

Microbiology with Parasitology and Immunology

Educational subject description sheet

Basic information

Organizational unit Faculty of Medicine		Didactic cycle 2021/22	
Field of study Medical Program		Realization year 2022/23	
Study level long-cycle master's degree program		Lecture languages english	
Study form full-time		Block obligatory for passing in the course of studies	
Education profile general academic		Mandatory obligatory	
Disciplines Medical science		Examination examination	
Subject related to scientific research Yes		Standard group C. Preclinical course	
Subject coordinator		Agata Pietrzyk, Krzysztof Bryniarski	
Lecturer		Pełna lista prowadzących dostępna na stronie usosweb.uj.edu.pl w zakładce Katalog → Przedmioty.	
Period Semester 4	Examination examination	Number of ECTS points 6.0	
	Activities and hours e-learning lecture: 37 seminar: 16 laboratory: 27		

Goals

C1	Familiarizing students with the biology and classification principles of pathogenic microorganisms and the mechanisms of their pathogenic impact on the human body.
C2	Presentation of transmission modes and methods to prevent the spread of infectious and parasitic diseases in the human population.
C3	Presentation of the principles of microbiological and parasitological diagnostics, proper collecting and sending samples for testing.
C4	Familiarizing students with the principles of proper aseptic and antiseptic procedures.
C5	Teaching students the correct selection of diagnostic methods and the proper interpretation of microbiological and parasitological tests results in the field of classical (microscopy and culture) as well as serological and molecular diagnostics.
C6	The course aims at presenting the general concepts of immunological processes and mechanisms underlying human immunity, with the special emphasis on those, which understanding is important in the medical profession.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge - Student knows and understands:			
W1	micro-organisms, including pathogenic and present in the physiological flora	C.W12	multiple choice test
W2	epidemiology of viral and bacterial infections and infections with fungi and parasites, taking into account their geographical distribution	C.W13	multiple choice test
W3	the impact of abiotic and biotic (viruses, bacteria) environmental factors on the human body and human population and their pathways into the human body	C.W14	multiple choice test
W4	the consequences of human body exposure to various chemical and biological agents and the principles of prevention	C.W15	multiple choice test
W5	the principle of the parasite-host system and the principal disease symptoms caused by the parasites	C.W17	multiple choice test
W6	symptoms of iatrogenic infections, their pathways and pathogens causing changes in individual organs	C.W18	multiple choice test
W7	basics of microbiological and parasitological diagnostics basics of disinfection, sterilization and aseptic management	C.W19	practical test, multiple choice test
W8	basic principles of disinfection, sterilization and aseptic management	C.W20	multiple choice test
W9	genetic mechanisms for the acquisition of drug resistance by microorganisms and cancer cells	C.W11	multiple choice test
W10	human-invasive forms or stages of parasitic fungi, protozoa, helminths and arthropods of selected parasitic species, taking into account their geographical distribution	C.W16	practical test, multiple choice test

W11	basic of development and mechanisms of immune system action, including specific and non-specific mechanisms of humoral and cellular immunity	C.W21	classroom observation, multiple choice test
W12	major histocompatibility complex	C.W22	multiple choice test
W13	types of hypersensitivity reactions, types of immunodeficiency and basics of immunomodulation	C.W23	classroom observation, multiple choice test
W14	issues related to cancer immunology	C.W24	multiple choice test
W15	the genetic basis for donor and recipient selection and the basics for transplantation immunology	C.W25	multiple choice test
W16	benefits and threats resulting from the presence of genetically modified organisms (GMOs) in the ecosystem	C.W10	multiple choice test
Skills - Student can:			
U1	recognize the most frequent human parasites on the basis of their structure, life cycles and symptoms of illnesses	C.U7	practical test, multiple choice test
U2	prepare preparations and identify pathogens under the microscope	C.U9	classroom observation, practical test
U3	interpret the results of microbiological tests	C.U10	classroom observation, practical test, multiple choice test
U4	use the antigen-antibody reaction in current modifications and techniques for the diagnosis of infectious, allergic, autoimmune and neoplastic diseases and blood diseases	C.U8	classroom observation
U5	analyze reaction, defense and adaptation phenomena and regulatory disturbances caused by an etiological factor	C.U12	classroom observation
Social competences - Student is ready to:			
K1	formulate conclusions from own measurements or observations	O.K8	classroom observation, practical test
K2	use objective sources of information	O.K7	classroom observation
K3	promote health-promoting behaviors	O.K6	classroom observation

Calculation of ECTS points

Activity form	Activity hours*
e-learning lecture	37
seminar	16
laboratory	27
preparation for classes	15
preparation for examination	53

participation in examination	2
Student workload	Hours 150
Workload involving teacher	Hours 80
Practical workload	Hours 27

