**Medical microbiology – practical part**

lecture - [identification](https://is.cuni.cz/studium/predmety/index.php?id=1f4b1a6c4d9b616aadc206b71a93f9a4&tid=1&do=download&did=206614&kod=B03122) of microorganisms

**1. Microbiology lab safety rules**

<https://microbeonline.com/microbiology-laboratory-safety-rules-procedure/>

<https://www.carolina.com/teacher-resources/Interactive/nine-safe-practices-for-the-microbiology-lab/tr11085.tr>

<https://www.d.umn.edu/~rhicks/genmicro/Microbiology%20Lab%20Safety.pdf>

<https://is.muni.cz/el/1431/jaro2012/Bi4090c/um/1_Bezpenost_prace.pdf> - shrnutí z MUNI

**2. Principles of sterile techniques**

<https://pbiol.rsb.org.uk/standard-techniques/aseptic-techniques>

<https://www.austincc.edu/microbugz/aseptic_technique.php>

<https://www.youtube.com/watch?v=bRadiLXkqoU>

<https://www.labtube.tv/video/aseptic-technique-2>

<https://www.youtube.com/watch?v=WYvTj6pIhbo>

Both videos show microbe inoculation techniques.

**2. Environmental sterility checks**

Air sterility check – fall-out, air sampling

<https://www.youtube.com/watch?v=s1sKkwWA7zM>

Surface sterility control

https://www.youtube.com/watch?v=QRs3z2mCfg8

Hand hygiene control

<https://www.youtube.com/watch?v=1xuEowtB7qg>

General principles of sterilization and disinfection

<https://www.youtube.com/watch?v=UN6xDdxL3rY>

**3. Culture media**

<https://en.wikipedia.org/wiki/Growth_medium>

**Blood agar**

<https://en.wikipedia.org/wiki/Agar_plate#Blood_agar>

<https://microbeonline.com/blood-agar-composition-preparation-uses-and-types-of-hemolysis/>

**Chocolate agar**

<https://en.wikipedia.org/wiki/Chocolate_agar>

https://microbeonline.com/chocolate-agar-composition-uses-colony-characteristics/

**Endo agar**

<https://en.wikipedia.org/wiki/Endo_agar>

**Saboraud agar**

<https://en.wikipedia.org/wiki/Sabouraud_agar>

https://microbeonline.com/sabouraud-dextrose-agar-sda-principle-composition-uses-colony-morphology/

**Mueller-Hinton agar**

<https://en.wikipedia.org/wiki/Mueller-Hinton_agar>

https://microbeonline.com/why-mueller-hinton-agar-is-used-in-routine-antibiotic-susceptibility-testing/

**Deoxycholate-citrate agar**

<https://en.wikipedia.org/wiki/DCA_agar>

**Bile-aesculine agar**

<https://en.wikipedia.org/wiki/Bile_esculin_agar>

**MacConkey agar**

<https://en.wikipedia.org/wiki/MacConkey_agar>

https://microbeonline.com/macconkey-agar-mac-composition-preparation-uses-and-colony-characteristics/

**Tinsdale agar**

<https://www.sigmaaldrich.com/content/dam/sigma-aldrich/docs/Sigma-Aldrich/Datasheet/1/89747dat.pdf>

https://microbeonline.com/tinsdale-agar-composition-preparation/

**Lowenstein-Jensen agar**

<https://en.wikipedia.org/wiki/L%C3%B6wenstein%E2%80%93Jensen_medium>

https://microbeonline.com/preparation-uses-lowenstein-jensen-lj-medium/

**Wilson-Blair agar**

<http://www.himedialabs.com/intl/en/products/Microbiology/Dehydrated-Culture-Media-Selective-Animal-based-Media-Bacterial/Wilson-Blair-Agar-Base-M331>

<http://www.himedialabs.com/TD/M332.pdf>

**4. Clinical specimen collection and transport**

Collection:

https://www.labcorp.com/resource/introduction-to-specimen-collection<https://labtestsonline.org/articles/collecting-samples-laboratory-testing>

Transport:

<https://www.youtube.com/watch?v=GJK9FRT4lXM>

Collection and transport slideshow:

https://www.slideshare.net/jit12/collection-and-transport

**5. Aerobic culture**

inoculation techniques, clean culture technique

throat swab, sputum, BAL, stool, urine – urine plate, hemocultures

Inoculation:   
<https://www.youtube.com/watch?v=c1onYow0O58>

<http://www.eucast.org/videos_from_eucast/english/>

**6. Anaerobic culture**

anaerostat, Fortner method

<https://www.youtube.com/watch?v=YnlDbeNRk9g>

<https://www.youtube.com/watch?v=N4nPOECFi7A>

<https://slideplayer.com/slide/8402726/>

**7. Staining and microscopy**

Gram, Ziehl-Neelsen, Giemsa, Wirtz a Conklin, Albert, Burri

Gram stain

<https://www.youtube.com/watch?v=sxa46xKfIOY>

<https://www.youtube.com/watch?v=ROqbhi8s3OY>

<https://www.youtube.com/watch?v=LWX4jKSz5Fo>

Ziehl-Neelsen

<https://www.youtube.com/watch?v=Dy6dYstZpZY>

<https://www.youtube.com/watch?v=gjnSqT7sstY>

Giemsa

<https://www.youtube.com/watch?v=qphokxSd4CM>

Wirtz a Conklin

<https://en.wikipedia.org/wiki/Schaeffer%E2%80%93Fulton_stain>

Albert

<https://microbeonline.com/albert-stain-principle-procedure-results-uses/>

Negative stain

<https://www.youtube.com/watch?v=NxqAil9avUU>

**8. Phenotypic characteristics in identification of microbes**

O/F test, catalase test, plasma coagulase test, optochin test, hemolysis, CAMP test, OXI (cytochrome oxidase) test, PYR test, hyaluronidase test

