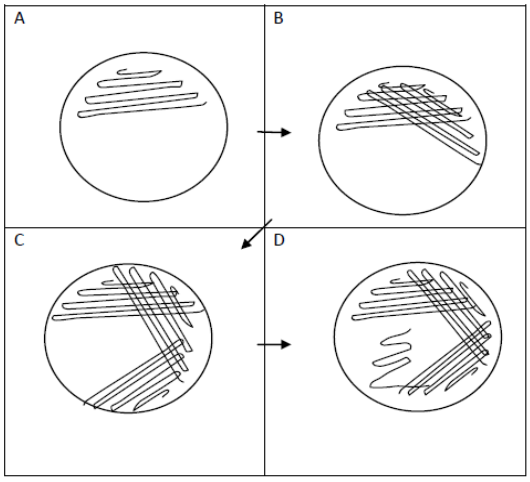
C1. General microbiology – bacteriological media, methods of the microbiological inoculation and cultivation, preparation of pure cultures, the structure of the bacterial cell, staining methods of the bacterial slides.

Knowledge: the student knows:
- the microbiological media (liquid, semi-solid and solid, simple and enriched, selective, diagnostic and selective-diagnostic),
- the techniques of the microbiological inoculation, and the methods used to get pure cultures;
- how to describe the bacterial growth in the liquid medium (surface growth, turbidity, and sediment) and in the solid medium (bacterial colony characteristics), the growth of bacteria producing pigments;
- the shape and the structure of the bacterial cell (the basic and additional components);
- the staining methods of bacteria (simple and complex, positive and negative, positive-negative);
- the types of microscopes used in bacteriology and their application;
- the role of the microscopic slides in the microbiological diagnostics;
- methods of the bacterial identification on the basis of the biochemical features and antigenic structure of the bacterium.

Practice
1. Regulations and Laboratory Rules
2. Study and describe the types of laboratory equipment and culture media needed do develop and maintain pure cultures in diagnostic process.
3. Describe bacterial growth in solid media – describe a single colony appearance in solids media including size, shape, edge, consistency, cross-section, surface, relation to the medium, transparency, release of pigment, suspension, medium changes around colony.
4. Describe release of pigment on solid media.
5. Draw the slide presenting rods – negative staining.
6. Draw the slide presenting cocci – negative staining.
7. Draw the slide presenting capsule – positive-negative staining.
8. Draw the slide presenting flagella.
9. Draw the slide presenting spores stained with

a) Gram method b) Schaeffer-Fulton method/(Wirtz method).

10. **Inoculate the given bacteria from liquid media** (broth) or solid medium into solid media using **streak-plate technique** (looping-out technique):



a. Loosen the cap of the bottle containing the inoculum.
b. Hold an inoculation loop in your right hand and flame the loop; then allow it to cool.
c. Lift the test tube containing the inoculum with your left hand. Remove the cap/ cotton wool plug of the test tube with the little finger of your right hand.
d. Flame the neck of the test tube.
e. Insert the loop into the culture broth and withdraw. At all times hold the loop as still as possible.
f. Flame the neck of the test tube again.
g. Replace the cap/ cotton wool plug of the test tube using the little finger of your right hand. Place the test tube in a rack. For a liquid culture, dip the loop into the broth, or for solid media, lightly touch a colony with the loop.
h. Partially lift the lid of the Petri dish containing the solid medium.
i. Place a loopful of the culture on the agar surface on the area 1. Flame the loop and cool it for 5 seconds by touching an unused part of the agar surface close to the periphery of the plate, and then drag it rapidly several times across the surface of area1.
j. Remove the loop and close the Petri dish.
k. Reflame and cool the loop, and turn the petri dish 90°C then touch the loop to a corner of the culture in area1 and drag it several times across the agar in area 2, hitting the original streak a few times. The loop should never enter area 1 again.
l. Remove the loop and close the Petri dish.
m. Reflame and cool the loop and again turn the dish 90°C anticlockwise. streak area 3 in the same manner as area 2, hitting last area several times. Remove the loop and close the Petri dish.
n. Flame the loop, again turn the dish 90°C and then drag the culture from a corner of a area3 across area 4, contacting area 3 several times and drag out the culture. Do not let the loop touch any of the previously streaked areas. The flaming

of the loop at the points indicated is to effect the dilution of the culture so that fewer organisms are streaked in each area, resulting in the final desired separation.

o. Remove the loop and close the Petri dish.
p. Tape the plate closed and incubates the plate in an inverted position in an incubator for 24-48 hours.
q. Flame the loop before putting it aside.