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	Morphology, physiology and methods of bacteria classification. Bacterial cell structure.	W1	e-learning lecture
2.	The genome of bacteria. The basis of variation and transfer of genetic material bacteria. Bacterial resistance to antibiotics and chemotherapeutics.	W16, W9	seminar
3.	Physiological flora and mechanisms of the human microbiome formation.	W1	seminar
4.	Pathogenesis of bacterial infections. Bacterial virulence factors.	W3	seminar
5.	Bacterial etiological factors of infections in humans (Gram-positive and Gram-negative cocci, Gram-negative rods, Gram-positive sporulated and non-sporulated bacilli, anaerobic bacteria, mycobacteria, spirochetes, actinomyces, mycoplasma, chlamydia, rickettsia).	W1	seminar
6.	Epidemiology and prevention of bacterial infections. Anti-bacterial vaccines.	W2, W4	seminar
7.	Sterilization, disinfection and aseptic: principles and methods of disinfection and sterilization, the mechanism of disinfectants action, sterilization process control methods, the principle of good antiseptics.	W8	seminar, laboratory
8.	Hospital infection. Epidemiology and etiology.	W6	e-learning lecture
9.	Basics of bacteriological diagnosis. Rules for collecting and sending of specimens for bacteriological testing. Gram staining and other staining methods. Methods of bacterial culture on artificial growth media. Isolation and selected methods of bacterial identification. Serological and molecular methods. Determination of bacterial resistance to antibiotics and chemotherapeutics. Interpretation of results.	W7, U2, U3, K1	seminar, laboratory
10.	Features of the structure and replication of viruses. Classification criteria for human pathogenic viruses.	W1	e-learning lecture
11.	Biological and pathogenic properties of DNA and RNA viruses. Pathomechanism of viral infections.	W3	seminar

12.	Viral etiological factors of infections in humans: DNA viruses (herpeviruses, adenoviruses, poxviruses, parvoviruses, polyomaviruses, papillomaviruses), RNA viruses (ortomixo- and paramixo-viruses, coronaviruses, picornaviruses, astroviruses, caliciviruses, reoviruses, togaviruses, flaviviruses, filoviruses, rhabdoviruses, bunyaviruses and arenaviruses, retroviruses), hepatitis viruses. Prions.	W1	seminar
13.	Epidemiology of viral infections. Antiviral vaccines.	W2, W4	seminar
14.	Virological diagnostics. Collecting and sending of specimens for virological testing. Methods of virus isolation and identification. Serological and molecular diagnostics. Diagnostics of influenza and rubella viruses, diagnostics of hepatitis viruses, rotaviruses and enteroviruses, HIV diagnostics - methods and interpretation of test results. Molecular methods in the diagnostics of CMV, EBV, HSV and HPV. Resistance to antiviral drugs.	W7, U3, K1	seminar, laboratory
15.	Morphology and physiology of fungi. Classification criteria for human pathogenic fungi.	W1	e-learning lecture
16.	Pathogenesis of fungal infections and etiological factors of fungal infections: yeasts, filamentous fungi (molds), dermatophytes and dimorphic fungi.	W1, W4	seminar
17.	Epidemiology and prevention of fungal infections.	W2, W4	e-learning lecture
18.	Fungi as allergens. Mycotoxins and mycotocscosis.	W4	e-learning lecture
19.	Basics of medical mycological diagnostics. Collecting and sending of materials for mycological testing. Diagnostic methods: microscopy, culture, serological and molecular techniques. Determination of sensitivity to antifungal drugs. Interpretation of mycological test results.	W7, U2, U3, K1	seminar, laboratory
20.	Classification rules and general features of the structure of human parasites.	W1	laboratory
21.	Definition of parasitism. The host-parasite system and mechanisms of pathogenic interaction of parasites on the human (host) body. Basic disease symptoms associated with parasitoses.	W5	seminar
22.	Life cycles and invasive developmental stages of selected protozoa, worms and arthropods that parasitize in humans (<i>Giardia intestinalis</i> , <i>Entamoeba histolytica</i> and other creeps, <i>Cryptosporidium</i> , <i>Balantidium coli</i> , <i>Trichomonas vaginalis</i> , <i>Trypanosoma</i> , <i>Leishmania</i> , <i>Plasmodium</i> , and <i>Babesia</i> , <i>Taenia</i> , <i>Diphyllobothrium</i> , <i>Echinococcus</i> , <i>Enterobius</i> , <i>Ascaris</i> , <i>Trichuris</i> , <i>Strongyloides</i> and <i>Ancylostoma</i> , <i>Trichinella</i> and <i>Toxocara</i> , and ectoparasites: <i>Sarcoptes</i> , <i>Pediculus</i> , <i>Phthirus</i> , <i>Demodex</i>).	W10, U1	seminar, laboratory
23.	Epidemiology and prevention of parasitic infections.	W2, W4	seminar
24.	Parasitological diagnostics. Diagnostic materials - sampling and sending. Methods of parasitological diagnostics: microscopy (coproscopy), macroscopic examination of feces, culture methods (culture of flagellates) as well as serological and molecular diagnostics.	W7, U1, U2, U3, K1	seminar, laboratory

