation of specialists of the second (master's) level of higher education in the field of knowledge 22 "Health care" in the specialty 222 «Medicine»

Discussed and approved
at the methodical meeting of the
department microbiology
Protocol № 1
from " 30" August 2021
Head of the department:
prof. O.P. Korniychuk, MD

«APPROVED» at the sitting of the
cyclic methodical commission
on the preventive medicine
Protocol No 5
dated 16 September 2021
Head of the commission
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Lviv-2021

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№	Content of changing	Data and № of protocol from meeting of the department	Annotation
1	No changes had been made	Protocol No 1 dated 27 August 2021 Protocol No 5 dated 16 September 2021	

Explanatory Note

The program of the elective discipline “Clinical Microbiology” is made by the Standard of higher education of Ukraine of the second (master’s) level of higher education in the field of knowledge 22 “Health” speciality 222 “Medicine”, discussed at the XIII All-Ukrainian scientific-practical conference with international participation “Current issues of quality of medical education” (May 12-13, 2016, Ternopil) and a sample curriculum for training second (master’s) level of higher education in the field of knowledge 22 “Health care” in higher educational institutions of the Ministry of Health of Ukraine in the speciality 222 “Medicine” qualification educational “Master of Medicine”, professional qualification “Doctor”, approved on 07/26/2016. At. Minister of Health V. Shafransky; taking into account the Instructions for assessing the educational activities of students in the implementation of the European credit transfer system for the organization of the educational process, approved by the Ministry of Health of Ukraine on 15.04.2014.

Description of the discipline (abstract)

Discipline description (abstract)

The study of the discipline “Clinical Microbiology” is provided in 5-6 semesters of 3 years of study to train specialists of the second (master’s) level of higher education qualification educational “Master of Medicine” qualification professional “Doctor” field of knowledge 22 “Health” speciality 222 “Medicine” is based on the knowledge received by students at studying of medical biology, normal and pathological anatomy and physiology, histology, pharmacology, philosophy, history of medicine, bases of the legislation of Ukraine, and integrates with these disciplines; lay the foundations for the formation of students’ skills and abilities that are determined by the ultimate goals of the discipline and can be used by students in the study of clinical disciplines in the 3rd year and subsequent professional activities.

According to the curriculum of the 3rd year of the medical faculty for the training of specialists of the second (master’s) level of higher education qualification educational “Master of Medicine” qualification professional “Doctor” study of “Clinical Microbiology” is given 90 hours, including 10 hours of lectures, 10 hours of practical classes and 70 hours of independent (extracurricular) work of students.

Types of educational activities of students, according to the curriculum, are a) lectures; b) practical classes; c) independent work of students. Thematic plans of lectures, practical classes and independent work cover all topics included in this course.

The duration of one lecture or practical lesson according to the curriculum and taking into account the standards of weekly classroom workload of students is 2 academic hours.

Practical classes according to the method of their organization are laboratory because they provide:

1) research by students of morphology and structure of bacteria, carrying out crops of researched materials on nutrient media, study of cultural, biochemical properties, factors of pathogenicity of microorganisms, their hereditary and nonhereditary variability, and also their sensitivity to antimicrobial means, statement of serological reactions, experiments on animals and chickens embryos;

2) solving situational problems (laboratory diagnostics of infectious diseases, assessment of immunity indicators, sanitary-microbiological assessment of the state of the environment, etc.), which have experimental, clinical-diagnostic or sanitary-hygienic direction.

Students in practical classes should briefly write down the research protocols, indicating the purpose of the study, the name of the method, the course of work, research results and conclusions.

The current learning activities of students are monitored in practical classes by specific objectives. The following means of diagnosing students' level of preparation are used: testing, written or oral answer to control questions, solving situational problems, conducting laboratory research and interpretation and evaluation of their results, control of practical skills.

The final control of students’ knowledge is carried out on students' current progress and ends with a test. The assessment of a student’s success in the discipline is a rating set on a multi-point scale and is determined by the ECTS system and the scale adopted in Ukraine.