11. Using pure or mixed cultures, prepare the bacterial smears obeying the following rules:

– make your slide free of fats by passing it through the flame

a) liquid medium - place a few loops of the cell suspension on the slide
b) solid medium - take one drop of water on the loop and place it on the centre of the slide; transfer a small amount of the bacterial inoculum from the solid medium into water, and spread both into a thin area

- allow the smear to air-dry next to the burner
- make a fixation of your preparation: while holding the slide at one end, quickly pass the smear over the Bunsen burner two to three times. Allow the smear to cool down for 10 seconds.

GRAM STAINING PROCEDURE

- Stain with crystal violet for 1 minute
- Gently wash of the stain with tap water
- Gently apply Gram's iodine for 1 minute
- Gently wash of the stain with tap water
- Add the alcohol (decolorizer) for 1 minute
- Counterstain with safranin (or fuchsin) for 1 minute
- Gently wash of the stain with tap water
- Dry with bibulous paper

Examine all stained slides under the light microscope (use an immersion objective, 100x), using immersion (cedar oil). **Gram-positive bacteria stain deep blue while Gram-negative are red/pink.** Draw what you see.

12. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C2: General microbiology. Physiology of bacteria. The influence of the physical and chemical factors on bacteria.

Knowledge: The student knows:
- role of the commensal microbiota in normal and pathogenic host immune responses;
- the bacterial physiology, the optimal conditions for their growth *in vitro*;
- the phases of the bacterial growth,
- nutritional requirements (chemical components of the bacterial cell, various requirements of nutrients);
- temperature (psychrophilic bacteria, mesophiles, and thermophiles);
- gaseous requirements (strictly aerobic bacteria, facultatively anaerobic bacteria, strictly anaerobic bacteria, microaerophilic bacteria, capnophiles), pH and the osmotic pressure;
- the influence of physical and chemical factors on bacteria;
- the methods of the bacteriological control (sanitization, antisepsis, asepsis, disinfection, sterilization);
- the tests used to control the process of autoclaving.

The student is able to talk over the diagnostic process of bacteria; He/she knows methods which can be used to identify and differentiate microorganisms.

Practice:

1. Read the results of previous growing bacteria from liquid media (streak-plate method).
2. Analyze the growth curve of microorganisms.
3. Describe bacterial growth in liquid media (broth). Take the growth types in consideration (sediment, turbidity, growth on the surface) according to gaseous requirements.
4. Study the types of hemolysis on a blood dish.
5. Describe the result of catalase test.
6. Describe the growth of *E. coli* and *P. mirabilis*

- on liquid media a) with tryptophan (Ehrlich/Kovac's reagent!), b) Christensen medium,
- in solid media a) Triple Sugar Iron slant, b) soft agar.

Notice the changes between sterile and inoculated diagnostic media.

7. Study the API E20 test used to biochemical identification of *Enterobacteriaceae* members.
8. Describe the meaning of biochemical, serological and molecular biology methods in identification of microorganisms.
9. Testing of the presence of bacteria in the air- sedimentation method on blood agar for 30 min.
10. Testing of the presence of bacteria on surfaces with blood agar.
11. Testing of the presence of bacteria on white coat with blood agar.
12. Testing of the presence of bacteria on fingers – placing the fingerprints after washing hands with water, soap and disinfectants.
13. Investigation of temperature action – inoculation of bacterial suspension (with *Bacillus* sp., and *Staphylococcus* sp., before and after boiling).
14. Investigation of UV radiation on bacteria – inoculation of bacterial suspension (*E. coli*) with sterile cotton swab on agar medium. Then put the sterile paper on the culture and leave uncovered plate under bactericidal UV lamp for 10 min. Then take the letter away by using tweezers and cover the plate and incubate for 24h.
15. Study the SPORAL and 3M ATTest used to control the efficacy of autoclaving.
16. Investigation of the microbiota of the oral cavity and skin – take a swab from the oral cavity and inoculate TSA agar; take the swab from skin and inoculate TSA agar.
17. Take a swab from nose vestibule to look for *Staphylococcus aureus* and inoculate Chapman medium.
18. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C3: <u>General microbiology – Genetics of microorganisms. Vaccines.</u>

