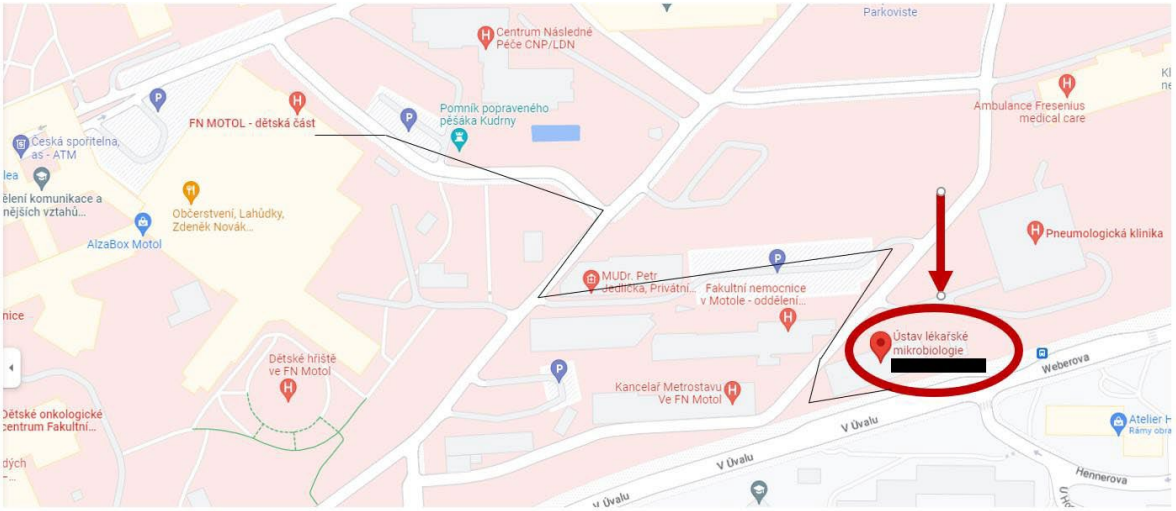
SECOND FACULTY OF MEDICINE
CHARLES UNIVERSITY

MICROBIOLOGY I - INSTRUCTIONS FOR THE SUMMER SEMESTER

Dear colleagues,

On **February 23rd 2026**, the summer semester of the 2nd year begins, including **Microbiology I.** You can look forward to encountering the clinical laboratory and discovering the fascinating world of dangerous microorganisms for humans, but in some cases also beneficial (see the list of interesting literature below). During the summer semester, you can attend **lectures on Thursdays 11:40 AM in the Pelouch Hall at Plzeňská** and practicals at the Department of Medical Microbiology (building 20 of the hospital area, see map below). In most cases, the **practicals** are related to the week's lecture, so we kindly advise you to consider your participation very carefully despite the early morning hour. You will need the knowledge gained there for the practicals. The syllabus for the summer semester lectures and practicals can be found on page 5 and also in SIS.



When you arrive at the practicals, wait until you are all present and at the earliest 10 minutes before the practicals start, ring the sign "Sekretariát" or, in case of non-reactivity ", Praktika" (the entrance is from the bottom of the building). Our kind secretary or lab technicians will let you in.

Please note that the teaching takes place in an infectious environment. Therefore, you must **store all your belongings in the lockers** (you will be given a key on entry). Please do not bring anything with you to the practical classes; your heads will be sufficient (this applies to all books, notebooks, etc.). You can take notes on paper, which will be provided with folders that can be disinfected on the outside. Similarly, for electronic instruments - if you wish to use them, it will be compulsory to always disinfect them before entering and when leaving. Always leave food and drink in the lockers; you will be able to return to them if necessary. **Always carry out thorough hand hygiene** (soap and alcohol disinfection) **when entering and leaving the practical room**.

The practicals in weeks 2,3 and 4 are so-called **compulsory topics** covered by Dean's Action 4/2022. If you cannot come with your group, you must substitute the exercise with another group or arrange another form of substitution with your circle assistant.

The teaching materials can be found on Moodle in thematic blocks corresponding to the topics of lectures and practical exercises (link here).