CONTENT OF THE COURSE PROGRAM “Clinical Microbiology”

Topic	Lectures	Practical	Self-work
1. General information about clinical microbiology. Biological features of opportunistic microorganisms and diseases caused by them.	2		4
2. Features of microbiological diagnostics of nosocomial infections. Methods of identification of hospital strains.	2		4

3. Etiology, epidemiology, pathogenesis and clinic of nosocomial infections. COVID-19 as a nosocomial infection.	2		8
4. The main representatives of biocenoses of the human body. Dysbiosis, methods of microbiological diagnosis.	2		12
5. Microbiological diagnosis of bacteremia and sepsis. Microbiological diagnosis of meningitis	2		12
6. Microbiological diagnosis of my bacteria and sepsis. Microbiological diagnosis of meningitis		2	10
7. Microbiological diagnosis of the urinary tract and genital infections		2	
8. Microbiological diagnosis of respiratory infections. Features of microbiological diagnostics of COVID-19. Microbiological diagnosis of inflammatory processes of the eyes and ears		2	10
9. Microbiological diagnosis of intestinal infections and food poisoning. Oral microflora and its role in human pathology		2	10
10. Microbiological diagnosis of wound infection		2	
Total hours - 90	10	10	70
Credits ECTS - 3			

Note 1 ECTS credit - 30 hours.

The subject of the discipline is the properties of opportunistic pathogens of the world of microbes, their interaction with the human body, the mechanisms of development of infectious diseases, methods of their diagnosis, specific prevention and treatment.

Interdisciplinary links: "Clinical Microbiology" as a discipline is based on knowledge gained in the study of general biology, biochemistry, biophysics, histology, cytology and embryology, physiology; clinical microbiology, in turn, is the basis for the study of epidemiology, infectious clinical immunology and allergology, pharmacology, general hygiene, internal medicine, surgery and paediatrics and other clinical disciplines. Lays the foundations of the doctrine of the physiological role of microbes in the human body and the prevention of changes in the normal microflora in the process of drug interventions.

1 Purpose and objectives of the discipline

1.1. The purpose of the study of the discipline "Clinical Microbiology" and the ultimate goals are set based on OPP training of a specialist by the block of its content module (scientific training) and is the basis for determining the content of the discipline. The description of goals is formulated through skills in the form of target tasks (actions). Based on the ultimate goals for each content module, specific goals are formulated in the form of certain skills (actions), target tasks that ensure the achievement of the ultimate goal of studying the discipline.

1.2. The main tasks of studying the discipline "Clinical Microbiology" are :

- interpret the biological properties of pathogenic and non-pathogenic microorganisms, the patterns of their interaction with the macroorganism and the environment;
- determine methods of microbiological and virological diagnostics, etiologic therapy and specific prevention of infectious diseases, as well as non-infectious diseases of microbial origin;
- explain the role and functions of the immune system of the human body;
- to interpret the main mechanisms of formation of the immune response of the human body;
- identify the main types of pathological reactions of the immune system and the relationship with the occurrence of the most common human diseases.

1.3 Competences and learning outcomes, the formation of which is facilitated by the discipline (relationship with the normative content of higher education training, formulated in terms of learning outcomes in the Standard of Higher Education).

According to the requirements of the Standard of Higher Education, the discipline provides students with the acquisition of **competencies**:

- *general*: the ability to apply knowledge in practical situations. Ability to make decisions in unusual situations. Ability to choose a communication strategy; ability to work in a team; interpersonal skills. Skills in the use of information and communication technologies. Ability to abstract thinking, analysis and synthesis, the ability to learn and be modernly trained. Definiteness and perseverance in terms of tasks and responsibilities. Ability to act socially responsibly and with public awareness. Ability to lead a healthy lifestyle. The desire to preserve the environment. Universal competencies that are important for successful further professional and social activities and personal development of the applicant.

- *special (professional, subject)*: Ability to evaluate the results of laboratory tests. Ability to carry out sanitary and hygienic, and preventive measures. Ability to plan preventive and anti-epidemic measures for infectious diseases. Ability to process state, social, economic and medical information. Ability to assess the impact of socio-economic and biological determinants on the health of the individual, family, population. Ability to apply scientifically-based psychological techniques of effective work with colleagues, medical staff, patients and their relatives, willingness to interact with other people—awareness of the individual in the culture of other peoples.

Detailing of competencies according to the descriptors of the National qualifications framework in the form of the “Competence Matrix”.