Knowledge: The student knows:
- genetic material of bacteria and viruses (bacterial chromosome, plasmids, transposons, IS);
- ways of gene exchange in bacteria (conjugation, transformation, transduction);
- structure, function and regulation of the lactose operon;
- types of vaccines;
- schedules of vaccination;
- advantages and disadvantages of vaccination;

Practice:
1. Read and write down the culture results from class no. 2.
   To write down:
   Results of sedimentation method:
   Number of colonies…….
   Number of microorganisms in $1m^3$……..
   Clean standard……..
   I ≥ 70 CFU/1m3
   II≥ 300 CFU/1m3
   III ≥ 700 CFU/1m3
2. Isolate single colony of suspected *S. aureus* from Chapman agar and inoculate fresh TSA agar (streak plate method).
3. Stain the cultures from skin and oral cavity with Gram method.
   To write down:
   Streak-plate method is used to.....
   Description of morphology of colonies.....
   Microorganisms were stained with.....method.
   The result of staining is..... .
   ……times magnification was used to observe microorganisms.
   Which additional elements of bacterial cell do you know?.....
   Shape of bacterial cells:.....
   Arrangement of bacterial cells:.....
4. Agarose Gel Electrophoresis – running the gel and reading the results.
5. Restriction fragment length polymorphism (RFLP) – analysis of results.
6. Study vaccination schedules.
7. Plaque test – the students dye a dental plaque and then prepare Gram-staining of bacteria from dental plaque.

PLEASE BRING TOOTHBRUSHES AND TOOTHPASTES!

8. Microorganism present in saliva – the student prepare the microscopic slide with saliva, stain it and study under the microscope.
9. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C4: <u>General microbiology – Antibiotics and chemotherapeutics.</u>

Knowledge: the student knows the antibacterial drugs: beta-lactam antibiotics, aminoglycosides, quinolones, tetracyclines, macrolides, lincosamides, glycopeptides, etc.; bacteriostatic *versus* bactericidal agents, antibacterial spectrum (broad-spectrum and narrow-spectrum agents), and the mechanisms of antibacterial action. The side-effects of the antibiotic therapy. Bacterial resistance to antimicrobial agents - its origin and the ways of transmission (natural and acquired resistance, vertical and horizontal transmission of drug resistance). Standardized techniques determining bacterial susceptibility to antimicrobial agents (antibiogram): qualitative tests (disc-diffusion method), quantitative tests (E-test). The clinical meaning of MIC, MBC and MBQ.

Practice:

1. Study and draw an example of disc-diffusion method.
2. Study and draw E-test.
3. Analysis of microbial resistance with automated systems – BD MAX.
4. Study the examples of susceptibility testing /antibiograms/ samples 1-9.
5. Prepare the microscopic slide stained with Gram-method, latex test and antibiograms for staphylococci isolated during class no. 2/3.
6. Learning assessment questions.

To write down:

<u>5a. Identification of bacteria</u>

Mention media used to isolate *Staphylococcus spp.:* .....
Mention possible ways of identification of staphylococci: .....
….....
Your result of identification: .....

5b. Evaluation of the sensitivity of *Staphylococcus* sp. to antibiotics.

1. Mention possible resistance mechanisms to antibiotics:
……..
2. What is cross-resistance?……
3. Which antibiotics are used to evaluate resistance mechanisms in staphylococci?
……

Antibiotic		Group of antibiotics	Mechanism of action	Inhibition zone diameter	Sensitive/ resistant
Penicillin	**P**				
Ampicillin	**AMP**				
Cefoxitin	**FOX**				
Gentamicin	**CN**				
Mupirocin	**MUP**				
Erythromycin	**E**				
Clindamycin	**Da**				

The assistant checks your exercise book after finishing tasks.

C5: <u>General virology. Colloquium no. 1 (C1-C4 and lecture no. 1)</u>

Knowledge: the student knows: the basic features of the viruses including their structure, characteristics, and replication phases; diagnostic process of the viral infection (clinical material, the time of sampling, storage, transport to the laboratory, principles of specimen processing for viral investigation, cell cultures, embryonated eggs, laboratory animals, microscopic identification, serologic tests, molecular analysis);
The student is able to explain the influence of the viral replication type on the course of the viral infection.