Credit

To receive credit, you will need:

1) **Attendance at practicals** (you are allowed 20% absences, i.e. two practicals per semester)
2) Earn a total **of 14 out of 20 points on two credit tests during the** semester (written in week 6 and week 14 at the beginning of the lecture, ten "single-choice" questions per 10 minutes; see Syllabus). In case of illness or inability to attend, contact Dr. Hurych; it will be possible to make up the test with an oral examination. Test topics:
   - **Test I:** General microbiology, laboratory methods (within the scope of topics from practical exercises until Week 5), antibacterial agents
   - **Test II:** Special Bacteriology, Mycology I
3) **Pass the practical exam** in week 13 during practicals (see below). The practical exam in the summer term will test your knowledge:
   I. To be able to describe at least a basic description of a microscopic slide or culture finding (real or virtual) or a basic description and interpretation of the result of a molecular or serological method; list of microbes to be tested is on page 6.
   II. Know the types and use of basic sampling kits in microbiological diagnostics

In case of illness or inability to come to the practical exam with your group, contact Doctor Hurych; it will be possible to come with another group. In case of illness, it will be possible to take the exam on an alternate date during the exam period.

If these conditions are not met, your case will be individually assessed by Dr. Hurych in consultation with your group assistant.

You will take the theoretical exam in the winter semester of the next academic year. It will consist of three questions. The exam questions have been slightly modified from last year's version, the new version is in SIS and on pages 7-9 of this document.

Conclusion

We look forward to seeing you and guiding you on our journey through the world of dangerous microbes. We hope you enjoy the first half of Microbiology.

On behalf of the teaching staff of the Department of Medical of Microbiology, Second Faculty of Medicine, Charles University,

Jakub Hurych, M.D., Ph.D.
Deputy Head for Teaching

Ad. study materials

- Lectures in PDF format will be published on Moodle in the course Microbiology I.
- Atlas of microscopic slides and Atlas of microbial cultures on Moodle in the course Microbiology I.

- Basic study literature:
  - Melter O et al.: The MicroBook - Clinical Microbiology for Medical Students, 1st edition, Karolinum, 2019, ISBN 978-80-246-3871-3.
  - Goering RV et al: Mims' Medical Microbiology, 5th edition, Triton, 2016, ISBN 978-80-7387-928-0.

- Popularization books on the topic of medical microbiology and infectious medicine:
  - Cantor N.F.: In the footsteps of the plague - the black death and the world it gave birth to, BB art, 2005, ISBN 80-7341-416-3
  - Cook R: Toxin, Book Club, 1998, ISBN 80-7202-374-8.
  - Daniel M. Secret Paths of the Death Eaters, Young Front, Columbus Edition, 1985, ISBN 23-035-85.
  - de Kruif P: The Microbial Hunters, Orbis, 1959.
  - de Kruif P: Fighters with Death, Young Frontier, 1960.
  - Dobson MJ: Diseases - stories of history's most dangerous killers, Slovart, 2009, ISBN 978-80-7391-292-5.
  - Garret L: Will we survive? Plagues of Today, Triton, 2008, ISBN: 978-80-7387-171-0.
  - Gel F: Přemožitel neviditelných predců, Albatros, 1979, ISBN 13-228.
  - Karger-Decker H: Invisible Enemies, Orbis, 1977.
  - Lax E: Mould in a Coat, BB art, 2005
  - Levy SB: Antibiotic paradox, Academia, 2007, ISBN 978-80-200-1485-6.
  - Lesny I: A Report on the Diseases of the Powerful, Horizon, 1984, ISBN 40-036-84.
  - Lesny I: The Second Report on the Diseases of the Powerful, Horizon, 1987, ISBN 40-001-87.
  - Lewis S: Arrowsmith - the story of a young doctor, Book Club, 1993, ISBN 80-85634-38-4.
  - Maurois A: The Life of Sir Alexander Fleming, Odeon, 1981.
  - Osterholm M.T.: The Invisible Killers, Prostor, 2020 , ISBN 978-80-7260-473-9
  - Preston R.: The insidious Ebola, Book Club, 1996, ISBN 80-7176-312-8
  - Ryan F: Viruses - the threat of our time, Prague, 1997, ISBN 80-85809-67-2.
  - Spinney, L: The Pale Rider, Omega, ISBN 978-80-7390-687-0
  - Zimmer C: The Master Parasite, Paseka, 2005, ISBN 80-7185-685-1.