Competence matrix

№	Competence	Knowledge	Skills	Communication	Autonomy and responsibility
1	2	3	4	5	6
General competencies					
1	Ability to apply knowledge in practical situations	Have specialized conceptual knowledge acquired in the learning process.	Be able to solve complex problems and problems that arise in professional activities.	Clear and unambiguous communication of own conclusions, knowledge and explanations that substantiate them to specialists and non-specialists.	Responsible for making decisions in difficult conditions
2	Ability to learn and master modern knowledge.	Know the current trends in the industry and analyze them.	Be able to analyze professional information, make informed decisions, acquire modern knowledge	Establish appropriate links to achieve goals.	To be responsible for the timely acquisition of modern knowledge.
3	Knowledge and understanding of the subject area and understanding of professional activity.	Have deep knowledge of the structure of professional activity.	Be able to carry out professional activities that require updating and integration of knowledge.	Ability to effectively form a communication strategy in professional activities	To be responsible for professional development, ability to further professional training with a high level of autonomy.
4	Skills in the use of information and communication technologies.	Have in-depth knowledge in the field of information and communication technologies used in professional activities	Be able to use information and communication technologies in the professional field, which requires updating and integrating knowledge.	Use information and communication technologies in professional activities	To be responsible for the development of professional knowledge and skills.
5	Definiteness and perseverance in relation to the set tasks and responsibilities.	Know the responsibilities and ways of fulfilling the set tasks	Be able to define the purpose and tasks to be persistent and honest in the performance of duties	Establish interpersonal relationships to perform tasks and responsibilities effectively	Responsible for the quality of the tasks
6	Ability to communicate in a foreign language	Have a basic knowledge of a foreign language	Be able to communicate in a foreign language.	Use a foreign language in professional activities	To be responsible for the development of professional knowledge using a foreign language.

7	Ability to communicate in the state language both orally and in writing.	Have perfect knowledge of the state language	Be able to apply knowledge of the state language, both orally and in writing	Use the state language in professional and business communication and in the preparation of documents.	To be responsible for the free command of the state language, for the development of professional knowledge.
Special (professional, subject) competencies					
1.	Ability to evaluate the results of laboratory and instrumental research	Have specialized knowledge about humans, their organs and systems, know the standard methods of laboratory and instrumental research (according to list 4: Serological reactions in infectious diseases; Rapid tests for viral diseases; Amplification methods in infectious diseases; Serological reactions in autoimmune diseases; Chemical and bacteriological studies of biological fluids and secretions).	Be able to analyze the results of laboratory and instrumental studies and on their basis to evaluate information about the patient's diagnosis (according to list 4)	It is reasonable to assign and evaluate the results of laboratory and instrumental research (according to list 4).	Be responsible for deciding on the evaluation of laboratory and instrumental research results
2.	Ability to develop preventive and anti-epidemic measures for infectious diseases	Know the principles of organizing and conducting a system of preventive and anti-epidemic measures for infectious diseases and preventing their spread in typical conditions and during the exacerbation of the epidemic situation. Know the methods of detection and early diagnosis of infectious diseases, the organization of primary anti-epidemic measures	Be able to identify risk groups in terms of the development of infectious diseases.	Inform employees of clinical institutions about the timely implementation of treatment and prevention measures.	Be responsible for the quality and timely diagnostic results (including early diagnosis), compliance with the rules of evidence-based medicine.

		in the centre of infectious diseases.			
3.	Ability to process state, social, economic and medical information	Know standard methods, including modern computer information technology, processing of state, social and medical information	Ability to determine the source of the required information depending on its type; ability to conduct statistical processing of material and analysis of the received information	To form conclusions based on the analysis and statistical processing of the received information	To be responsible for high-quality and timely execution of statistical processing and analysis of the received information
4.	Ability to assess the impact of socio-economic and biological determinants on the health of the individual, family, population	Know the socio-economic and biological determinants that affect public health; types and methods of prevention to prevent the negative impact of socio-economic factors on the health of the population and its individual groups	Be able to calculate based on epidemiological and medical-statistical research indicators of public health Be able to assess the relationship and impact of socio-economic and biological factors on the health of the individual, family, health population Be able to plan preventive measures to prevent the negative impact of socio-economic factors on the health of the population and its individual groups	Obtain the necessary information from identified sources on the health of the population and its individual groups and formulate conclusions on the impact of socio-economic and biological factors on public health	To be responsible for the validity of preventive measures to prevent the negative impact of socio-economic factors on the health of the population and its individual groups
5.	Ability to apply intellectual abilities and knowledge when working with the patient	Know the worldview function of bioethics in the formation of civil society and historical aspects of the concept of "human rights."	Be able to identify potential threats to the essence of living organisms	Get the necessary medical, social, special information	Make effective decisions, including in extreme conditions, and be responsible for them
6.	Ability to provide medical, ethical and legal assessment of specific cases from the standpoint of confidentiality and medical secrecy in solving situational problems in patients with HIV.	Know the Law of Ukraine "On Combating the Spread of Diseases Caused by Human Immunodeficiency Virus (HIV), Legal and Social Protection of People Living with HIV."	Take into account the diversity of human and civil rights	Apply norms and principles of biomedical ethics and deontology	Be responsible for maintaining medical confidentiality.

