



## MICROBIOLOGY II - INSTRUCTIONS FOR WINTER SEMESTER

Dear colleagues,

On October 2, 2023, the winter semester of the 3rd year begins and with it the teaching of the course "Microbiology II" (for Group 2 and 20 "Medical Microbiology II"). You can look forward to digging deeper and learning more about the world of dangerous microorganisms. Firstly, by extending your horizons to include other agents, viruses and parasites and secondly by applying your knowledge about microorganisms and antimicrobial agents to the problem of organ systems infections. At the end of your journey through the world of microorganisms, you will take a two-part exam (practical with one question and theoretical with three questions). The following is a structured description of what you will encounter in the coming semester. Please direct any questions or concerns to [jakub.hurych@lfmotol.cuni.cz](mailto:jakub.hurych@lfmotol.cuni.cz).

### Lectures and practice

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You have lectures twice a week, always in the Great Auditorium:

- Mondays from 9:50
- Tuesdays from 14:25

Except for groups 2 and 20 you have no practical exercises, so we will only meet in lectures. We have structured these in thematic blocks, which now last only 90 minutes (see **Syllabus** below). We hope you might better absorb the information, and we get more space for interaction and case studies. Although, given the non-mandatory nature of the lectures, it may be tempting to skip the lectures and come straight to the exam, we highly discourage you from doing so. Compared to a textbook, lectures allow you to put the issues in context and clarify any ambiguities with the lecturer. Therefore, consider attending lectures as an essential part of your preparation to pass the exam.

### Panel discussion

A new feature is the final lecture set as a **panel discussion**. In it, we will offer answers to questions that may arise in preparation for the exam. For our proper preparation for this discussion, please write down your questions in advance on [this shared document](#) no later than January 9, 2024. Please provide only the wording of the question. If necessary, you may add new lines according to the template (everyone with access has permission). Due to time constraints, we reserve the right not to answer all questions. Those that remain unanswered can be resolved by personal consultation.

### Changes in the timetable

- You will have no lecture on Monday, October 30 due to personnel issues at our Department.
- For groups 2 and 20, the practicals in the first four weeks will be cancelled and replaced by lectures in virology and molecular microbiology; Groups 2 and 20 practicals will not begin until Friday, November 2.



## Credit

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A condition for obtaining credit is the successful completion of written tests before the Thursday lecture (weeks 3, 7 and 11; see **Syllabus**), in which a minimum of 20 points must be obtained in the sum of all three tests. There are no replacement terms. Each of the individual tests contains 10 questions, each correctly answered question is worth 1 point. The duration of each test is 10 minutes. If a student fails to achieve the minimum score of 20 points, he/she has the option of taking a summary test during the credit week; the test lasts 30 minutes, and contains 30 questions, each of which is scored one point; the minimum score for credit is 24 points.

## Circuits for credit tests

- **Test 1:** General microbiology (general bacteriology, virology, mycology, parasitology - basic concepts; antimicrobials - overview, mechanisms of action and resistance to ATBs, spectrum of action; testing methods - overview and distribution, importance, advantages and disadvantages of each method)
- **Test 2:** Special microbiology (bacteria - G+, G- and others, fungi, parasites, viruses; knowledge of individual agents - classification; pathogenicity and most important virulence factors; possibilities of diagnosis and therapy)
- **Test 3:** Clinical microbiology (nosocomial, urinary, respiratory, alimentary, nervous system, bloodstream infections - the most important agents; methods of diagnosis, treatment and prevention)

For Groups 2 and 20, there is an additional requirement to attend at least 80% of the practicals sessions.

## Exam

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Dates for the examination will be announced during the 9th week of the winter semester in accordance with the wording of the Examination Regulations of the 2<sup>nd</sup> Faculty of Medicine, listed on the faculty's website.