- Popularization films with the theme of medical microbiology and infectious medicine:
  - The Colored Veil, directed by J. Curran, 2006

- Once Upon a Time (serial), directed by A. Barillé, 1987 (episodes: Bodyguard, Vaccination)
- Dr. Ignaz Semmelweis, directed by M. Verhoeven, 1988
- The Shot Felt 'Round the World, directed by T. Greidanus, 2010
- Pasteur and Koch: Duel of the Giants of the Microbial World, directed by M. Schwarz, 2018
- Pasteur, directed by A. Brunard, 2010
- Kerosene Lamps, directed by J. Herz, 1971
- Philadelphia, directed by J. Demme, 1993
- Outbreak, directed by Wolfgan Petersen 1995

Syllabus

Wk	Date	**Lecture** (Thu 11:40, Pelouch Hall)	**Presenting**	**Week's practicals** (gr.2 Mon 8:00, gr.1 Tue 8:00, gr.3 Wed 11:40, gr.4 Fri 8:00)
1	26.02.2026	**Introduction to Medical microbiology, basics of bacterial cell genetics**	Doc. MVDr. Oto Melter, Ph.D.	Preanalytical phase of microbiological diagnostics
2	05.03.2026	**Bacterial cell. Pathogenicity of bacteria.**	RNDr. Jan Tkadlec, Ph.D.	Microscopy in bacteriology
3	12.03.2026	**Introduction to antibiotics. Systematics of antimicrobials I** (execpt for betalactams).	doc. MVDr. Oto Melter, Ph.D.	Bacterial cultures and procedures leading to the identification of bacteria
4	19.03.2026	**Molecular microbiology**	Prof. MUDr. Pavel Dřevínek, Ph.D.	SEMINAR: BETALACTAM ABS.Antimicrobials susceptibility testing (AST)
5	26.03.2026	**Significant G+ cocci I** (staphylococci)	RNDr. Jan Tkadlec, Ph.D.	Serological methods
6	02.04.2026	**G+ cocci II** (streptococci and enterococci) - **CREDIT TEST I**	Mgr. Marcela Krůtová, Ph.D.	Diagnostics of G+ cocci I (staphylococci)
7	09.04.2026	**G+ rods** (corynebacteria, listeria, clostridia)	Doc. MVDr. Oto Melter, Ph.D.	Diagnostics of G+ cocci II (streptococci and enterococci)
8	16.04.2026	**G- bacteria I** (enterobacteria) **w/ G+ and G- anaerobes**	MUDr. Anežka Gryndlerová	Diagnostics of important G+ rods (corynebacteria, listeria, clostridia and bacilli)
9	23.04.2026	**G-bacteria II** (non-fermenters, Campylobacter, Helicobacter)	doc. MVDr. Oto Melter, Ph.D.	Diagnostics of G-bacteria I. (enterobacteria) and anaerobes
10	30.04.2026	**G- bacteria III** (fastidious: Bordetella, Legionella, Haemophilus, Meningcoccus)	MUDr. Daniela Lžičařová	Diagnostics of G-bacteria II - nonfermenters, Campylobacter, Helicobacter
11	07.05.2026	**Mycology I:** general principles, antifungal agents, dermatophytes	MUDr. Daniela Lžičařová	Seminar: Brucella, Francisella. Diagnostics of G-bacteria III - fastidious bacteria (bordetella, Legionella, haemophilus, meningococcus) **Wednesday:** Rector's sport day