Studying outcomes:

Integrative final program learning outcomes, the formation of which is facilitated by the training course :

- Ability to analyze pathogenic and non-pathogenic microorganisms' biological properties and patterns of their interaction with the macroorganism and the environment.
- The ability to interpret the basic mechanisms of formation of the immune response of the human body.
- The ability to determine the main types of pathological reactions of the immune system and the relationship with the most common human diseases.
- Ability to determine methods of microbiological and virological diagnostics, etiotropic therapy, specific prevention of infectious diseases, and non-infectious diseases of microbial origin.
- Ability to process state, social, economic and medical information.

Learning outcomes for the discipline - a set of knowledge, skills, abilities, other forms of competence acquired by a person in the learning process by the Standard of higher education, which can be identified, quantified and measured.

According to higher education standards, students must:

Know :

- Identify the most informative methods of microbiological diagnosis (according to list 4). To determine the methods of immunological tests and methods of rapid diagnosis and evaluate the results.
- Identify appropriate research methods and assess microbiological contamination of the environment (water, air, soil) and food.

Be able to :

- Evaluate the results of laboratory and instrumental research according to list 4;
- Master modern methods of microbiological research in infectious diseases;
- Analyze the principles of obtaining vaccines, methods of their standardization and control, practical use;
- Master the principles of production of immune sera, methods of their standardization, control, analyze the practical significance;
- Interpret the development of microbiological science in historical retrospect;
- Interpret the main scientific developments in microbiology and immunology;
- Demonstrate mastery of moral and ethical principles of attitude to a living person, his body as an open system and the appropriate microbiome.

2. Information volume of the discipline

In the study, I discipline given 3 credits ECTS, 90 hours

LIST OF TOPICS

Topic № 1. General information about clinical microbiology. Biological features of opportunistic microorganisms and diseases caused by them

Topic № 2. Features of microbiological diagnostics of nosocomial infections. Methods of identification of hospital strains.

Topic № 3. Aetiology, epidemiology, pathogenesis and clinic of nosocomial infections. COVID-19 as a nosocomial infection.

Topic № 4. The main representatives of the biocenoses of the human body. Dysbiosis, methods of microbiological diagnosis.

Topic № 5. Microbiological diagnosis of exogenous opportunistic infections.

Topic № 6. Microbiological diagnosis of bacteremia and sepsis

Topic № 7 . Microbiological diagnosis of the urinary tract and genital infections

Topic № 8. Microbiological diagnosis of infections of the respiratory system. Features of microbiological diagnostics of COVID-19.

Topic № 9 . Microbiological diagnosis of intestinal infections and food poisoning

Topic № 10. Microbiological diagnosis of wound infection

THEMATIC PLAN OF LECTURES

№	Topic	Number of hours
1.	General information about clinical microbiology. Biological features of opportunistic microorganisms and diseases caused by them	2
2.	Features of microbiological diagnosis of nosocomial infections. Methods of identification of hospital strains	2

3.	Aetiology, epidemiology, pathogenesis and clinic of nosocomial infections. COVID-19 as a nosocomial infection.	2
4.	The main representatives of the biocenoses of the human body. Dysbiosis, methods of microbiological diagnosis.	2
5.	Microbiological diagnosis of exogenous opportunistic infections.	2
	Total	10

THEMATIC PLAN OF PRACTICAL CLASSES

№	Topic	Number of hours
1	Microbiological diagnosis of bacteremia and sepsis.	2
2	Microbiological diagnosis of the urinary tract and genital infections	2
3	Microbiological diagnosis of respiratory infections. Features of microbiological diagnostics of COVID-19.	2
4	Microbiological diagnosis of intestinal infections and food poisoning	2
5	Microbiological diagnosis of wound infection	2
	Total	10

Types of self-education work of students and its control

	Types of self-education	Number of hours	type of control
1	Dysbacteriosis of the large intestine. Conditions of occurrence. Consequences of development. Correction methods.	12	Final lesson
2	The problem of “healthy” carriers of opportunistic pathogens and remediation of bacteria carriers.	8	Final lesson
3	Exogenous opportunistic infections (legionellosis, pseudotuberculosis, listeriosis, seraciosis).	12	Final lesson
4	Hospital strains and ecovars of opportunistic pathogens. Causes and ways to prevent their spread.	8	Final lesson
5	Oral microflora and its role in human pathology	10	Final lesson
6	Microbiological diagnosis of meningitis	10	Final lesson
7	Microbiological diagnosis of inflammatory processes of the eyes and ears	10	Final lesson
	Total	70	

DISTRIBUTION OF POINTS FOR EVALUATION OF STUDENT LEARNING ACTIVITY

When mastering the topic, the student receives grades on the traditional (four-point) from “2” to “5”. Next, the average is calculated and converted into a 200-point system for disciplines that end with a credit (differential credit).