## Practical part

As we have already announced in the summer semester of the previous academic year, you will now have a practical exam. This will consist of one question, closely linked to one microorganism (which will remain secret in the question). An overview of these can be found in SIS and also in **Table 1** below. It will proceed as follows:

- You have one question connected to one agent (without knowing the agent) that is defined by a clinical case and a working diagnosis. Your task will be:
  1. Determine the type of suitable sampling material (not necessarily just one).
  2. Describe methods for processing the specified material to capture possible microbial agents in the case. *These two points are essential for the practical part.*
  3. You will then be given diagnostic materials (a microscopic slide, a live culture or photograph of it, or a test result). The task will be to describe what you see from the microbiologist's perspective (shape, staining, growth characteristics, phenomena, etc.), or to suggest further microbiological testing to more accurately identify the agent. Finally, you will attempt to identify the causative agent of the disease. *We will be very lenient at this point of the evaluation and will especially expect an adequate description of the findings (e.g., if you say*



*you see G- cocci and they are G+ rods or you do not recognize the bacterium by specific growth on the plate, this will not lead to termination of the test).*

To prepare for the practical exam, use the Atlas of Microscopic Specimens by doc. Melter (on Moodle), during the semester we will also make available the Atlas of Microbial Cultures. You will also be able to prepare at the Department of Medical Microbiology's Practical Room. The dates for viewing the slides and cultures are in the [google sheet link](#). The document is also used for czech groups (but is in English). Please sign up for a maximum of two sessions in the initial phase to ensure that everyone can see the slides and cultures (it is due to limited capacity). If there is still space 48 hours beforehand on a given date, you can still sign up even if you have already come twice. The latest you can sign up for a date is 24 hours in advance. The spreadsheet will be made available for the enrollment approximately 14 days before the first date (which will be 12/19/2023). You will be notified by email.

### Theoretical part

The questions for the theoretical part of the exam do not change this year. You will get three questions, a list of which can be found in SIS and **Table 2**:

- 1) General microbiology + clinical microbiology (39 questions in total).
- 2) Special virology and mycology + parasitology + examination procedures and diagnostics (39 questions in total).
- 3) Special bacteriology (32 questions in total).

### Study materials

- Lectures in PDF format will be published on Moodle in the course Microbiology II.
- Atlas of microscopic slides and atlas of microbial cultures are or will be on Moodle in the course Microbiology II.
- Required (compulsory) textbooks:
  - Murray P. et al. Medical Microbiology, Elsevier Books, 2015
  - Melter O. and Castelhana R. MicroBook – Clinical Microbiology for Medical Students, 2019
- Recommended (optional) textbooks:
  - Microbiology, Lippincott's Illustrated Reviews, Lippincott Williams and Wilkins, 2012
  - Mims' Medical Microbiology and Immunology, Elsevier, 2018
- Recommended (optional) practicals:
  - Melter O. and Malmgren Annika, Principles and Practicals in Medical Microbiology, 2014

### Practicals for group 2 and 20

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To arrive at the practicals, wait until you are all present and no earlier than 10 minutes before the practicals start. Ring the sign "Sekretariát" or (if there is no response) "Praktika" (the entrance is on the lower side of the building). Our secretaries or lab technicians will let you in. We remind you that classes takes place in an infectious environment. Therefore, you will need to **keep all your belongings in lockers** (you will receive key upon entry). Do not bring anything with you to the practical classes (including 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 mandatory 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 practice room.

As mentioned, practicals do not begin **until week 5**.

### **Conclusion**

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We hope that you enjoy the second half of Microbiology and that you successfully pass the final exam. We wish you all the best for the upcoming semester!

On behalf of the teaching staff of the Department of Medical Microbiology,

Jakub Hurych, M.D.