25.	Cells of the immune system. Organs of the immune system. Innate immunity	W11	e-learning lecture
26.	Antigen-antibody interactions, complement system: Precipitation-based immunoassays (diffusion, immune-double diffusion, radial immunodiffusion, immunoelectrophoresis, rocket immunoelectrophoresis, countercurrent electrophoresis)	W11, U4, U5, K1	laboratory
27.	Antigens, Antibodies: Structure, Function. Monoclonal antibodies. Antibody genes and generation of diversity.	W12, W15	e-learning lecture
28.	Major histocompatibility complex. Antigen processing and presentation. Generation of the humoral immune response.	W11, W12	e-learning lecture
29.	Antigen - antibody interactions, complement system: agglutination- based immunoassays (haemagglutination) Enzyme linked immunosorbent assay (ELISA) Immunoblotting (Western blot)	W11, W13, U4, U5, K1, K2, K3	laboratory
30.	Cell-mediated immunity. Classical cellular response and delayed type hypersensitivity.	W11, W13, W14, W15	e-learning lecture
31.	Cellular immunology and cellular immunology basic assays: NBT (Nitro-blue Tetrazolium Test) MACS (microbeads separation of cells) lymphocyte separation on gradient- Ficoll discontinuous gradient separation isolation of lymphocyte subpopulations - rosetting	W13, W15, U5, K2, K3	laboratory
32.	Cellular immunology and cellular immunology basic assays: dissection of mouse (demonstration) contact sensitivity reactions (in vivo assay in contact sensitivity (CS)) modern laboratory techniques in immunology - immunofluorescence (Fluorescence Activated Cell Sorter) FACS	W11, U4, U5, K1	laboratory
33.	Immune regulation and tolerance.	W11, W12, W13, W14, W15	seminar
34.	Inflammation. Hypersensitive reactions mediated by antibodies.	W11, W12, W13, W14	e-learning lecture
35.	Immune responses to infection. Vaccines.	W11, W14, U5	e-learning lecture

Course advanced

Teaching methods:

classes / practicals, laboratories (labs), preclinical classes, discussion, e-learning, educational film, presentation, seminar, lecture, lecture with multimedia presentation

Activities	Examination methods	Credit conditions
e-learning lecture	multiple choice test	Final test (100 multiple-choice questions with one correct answer) covering topics covered during lectures, seminars and exercises in Immunology (40 test questions) and Microbiology with parasitology (60 questions). Assessment threshold: 60% correct answers (a 60% threshold is required for both Immunology and Microbiology with parasitology).

Activities	Examination methods	Credit conditions
seminar	multiple choice test	Theoretical issues (Immunology) are included in the final test exam (MCQ exam) at the end of the course (semester 4).
laboratory	classroom observation, practical test, multiple choice test	Active participation in classes - student is required to perform a particular task (exercise) in accordance with the instructions indicated by the teacher and to interpret the results of microbiological / parasitological testing. Student is obliged to obtain a credit for all practical classes except those he was not present (maximum 2 in Microbiology with parasitology). Assessment of practical skills acquired by the student is carried out in each case during and at the end of the practical classes. Theoretical issues (Microbiology with parasitology and Immunology) are included in the final test exam (MCQ exam) at the end of the course (semester 4).

Additional info

1. Student receives the total final grade from the module: Microbiology with parasitology and Immunology.
2. The final grade is calculated based on the score obtained on the final examination test.
3. Final examination test - to pass the exam is obliged to get 60% correct answers, which is required to provide at least 60% of correct answers in the field of Immunology and at least 60% correct answers of Microbiology with parasitology. Obtaining less than 60% of correct answers in terms of any of the items in the first or in the second term leads to a lack of passing module.
4. Module passing is a subject to the following conditions:
 - o Attendance of exercises and seminars (a maximum of 3 excused absences are allowed, with a maximum of 1 in Immunology classes and a maximum of 2 in Microbiology with parasitology).
 - o Active participation in lab classes and performance a particular task (exercise) indicated by the teacher.
5. Final exam grading scale for Microbiology with Parasitology and Immunology:
 - <60 points.; failed (2.0)
 - 60 - 67; satisfactory (3.0)
 - 68 - 75; satisfactory plus (3.5)
 - 76 - 83; good (4.0)
 - 84 - 91; good plus (4.5)
 - 92 - 100; very good (5.0)
6. NB! Please note! Owing to COVID-19 pandemic situation, there may be last minute modifications regarding the syllabus.
7. E-learning (ONLINE lectures) will currently replace traditional lectures/seminars.
8. We are hoping to conduct the labs and exam at the university facilities.