The test in the above discipline is given to students who have attended all the curricula provided by the discipline and during the study of the course scored the number of points not less than the minimum.

Teaching methods

Teaching methods

Traditional teaching methods: verbal, visual, practical.

Methods of educational and cognitive activity: explanatory-illustrative method, reproductive method, method of problem statement, partial-search or heuristic method, the research method.

Methods of stimulation and motivation of educational and cognitive activity: inductive and deductive teaching methods, methods of stimulation and motivation of learning. Interactive methods: “Brainstorming”, “Competitive group method”, “Case method”, and other educational technologies used for the transfer and acquisition of knowledge and practical skills.

Control methods are teaching methods (teacher control, self-control, mutual control, self-correction, mutual correction). Distance learning methods (“ Misa ” program) to prepare for the licensing exam “Step-1”.

12. Methods of control

Current control is carried out during the study of a specific topic to determine the level of formation of a particular skill or ability, the quality of learning a certain portion of educational material by observing students' learning activities, oral interviews, written control of knowledge and practical skills through written work (written answers questions, essays, solving situational problems, etc.) and test control using a set of standardized tasks.

The control of students' independent work is carried out during the current control and the final lesson.

Final control involves summarizing the results of the current control.

LIST OF PRACTICAL SKILLS, THE ACQUISITION OF WHICH IS CONTROLLED DURING PRACTICAL CLASSES AND CURRENT CONTROL

1. To carry out the account of blood culture on the two-component environment, to note the existence of growth and to make the scheme of the further researches
2. On a Petri dish with blood agar, where urine was seeded by the method of Gold, count the colonies of microorganisms and conclude the diagnostic conception of the result
3. Perform microscopy of smears from the female genitals. Establish the presence of microorganisms that indicate a pathological process
4. Detect in crops of colonies of opportunistic pathogens, calculate their percentage.
5. Know the principle of operation of modern test systems for biochemical identification of opportunistic pathogens.

LIST OF QUESTIONS FOR CURRENT CONTROL

in the discipline "Clinical Microbiology."

1. Tasks of clinical microbiology. The value of clinical microbiology in the work of the doctor.
2. Objects of research (clinical material). Pathogenic and opportunistic microorganisms, population features, role in the development of the pathological process.
3. Microbiocenoses of healthy and pathologically altered habitats of the human body. Dysbacteriosis (dysmicrobiocenosis). Conditions of occurrence. Consequences of development. Classification by etiological factors and localization. Methods of diagnosis and rehabilitation (rehabilitation).
4. Definition of opportunistic infections. Conditions of occurrence and features of the course.
5. Classification by prevalence of opportunistic infections. Exogenous opportunistic infections (legionellosis, pseudotuberculosis, listeriosis, seraciosis).
6. Endogenous opportunistic infections, the role of representatives of the resident microflora of the organism in their occurrence. Microbiological diagnostics. Criteria for the etiological role of opportunistic pathogens isolated from the pathological focus.
7. Opportunistic iatrogenic infections. Etiological structure. Hospital strains and ecovars of opportunistic pathogens.
8. Opportunistic infections associated with medical intervention. Features of immunity. Microbiological bases of prevention and treatment of opportunistic infections.
9. Scientific substantiation of anti-epidemic measures in the centre of nosocomial infection.
10. Determination of nosocomial (hospital, nosocomial) infections. Classification. Conditions that contribute to their emergence and widespread use in hospitals.
11. Conditions for a successful diagnosis of nosocomial infections. Criteria for the etiological role of microorganisms isolated in the bacteriological diagnosis of nosocomial infections.
12. Prevention of nosocomial infections.

Evaluation of the discipline "Clinical Microbiology."

Forms of control and assessment system are carried out by the requirements of the discipline program and instructions on the system of assessment of students' learning activities.