Deputy Head for Teaching



**Syllabus**

<b>MICROBIOLOGY II - WINTER SEMESTER 2023/2024</b>					
Week	Date	Day	Time	Topic	Teacher
1	02.10.2023	Monday	9:50-11:30	<b>Molecular microbiology</b>	prof. MUDr. Pavel Dřevínek, Ph.D.
	03.10.2023	Tuesday	14:25-16:05	<b>General virology, diagnostic methods in virology</b>	MUDr. Petr Hubáček, Ph.D.
2	09.10.2023	Monday	9:50-11:30	<b>Viral exanthematous diseases</b>	MUDr. Petr Hubáček, Ph.D.
	10.10.2023	Tuesday	14:25-16:05	<b>Herpesviruses</b>	MUDr. Petr Hubáček, Ph.D.
3	16.10.2023	Monday	9:50-11:30	<b>Protozoa I</b> <b>CREDIT TEST I</b>	doc. MVDr. Oto Melter, Ph.D.
	17.10.2023	Tuesday	14:25-16:05	<b>Protozoa II, Trematoda</b>	doc. MVDr. Oto Melter, Ph.D.
4	23.10.2023	Monday	9:50-11:30	<b>Cestoda, Nematoda</b>	doc. MVDr. Oto Melter, Ph.D.
	24.10.2023	Tuesday	14:25-16:05	<b>Intestinal serotypes of E. coli and shigella</b>	doc. MVDr. Oto Melter, Ph.D.
5	30.10.2023	Monday	9:50-11:30	<b>NO LECTURE</b>	
	31.10.2023	Tuesday	14:25-16:05	<b>GIT infections</b>	doc. MVDr. Oto Melter, Ph.D.
6	06.11.2023	Monday	9:50-11:30	<b>Respiratory tract infections</b>	doc. MVDr. Oto Melter, Ph.D.
	07.11.2023	Tuesday	14:25-16:05	<b>Respiratory viruses</b>	MUDr. Petr Hubáček, Ph.D.
7	13.11.2023	Monday	9:50-11:30	<b>Arboviruses; haemorrhagic fevers</b> <b>CREDIT TEST II</b>	MUDr. Petr Hubáček, Ph.D.
	14.11.2023	Tuesday	14:25-16:05	<b>Neuroinfections</b>	prof. MUDr. Pavel Dřevínek, Ph.D.
8	20.11.2023	Monday	9:50-11:30	<b>Bloodstream infections (BSI)</b>	prof. MUDr. Pavel Dřevínek, Ph.D.
	21.11.2023	Tuesday	14:25-16:05	<b>Introduction to HAI, Catheter Infection; Surgical Site Infections; Hospital-Aquired &amp; Ventilator-Associated Pneumonia</b>	Prof. RNDr. Alexandr Nemeč, Ph.D. et Ph.D.
9	27.11.2023	Monday	9:50-11:30	<b><i>Clostridioides difficile</i> infections (CDI)</b>	Mgr. Marcela Krůtová, Ph.D.
	28.11.2023	Tuesday	14:25-16:05	<b>Urinary tract infections (UTI)</b>	MUDr. Jakub Hurych
10	04.12.2023	Monday	9:50-11:30	<b>Multi-drug resistant bacteria &amp; reserve antibiotics</b>	Mgr. Jan Tkadlec, Ph.D.
	05.12.2023	Tuesday	14:25-16:05	<b>Bone and joint infections</b>	MUDr. Anežka Gryndlerová
11	11.12.2023	Monday	9:50-11:30	<b>Sexually transmitted infections (STI)</b> <b>CREDIT TEST III</b>	doc. MVDr. Oto Melter, Ph.D.
	12.12.2023	Tuesday	14:25-16:05	<b>Soft tissue infections</b>	MUDr. Anežka Gryndlerová
12	18.12.2023	Monday	9:50-11:30	<b>HIV &amp; hepatitis viruses</b>	MUDr. Petr Hubáček, Ph.D.
	19.12.2023	Tuesday	14:25-16:05	<b>Sequencing techniques in microbiology. Human microbiome, physiological microbiota.</b>	MUDr. Jakub Hurych
13	02.01.2024	Tuesday	14:25-16:05	<b>Infections in pregnancy and newborns</b>	MUDr. Petr Hubáček, Ph.D.
14	08.01.2024	Monday	9:50-11:30	<b>Vaccination from a microbiology perspective</b>	prof. MUDr. Pavel Dřevínek, Ph.D.
	09.01.2024	Tuesday	14:25-16:05	<b>Panel discussion: ask us anything</b>	All teachers