12	14.05.2026	**Mycology II:** Candidiasis, cryptococcosis, aspergillosis, mucormycosis, *Pneumocystis jirovecii* pneumonia.	MUDr. Daniela Lžičařová	Diagnostic methods in mycology // SEMINAR: General parasitology. Basics of malaria and intestinal paraitics diseases. Diagnostic methods in parasitology
13	21.05.2026	**General virology. CREDIT TEST 2.**	MUDr. Petr Hubáček, Ph.D.	Diagnostic methods in mycology // SEMINAR: General parasitology. Basics of malaria and intestinal paraitics diseases. Diagnostic methods in parasitology
14	28.05.2026	**Consulations.**	NA	**PRACTICAL EXAM**

List of microbes for the practical exam

No	Microbe	No	Microbe
1	*Enterococcus faecalis*	19	*Klebsiella pneumoniae*
2	*Enterococcus faecium*	20	*Proteus mirabilis*
3	*Staphylococcus aureus*	21	*Salmonella* Enteritidis
4	*Staphylococcus hominis*	22	*Shigella dysentariae*
5	*Streptococcus agalactiae*	23	*Yersinia enterocolitica*
6	*Streptococcus pneumoniae*	24	*Neisseria meningitidis*
7	*Streptococcus pyogenes*	25	*Bacteroides fragilis*
8	*Clostridioides difficile*	26	*Fusobacterium nucleatum*
9	*Clostridium perfringens*	27	*Prevotella* sp.
10	*Listeria monocytogenes*	28	*Candida albicans*
11	*Actinomyces* sp.	29	*Candida krusei*
12	*Cutibacterieum acnes*	30	*Cryptococcus neoformans*
13	*Burkholderia cepacia komplex*	31	*Pneumocystis jirovecii*
14	*Pseudomona aeruginosa*	32	*Aspergillus fumigatus*
15	*Stenotrophomonas maltophilia*	33	*Cryptosporidium parvum*
16	*Helicobacter pylori*	34	*Entamoeba histolytica*
17	*Escherichia coli*	35	*Plasmodium falciparum*
18	*Haemophilus influanzae*		

Exam questions in the 3rd year

Rules: combination of three questions from three groups:
1. General microbiology (subgroup I.)
2. Special microbiology (subgroups II.-IV)
3. Clinical Microbiology (subgroup V.) and Microbiologal Methods (subgroup VI.)

I. General Microbiology (26 questions)

1. Cell wall composition of G+ and G- bacteria. Classification of bacteria.
2. Structure of bacterial cell and surface structure, bacterial spore.
3. Exotoxins and their classification according to mechanism and site of action.
4. The bacterial genome and its plasticity. Mobile genetic elements.
5. Structure of viral particles. Classification of viruses.
6. Pathogenesis of viral infections.
7. General mycology. Classification of micromycetes.
8. General parasitology. Classification of parasites.
9. Mechanisms of action of antibiotics.
10. Mechanisms of antibiotic resistance.
11. Reserve antibiotics
12. Principles of rational antibiotic therapy.
13. Penicillin antibiotics.
14. Generation I to V cephalosporins, carbapenems
15. Glycopeptides. Oxazolidinones (linezolid)
16. Antimicrobials with beta-lactamase inhibitors
17. Macrolide and lincosamide antibiotics.
18. Tetracyclines, including tigecycline. Chloramphenicol.
19. Aminoglycosides. Polypeptide antibiotics (polymyxin).
20. Quinolone antibiotics.
21. Cotrimoxazole. Metronidazole. Nitrofurantoin.
22. Antituberculosis.
23. Virostatics, including covid-19 treatment.
24. Antifungals.
25. Antiparasitics (emphasising antimalarials), including anti-infectives used to treat parasitic infections.
26. Side effects of antibiotics.

II. Special Virology and Mycology (19 questions)

27. Herpesviruses - HSV1, HSV2 and VZV.
28. Herpesviruses - EBV, CMV and HHV-6.
29. Influenza viruses.
30. Parotitis virus. Measles virus.
31. Rubella virus and parvovirus B19.
32. Rabies virus.
33. Adenoviruses.
34. Rotavirus. Caliciviruses.
35. Polioviruses and other enteroviruses.
36. Flaviviruses causing encephalitis
37. Viral hemorrhagic fever.
38. Papillomaviruses. Human pathogenic poxviruses.
39. RSV, parainfluenza viruses, rhinoviruses.
40. SARS-CoV-2 and other coronaviruses
41. Agents of viral hepatitis.
42. HIV and other retroviruses.
43. Yeasts (candida)
44. Filamentous micromycetes (aspergilli, mucormycetes, dermatophytes).
45. Cryptococcus. Pneumocystis.