Current control is carried out at each practical lesson by the specific objectives of each topic. When evaluating students' learning activities, it is necessary to give preference to standardized methods of control: structured written works, structured according to the procedure of control of practical skills in conditions close to real ones. Assessment of students' current learning activities is described above.

When mastering the topic, the student receives grades on the traditional (four-point) from "2" to "5". Then the average is calculated, which is converted into a 200-point system, as for disciplines that end with a credit (differential credit).

The test in the above discipline is given to students who have attended all the curricula provided by the discipline and during the study of the course scored the number of points not less than the minimum.

Assessment of students' independent work is carried out during classroom classes and the final lesson.

Conversion of points from the discipline into grades on ECTS scales and four-point (traditional) is as follows:

Points in the discipline	Traditional assessment	ECTS assessment
From 175 to 200 points	«5»	A (175-200)
From 140 to 174 points	« 4 »	B (160-174)
		C (140-159)
From 90 to 139 points	« 3 »	D (120-139)
		E (90-119)
Below 90 points	«2»	FX, F (less than 90)

Ranking on an assignment of grades “ A ”, “ B ”, “ C ”, “ D ”, “ E ” is carried out for students of this course who study in one speciality and have successfully completed the study of the discipline.

Grades “ F X ” are given to students who have not enrolled in the course after completing its study.

Grade “ F ” is given to students who attended all classes but did not score the minimum number of points for the current educational activities and are not admitted to the final control. This category of students has the right to re-study the course.

12. Recommended literature.

Mandatory as :

1. Medical microbiology, virology and immunology (ed. Acad. Shirobokova VP). - Vinnytsia., “New book”. - 2011.- 951 p.
2. SI. Klimnyuk, IO Sitnik, VP Shirobokov Practical microbiology: textbook; за заг.пе.: B.П. Shirobokova, SI Klimnyuk. - Vinnytsia: Nova Kniga, 2018. - 576 p.
3. Microbiology, virology and immunology in questions and answers; for general ed.: VP Shirobokova, SI Klimnyuk. - Ternopil: Ukrmedknyha, 2019. - 340 p.
4. Sytnyk IO Microbiology, virology, immunology / Sytnyk IO, Klymnyuk SI, Tvorko MS - Ternopil: Ukrmedknyha, 2003. - 392 p.

Additional:

1. V.V. Danylychenko, JM Fedechko, OP Korniychuk, II Soloninko Microbiology with the basics of immunology (textbook) - Medicine, 2019.
2. Balakliets NI, Tsyganenko A. Ya., Minukhin VV General microbiology. - Kharkiv, 2002.
3. Protchenko PZ General microbiology, virology and immunology. Selected lectures: Textbook. manual. — Odessa: Odessa. Medical University, 2002.
4. Paliy GK, Paliy VG, Mrug VM Microbiology, virology, immunology, infectious diseases. Dictionary / Ed. GK Paliy, VG Paliy. - Kyiv: Health, 2004.
5. Shirobokov VP, Yankovsky DS, Diment GS Human microbial ecology. - K., 2009.
6. Review of Medical Microbiology and Immunology, 12edition / Warren E. Levinson / McGraw-Hill Prof Med.-Tech., 2012. - 688 p.
7. Jawetz, Melnick, & Adelberg’s Medical Microbiology, 26th Edition, 2012, English. - 880 p. - ISBN-13: 978-0071790314
8. Atlas R. M. Principles of microbiology.-McGraw-Hill, Boston, Massachusetts, 2001

13. Information resources

1. Official website of President of Ukraine <http://www.president.gov.ua/>
2. The Verkhovna Rada of Ukraine <http://www.rada.gov.ua/>
3. Cabinet of Ministers of Ukraine <http://www.kmu.gov.ua/>
4. The Ministry of Education and Science of Ukraine <http://www.mon.gov.ua/>
5. Ministry of Ecology and Natural Resources of Ukraine <http://www.menr.gov.ua/>
6. State Service of Ukraine for Emergencies <http://www.dsns.gov.ua/>
7. National Security and Defense Council of Ukraine <http://www.rnbo.gov.ua/>
8. Permanent Mission of Ukraine to the United Nations <http://ukraineun.org/>
9. North Atlantic Treaty Organization (NATO) <http://www.nato.int/>
10. World Health Organization <http://www.who.int/en/>
11. Microbiology and immunology online <http://www.microbiologybook.org/>
12. Online microbiology note <http://www.microbiologyinfo.com/>
13. Centres for disease control and prevention www.cdc.gov