Entry requirements

Biochemistry with elements of chemistry, Genetics with molecular biology.

Literature

Obligatory

1. Jawetz Melnick & Adelbergs Medical Microbiology, 28th Edition. McGraw-Hill Medical 2019. ISBN: 978-1260012026
2. Janeway's Immunobiology. K.Murphy, P.Travers and M. Walport. Garland Publishing Inc., New York

Optional

1. Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. Medical Microbiology, 9th Edition. Elsevier 2020. ISBN: 978-0323673228
2. Gilbert DN, Chambers HF, Saag MS, Pavia AT et al. Sanford Guide to Antimicrobial Therapy 2020. Antimicrobial Inc. 2020, VA
3. Abbas A.K., Lichtman A.H.: Cellular and molecular immunology. 5-th edition, Elsevier Saunders, Philadelphia 2016
4. P., Martin S.J., Burton D.R., Roitt I.M.: Roitt's Essential Immunology. 13th Editon, Willey Blackwell Edition 2017
5. Nairn R., Helbert M.: Immunology for medical students. 2-nd edition, Mosby Elsevier Philadelphia 2015

Effects

Code	Content
C.U7	rozpoznawać najczęściej spotykane pasożyty człowieka na podstawie ich budowy, cykli życiowych i objawów chorobowych
C.U8	posługiwać się reakcją antygen - przeciwciało w aktualnych modyfikacjach i technikach dla diagnostyki chorób zakaźnych, alergicznych, autoimmunizacyjnych i nowotworowych oraz chorób krwi
C.U9	przygotowywać preparaty i rozpoznawać patogeny pod mikroskopem
C.U10	interpretować wyniki badań mikrobiologicznych
C.U12	analizować zjawiska odczynowe, obronne i przystosowawcze oraz zaburzenia regulacji wywoływane przez czynnik etiologiczny
C.W10	korzyści i zagrożenia wynikające z obecności w ekosystemie organizmów modyfikowanych genetycznie (GMO)
C.W11	genetyczne mechanizmy nabywania lekooporności przez drobnoustroje i komórki nowotworowe
C.W12	drobnoustroje, z uwzględnieniem chorobotwórczych i obecnych we florze fizjologicznej
C.W13	epidemiologię zarażeń wirusami i bakteriami oraz zakażeń grzybami i pasożytami, z uwzględnieniem geograficznego zasięgu ich występowania
C.W14	wpływ abiotycznych i biotycznych (wirusy, bakterie) czynników środowiska na organizm człowieka i populację ludzi oraz drogi ich wnikania do organizmu człowieka
C.W15	konsekwencje narażenia organizmu człowieka na różne czynniki chemiczne i biologiczne oraz zasady profilaktyki
C.W16	inwazyjne dla człowieka formy lub stadia rozwojowe wybranych pasożytniczych grzybów, pierwotniaków, helmintów i stawonogów, z uwzględnieniem geograficznego zasięgu ich występowania
C.W17	zasadę funkcjonowania układu pasożyt - żywiciel i podstawowe objawy chorobowe wywoływane przez pasożyty
C.W18	objawy zakażeń jatrogennych, drogi ich rozprzestrzeniania się i patogeny wywołujące zmiany w poszczególnych narządach
C.W19	podstawy diagnostyki mikrobiologicznej i parazytologicznej
C.W20	podstawy dezynfekcji, sterylizacji i postępowania aseptycznego
C.W21	podstawy rozwoju i mechanizmy działania układu odpornościowego, w tym swoiste i nieswoiste mechanizmy odporności humoralnej i komórkowej
C.W22	główny układ zgodności tkankowej
C.W23	typy reakcji nadwrażliwości, rodzaje niedoborów odporności i podstawy immunomodulacji
C.W24	zagadnienia z zakresu immunologii nowotworów
C.W25	genetyczne podstawy doboru dawcy i biorcy oraz podstawy immunologii transplantacyjnej
O.K6	propagowania zachowań prozdrowotnych
O.K7	korzystania z obiektywnych źródeł informacji
O.K8	formułowania wniosków z własnych pomiarów lub obserwacji