**Bacterial growth**   
<https://www.youtube.com/watch?v=AWWyNDwkn1U>

**Bacteria identification flowchart**

<https://www.youtube.com/watch?v=JO6rbqiVi_0>

**Catalase**

<https://www.youtube.com/watch?v=PGBf7Xehcns>

**Plasma coagulase**

<https://www.youtube.com/watch?v=zTI7ieC09Qs>

**Optochin test**

<https://microbeonline.com/optochin-test-principle-procedure-expected-results-and-quality-control/>

**CAMP test, for hemolysis see blood agar**

https://microbeonline.com/camp-test-principle-procedure-results/

**Cytochrom oxidase (OXI) test**

<https://microbeonline.com/oxidase-test-principle-procedure-and-oxidase-positive-organisms/>

**PYR test**

<https://www.youtube.com/watch?v=Rw-JKLkXNDE>

<https://microbeonline.com/pyrrolidonyl-arylamidase-pyr-test-principle-procedure-results/>

**Hyaluronidase test**

http://www.bacteriainphotos.com/decapsulation%20test.html

**9. Commercial kits in identification**

- Enterotest, Staphy-, Strepto-, Neisseriatest, etc.

1. **ENTEROTEST**

Video <https://cit.vfu.cz/alimentarni-onemocneni/video/enterotest24.mpg>

Instructions from the manufacturer:<https://www.erbalachema.com/attachments/ENTEROtest%2016_CZ_SK_EN_RU_PL_S.pdf>

Automatic evaluation in the TNW software – demonstration – works for other tests as well

<http://mikrobiologie.lf3.cuni.cz/prakt/tnw.wmv>

Code book

https://www.erbalachema.com/attachments/ENTEROtest16\_EN.pdf

1. **STAPHYTest 16**

Description

<https://www.erbalachema.com/akce/prilohy/priloha/stahnout/407/>

<https://docplayer.cz/docs-images/40/6147881/images/page_20.jpg>

Code book

<https://www.erbalachema.com/attachments/STAPHYtest%2024_EN.pdf>

CZ only:

Popis v prezentaci – slide 46-47:

<https://slideplayer.cz/slide/5982157/>

Prezentace, srovnání s konkurenčním API Staph

<https://www.sci.muni.cz/ccm/downl/public/Lachema%202008_Sedlacek_Staphy24.pdf>

1. **STREPTOTest 16**

Description

<https://www.erbalachema.com/attachments/STREPTOtest%2016_CZ_SK_EN_RU_PL_P.pdf>

Code book

<https://www.erbalachema.com/attachments/STREPTOtest%2016_EN.pdf>

Sample result picture

<https://www.microbiologyinpictures.com/bacteria-photos/streptococcus-agalactiae-photos/streptococcus-agalactiae-identification.html>

CZ only:

Identifikace streptokoků – test slide 45-47, ale celé dobré 😊

<https://slideplayer.cz/slide/11518600/>

1. **NEISSERIATest**

Code book

<https://www.erbalachema.com/attachments/NEISSERIAtest_EN.pdf>

Description

<https://www.erbalachema.com/akce/prilohy/priloha/stahnout/382/>

CZ only:

Obrázek slide 20:

https://slideplayer.cz/slide/13098186/

**10. Phenotypic characteristics in yeast identification**

Gt test, Auxanogram, Zymogram

**Gt test**

<https://microbiologyinfo.com/germ-tube-test-principle-procedure-results-interpretation-and-limitations/>

**Auxanogram**

https://www.jcdr.net/article\_fulltext.asp?issn=0973-709x&year=2017&month=April&volume=11&issue=4&page=DC01&id=9653

**Zymogram**

<https://slideplayer.com/slide/8998910/>

<https://slideplayer.com/slide/8998910/27/images/26/Zymogram+test.jpg>

**Chromogenic agars – CandiSelect (BioRad)**

<http://www.bio-rad.com/webroot/web/pdf/inserts/CDG/cs/63746_04_2008_CZ.pdf>

<https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.bio-rad.com%2Fen-ch%2Fsku%2F63740-candiselect%3FID%3D63740&psig=AOvVaw1SzbIgxFxT0icuPVoK9WGV&ust=1585059703071000&source=images&cd=vfe&ved=2ahUKEwixitXV5bDoAhULgRoKHYDpAtcQr4kDegUIARDNAQ>

https://www.bio-rad.com/webroot/web/images/cdg/products/microbiology/sku\_view/global/idd\_63740\_CandiSelect\_view.jpg

**11. Antibiotic sensitivity tests**

Disc diffusion technique, MIC and MBC determination, E test

<https://www.youtube.com/watch?v=WIE9FoGjLfk>

<http://www.eucast.org/videos_from_eucast/english/>

**12. Parasitology**

**13. Hemoculture**

Blood Culture Collection Tutorial <https://www.youtube.com/watch?v=ShmnPplT15Y>

Processing Blood Cultures in the Laboratory  <https://www.youtube.com/watch?v=ZZoIZkna4vo&feature=youtu.be>

Bacteremia: Blood cultures and other diagnostic tools  <https://www.uptodate.com/contents/bacteremia-blood-cultures-and-other-diagnostic-tools>

**14. Exhibition – a review of bacteria colony appearance in various media types**

<https://uim.lf1.cuni.cz/vystavka-bakterii>