**Table 1.** List of questions for the practical examination.

Number	microbe
1	<i>Enterococcus faecalis</i>
2	<i>Enterococcus faecium</i>
3	<i>Staphylococcus aureus</i>
4	<i>Staphylococcus hominis</i>
5	<i>Streptococcus agalactiae</i>
6	<i>Streptococcus pneumoniae</i>
7	<i>Streptococcus pyogenes</i>
8	<i>Clostridioides difficile</i>
9	<i>Clostridium perfringens</i>
10	<i>Corynebacterium diphtheriae</i>
11	<i>Listeria monocytogenes</i>
12	<i>Actinomyces sp.</i>
13	<i>Cutibacterium acnes</i>
14	<i>Acinetobacter baumani</i>
15	<i>Burkholderia cepacia complex</i>
16	<i>Pseudomonas aeruginosa</i>
17	<i>Stenotrophomonas maltophilia</i>
18	<i>Bordetella pertussis</i>
19	<i>Campylobacter sp.</i>
20	<i>Helicobacter pylori</i>
21	<i>Citrobacter freundii</i>
22	<i>Enterobacter cloacae</i>
23	<i>Escherichia coli</i>
24	<i>Haemophilus influenzae</i>
25	<i>Klebsiella pneumoniae</i>
26	<i>Proteus mirabilis</i>
27	<i>Salmonella Enteritidis</i>
28	<i>Salmonella Typhi</i>
29	<i>Shigella dysenteriae</i>
30	<i>Yersinia enterocolitica</i>
31	<i>Neisseria meningitidis</i>
32	<i>Neisseria gonorrhoeae</i>

33	<i>Bacteroides fragilis</i>
34	<i>Fusobacterium nucleatum</i>
35	<i>Prevotella sp.</i>
36	<i>Mycobacterium tuberculosis</i>
37	<i>Ureaplasma urealyticum</i>
38	<i>Mycoplasma pneumoniae</i>
39	<i>Borellia burgdorferi</i>
40	<i>Candida albicans</i>
41	<i>Candida krusei</i>
42	<i>Cryptococcus neoformans</i>
43	<i>Pneumocystis jirovecii</i>
44	<i>Aspergillus fumigatus</i>
45	Influenza A
46	SARS-CoV-2
47	Rotavirus
48	Morbillivirus
49	<i>Cryptosporidium parvum</i>
50	<i>Entamoeba histolytica</i>



**Table 2.**

**I. General Microbiology (22 questions)**

1. Bacterial cell structure. Bacterial spore.
2. Structure and classification of viruses.
3. Cell wall composition of G+ and G- bacteria. Endotoxin.
4. Capsule and other surface components. Biofilm.
5. Exotoxins and their classification according to their mechanism and site of action.
6. Bacterial factors of pathogenicity.
7. Pathogenesis of viral infections.
8. Bacterial genome and its plasticity. Mobile genetic elements.
9. Classification of antibiotics according to their mechanism of action.
10. Mechanisms of resistance to antibiotics (incl. MRSA, VRE, betalactamases).
11. Principles of rational antibiotic therapy.
12. Penicillins.
13. Cephalosporins and carbapenems.
14. Glycopeptides. Oxazolidinons (linezolid).
15. Macrolides and linkosamides. Tetracyclines including tigecycline. Chloramphenicol.
16. Aminoglycosides. Polypeptide antibiotics (polymyxin).
17. Quinolons.
18. Co-trimoxazole. Metronidazole. Nitrofurantoin.
19. Antituberculotics.
20. Antiviral therapy.
21. Antifungal therapy.
22. Side effects of antibiotic therapy.

**II. Special virology and mycology (17 questions)**

23. Herpesviruses - HSV1, HSV2 and varicella zoster virus.
24. Herpesviruses - EBV, cytomegalovirus and HHV-6.
25. Influenza viruses.
26. Mumps virus. Measles virus.
27. Rubella virus and parvovirus B19.
28. Lyssavirus.
29. Adenoviruses.
30. Rotaviruses. Caliciviruses.
31. Polioviruses and other enteroviruses.
32. Tick-borne encephalitis virus and other flaviviruses (except for HCV).
33. Papillomaviruses. Human pathogenic poxviruses.
34. RSV, parainfluenza viruses, coronaviruses, rhinoviruses.
35. Hepatitis viruses.
36. Virus HIV and other retroviruses.
37. Candida. Dermatophytes.
38. Aspergillus. Zygomycetes.
39. Cryptococcus. Pneumocystis.