III. Special bacteriology (33 questions)

46. *Staphylococcus aureus*.
47. Coagulase-negative staphylococci.
48. *Streptococcus pyogenes*.
49. Beta haemolytic streptococci other than *S. pyogenes*.
50. *Streptococcus pneumoniae* and oral streptococci.
51. Enterococci.
52. Neurotoxic clostridia.
53. Histotoxic clostridia.
54. *Clostridioides difficile*.
55. *Bacillus anthracis* and other bacilli.
56. *Listeria monocytogenes.*
57. Corynebacteria.
58. Actinomycetes and nocardia.
59. *Pseudomonas aeruginosa* and other G-nonfermenting rods.
60. Bordetelly.
61. Brucella and *Francisella tularensis. Legionella pneumophila*.
62. *Campylobacter. Helicobacter pylori.*
63. *Haemophilus influenzae* and other haemophiles.
64. *Vibrio cholerae* and other vibrio.
65. *Escherichia coli*. Shigely.
66. Yersinia.
67. Salmonella (Typhi, Enteritidis and other serotypes).
68. *Klebsiella. Enterobacter*.
69. *Citrobacter, Serratia, Proteus* and *Providencia*.
70. *Neisseria meningitidis.*
71. *Neisseria gonorrhoeae*.
72. Anaerobic bacteria other than clostridia and actinomycetes.
73. Treponema pallidum.
74. Borrelia and leptospires.
75. Rickettsie, coxiellas, bartonells.
76. Chlamydia.
77. Mycoplasmas and ureaplasmas.
78. Mycobacteria.

IV. Parasitology (11 questions)

79. Trypanosomes and leishmania.
80. *Giardia*. *Cryptosporidium*. *Trichomonas*.
81. *Entamoeba* and other amoeboid protozoa.
82. The causative agents of malaria.
83. *Toxoplasma gondii*.
84. Schistosomes.
85. Taeniae and other agents of intestinal cestodes.
86. Echinococci and other agents of tissue cestodes.
87. *Enterobius* and *Ascaris*. Other agents of intestinal nematodes.
88. *Trichinella* and other agents of tissue nematodes (including filariasis).
89. Ectoparasites.

V. Clinical Microbiology (18 questions)

90. The human microbiome. Physiological microbiota.
91. Upper respiratory tract infections.
92. Lower respiratory tract infections.
93. Diarrhoeal diseases.
94. Urinary tract infections.
95. Sexually transmitted infections.

96. Non-infectious (aseptic) neuroinfections.
97. Suppurative meningitis.
98. Blood-stream infections. The concept of sepsis.
99. Healthcare-associated infections.
100. Multi-resistant strains and treatment options.
101. Exanthemic diseases.
102. Skin and soft tissue infections.
103. Infection of bones and joints.
104. Infections caused by anaerobic bacteria.
105. Infection of the fetus and newborn.
106. Types of vaccines. Compulsory vaccination.
107. Recommended vaccinations and vaccinations at the request of the individual.

VI. Investigation procedures and diagnostics (12 questions)

108. Microbiological diagnosis of bacterial infections
109. Microbiological diagnosis of viral infections
110. Microbiological diagnosis of mycotic infections
111. Microbiological diagnosis of parasitic infections
112. Microscopy in the diagnosis of infectious diseases.
113. Cultivation of bacteria.
114. Procedures leading to the identification of bacteria.
115. Antibiotic susceptibility tests. Interpretation of results
116. Serological reactions (agglutination, ELISA, WB, immunochromatography).
117. Molecular biology methods and their advantages and disadvantages in the diagnosis of infectious diseases.
118. PCR and its use in the diagnosis of infectious diseases (including POCT mode).
119. Sequencing and its use in the microbiology laboratory.