**III. Special bacteriology (32 questions)**

40. Streptococcus pyogenes.
  41. Viridans streptococci (S. pneumoniae, oral streptococci).
  42. Beta haemolytic streptococci other than S. pyogenes.
  43. Enterococci.
  44. Staphylococcus aureus.
  45. Coagulase negative staphylococci.
  46. Neisseria meningitidis.
  47. Neisseria gonorrhoeae.
  48. Brucella species and Francisella tularensis. Legionella pneumophila.
  49. Bordetella species.
  50. Haemophilus influenzae and other Haemophilus species.
  51. Listeria monocytogenes.
  52. Corynebacterium diptheriae and other corynebacteria.
  53. Escherichia coli. Shigella species.
  54. Salmonella species (Typhi, Enteritidis and other serotypes).
  55. Klebsiella, Enterobacter, Serratia, Proteus.
  56. Yersinia species.
  57. Vibrio cholerae and other Vibrio species.
  58. Campylobacter jejuni. Helicobacter pylori.
  59. Pseudomonas aeruginosa and other G-nonfermenters.
  60. Mycobacterium tuberculosis. M. leprae. Atypical mycobacteria.
  61. Anaerobes (other than clostridia).
  62. Actinomycetes and Nocardia.
  63. Clostridium tetani. Clostridium botulinum.
  64. Clostridium difficile.
  65. Clostridium perfringens and other histotoxic clostridia.
  66. Bacillus anthracis and other Bacillus species.
  67. Treponema pallidum.
  68. Borrelia and Leptospira.
  69. Rickettsia, Coxiella, Bartonella.
  70. Chlamydia species.
  71. Mycoplasma and Ureaplasma species.
- IV. Parasitology (11 questions)**
72. Trypanosomes and Leishmania.
  73. Giardia. Cryptosporidium. Trichomonas.
  74. Entamoeba and other ameboid protozoa.
  75. Malaria parasites.
  76. Toxoplasma gondii.
  77. Schistosoma species.
  78. Taenia species and other enteric tapeworms.
  79. Echinococcus and other tissue tapeworms.
  80. Enterobius and Ascaris. Other enteric nematodes.
  81. Trichinella and other tissue nematodes.
  82. Ectoparasites.



**V. Clinical microbiology (16 questions)**

83. Human microbiota
84. Upper respiratory tract infections. Microbiological diagnostics and antimicrobial therapy.
85. Lower respiratory tract and lung infections. Microbiological diagnostics and antimicrobial therapy.
86. Diarrheal diseases. Microbiological diagnostics and antimicrobial therapy.
87. Urinary tract infections. Microbiological diagnostics and antimicrobial therapy.
88. Sexually transmitted diseases. Microbiological diagnostics and antimicrobial therapy.
89. Aseptic neuroinfections. Microbiological diagnostics.
90. Purulent meningitis. Microbiological diagnostics and antimicrobial therapy.
91. Bloodstream infections. Sepsis. Microbiological diagnostics.
92. Nosocomial infections. Multiresistant strains.
93. Exanthematic viral infections.
94. Skin and soft tissue infections. Microbiological diagnostics and antimicrobial therapy.
95. Bone and joint infections. Microbiological diagnostics and antimicrobial therapy.
96. Infections caused by anaerobic bacteria.
97. Fetal and neonatal infections.
98. Vaccination.

**VI. Microbiological methods and diagnostics (12 questions)**

99. Specimen collection and transport for microbiological examination.
100. Microbiological diagnostics of bacterial infections; the use of methods of direct and indirect detection.
101. Microbiological diagnostics of viral infections; the use of methods of direct and indirect detection.
102. Microscopy in diagnostics of infectious diseases.
103. Bacterial culture. Culture media, their choice, culture conditions.
104. Methods of bacterial identification.
105. Antibiotic susceptibility testing. Result interpretation.
106. Serological methods (agglutination, ELISA, WB, immunochromatography). Their use in diagnostics of infectious diseases.
107. Molecular biology methods and their application in clinical microbiology.
108. Microbiological diagnostics of protozoan infections.
109. Microbiological diagnostics of helminth infections.

110. Microbiological diagnostics of fungal infections.

**Choice of 3 questions from 3 areas**

1. General microbiology + Clinical microbiology (total 39 questions)
2. Special virology and mycology + parasitology + methods and diagnostics (total 39 questions)
3. Special bacteriology (total 32 questions)