Practice:

1. Describe sampling and transport of the material in viral infections.
2. Presentation of virology laboratory.
3. Presentation of uninfected cell lines.
4. Presentation cell lines infected with PIV-3 and RV-1B viruses – observe cytopathic effect.
5. Analyze case reports concerning viral hepatitis.
6. Analyze immune response in viral hepatitis.
7. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C6: <u>Skin infections.</u>

Knowledge: the student knows:

- the etiological factors of skin infections: bacterial (staphylococci - *Staphylococcus aureus*, streptococci - *Streptococcus pyogenes, Clostridium perfringens, Propionibacterium acnes, Bacillus anthracis, Mycobacterium leprae, Nocardia spp., Actinomyces spp.)*; viral (poxviruses, foot-and-mouth disease virus, measles virus, rubella virus)
- postoperative wound infections (*S. aureus*, *Enterococcus* spp., *Pseudomonas aeruginosa*, *Acinetobacter* spp., *Bacteroides fragilis, Fusobacterium* spp., *Peptococcus* spp., *Prevotella spp, Veilonella spp.*)
- cutaneous tuberculosis
- cutaneous infections caused by herpesviruses
- the epidemiology, diseases, diagnostics, prevention and treatment for skin infections
- the student is able to explain the influence of the virulence factors on the course of infection.

Practice:

1. Skin infections - describe sampling and transport.
2. Draw slides presenting *Staphylococcus aureus* and *Micrococcus* spp.
3. Study and draw *Staphylococcus aureus on* agar-agar, blood agar and Chapman/Mannitol-Salt Agar.
4. Prepare latex test for *S. aureus*.
5. Study API20 *Staph* tests.
6. Analyze difference between strains resistant and sensitive to methicillin.
   A) growth on medium with an antibiotic B) gel electrophoresis
7. Draw the slide presenting *Enterococcus* sp.
8. Study and draw *Enterococcus faecalis* on agar-agar, Coccosel agar and agar with tellurite.
9. Analyze serotyping results – Latex Strep Kit.
10. Analyze results of biochemical tests – API20 Strep.
11. Resistance in enterococci. Analysis of antibiograms.
12. Prepare simple and Gram stain of Gram-negative rods.
13. Study and draw *Pseudomonas aeruginosa* and *Acinetobacter baumannii* on:
    a) agar-agar b) McConkey agar.
14. Study API system for non-fermenting rods.
15. Analyze antibiograms - *Pseudomonas* sp./*Acinetobacter* sp.
16. Bacteria most commonly isolated from the skin infections – use the bacterial liquid cultures and prepare the microscopic slide stained with Gram method.
17. Description of systems used to grow and differentiate anaerobic bacteria.
18. Analyze case reports concerning skin infections.
19. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C7: <u>Infections of the respiratory system.</u>

Knowledge: the student knows:

- the physiological flora of the respiratory system
- the clinical forms of the respiratory system infections
- the etiological factors of respiratory tract infections: bacterial (*Streptococcus pyogenes and Streptococcus pneumoniae, Corynebacterium diphtheriae*, Mycobacterium tuberculosis *complex and Mycobacterium avium complex, Mycobacterium other than tuberculosis* (MOTT), *Haemophilus spp., Bordetella spp., Legionella spp., Mycoplasma*

pneumoniae, Chlamydophila pneumoniae, Nocardia spp.); viral (adenoviruses, Picornaviridae [coxackievirus, echovirus], rhinovirus, parainfluenza viruses 1-4, respiratory syncytial virus, coronavirus, human bocavirus, human metapneumovirus)
- necrotizing pneumonia caused by Panton-Valentine leukocidin-releasing *S. aureus* strains
- viral pneumonia as the complication of the primary viral disease (influenza, measles, cytomegalovirus, varicella-zoster virus)
- influenza virus
- epidemiology, diseases, diagnostics, prevention and treatment of respiratory tract infections
- the student is able to explain the influence of the virulence factors on the course of infection

Practice:

1. Respiratory tract infections - describe sampling and transport.
2. Draw the slide presenting *Mycobacterium tuberculosis* stained with Ziehl-Neelsen method.
3. Draw the slide presenting *Mycobacterium tuberculosis* – cord factor.
4. Study the growth of diverse species of mycobacteria on Loewenstein-Jensen medium.
5. Study the results of tests for mycobacteria – Bogen's test, niacin test.
6. Analyze resistance patterns of *Mycobacterium* spp.
7. Draw the slide presenting *Streptococcus pneumoniae* stained with Gram method.
8. Study the growth of *Streptococcus pneumoniae* on blood agar with optochin disc.
9. Draw the slide presenting *Streptococcus pyogenes* stained with Gram method.
10. Study the growth of *Streptococcus pyogenes* in broth and on blood agar with bacitracin disc.
11. Describe Lancefield grouping.
12. Draw the slide presenting *Haemophilus influenzae* stained with Gram method.
13. Study the growth of *Haemophilus influenzae* on chocolate agar.
14. Description of latex tests for Neisseria spp./Haemophilus spp. and API NH strips.
15. Draw the slides presenting *Corynebacterium diphtheriae* stained with Gram's method, and Neisser staining.
16. Presentation of Löffler's medium.
17. Analyze sputum slides:
    To write down:
    Microorganisms were stained with.....method.
    The result of staining is..... .
    ……times magnification was used to observe microorganisms.
    Which specific elements of *Mycobacterium* cell do you know?
    .....
18. Prepare Gram staining of throat swab.
    To write down:
    Microorganisms were stained with.....method.
    The result of staining is..... .
    ……..times magnification was used to observe microorganisms.
    Shape of bacterial cells is.....
    Arrangement of bacterial cells is.....
19. Analyze of case reports concerning respiratory tract infections.
20. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C8: <u>Infections of the digestive tract. Food poisoning.</u>

Knowledge: the student knows:
- the physiological flora of the digestive tract;
- the clinical forms of the gastrointestinal infections;
- the etiological factors: bacteria (*Salmonella* spp., *Shigella* spp., *Escherichia coli* – pathogenic serotypes, *Vibrio cholerae* and *V. parahaemolyticus*, *Clostridium difficile* and *Clostridium perfringens*, *Bacillus cereus*, *Campylobacter* spp., *Helicobacter* spp., *Listeria monocytogenes*, *Staphylococcus aureus*); viruses (orthoreoviruses and rotaviruses, norovirus, adenovirus, astrovirus, Hepatitis A Virus, Hepatitis E Virus).
- *Clostridium botulinum* – bacteria transmitted via the gastrointestinal tracts that severely affect central nervous system; botulinum toxin activity
- epidemiology, diseases, diagnostics, prevention and treatment for digestive tract infections
- the student is able to explain the influence of the virulence factors on the course of infection

Practice:

1. Digestive tract infections - describe sampling and transport.
2. Study and draw *Bacillus cereus* stained with Gram method.
3. Study and draw the growth of *Bacillus cereus* on agar-agar medium.
4. Prepare staining of bacilli with Gram method and Schaeffer-Fulton method:

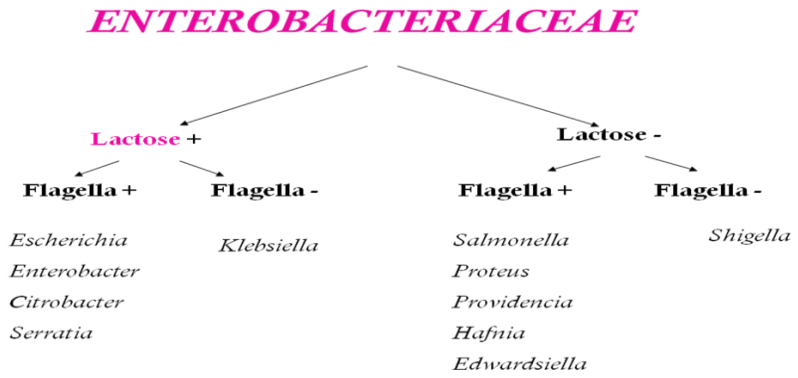
Schaeffer-Fulton method for staining endospores

I. Air dry and heat fix the organism on a glass slide.
II. Pour malachite green stain solution on a smear;
the slide should be steamed three times over a container of boiling water.
III. Wash the slide with tap water.
IV. Counterstain with safranin for 1 min. Wash with tap water;
V. Examine the slide under the oil immersion lens (100x).
Endospores are bright green and vegetative cells are brownish red to pink.

Fill in the protocol:
Microorganisms were stained with.....method.
The result of staining is..... .
……..times magnification was used to observe microorganisms.
Which specific elements of *Bacillus* cell do you know?
.....
Shape of bacterial cells is.....
Arrangement of bacterial cells is.....

5. Study and draw enteric rods stained with a) Gram method b) positive-negative staining.
6. Study the growth of *Escherichia coli* and *Salmonella* on
   a) MacConkey agar
   b) EMB/Lewin's agar
   c) SS agar
   d) Kligler's/Triple Sugar Iron (TSI) slant

7. Prepare the identification of two species (enteric rods) with API E strips.
8. Analyze biochemical features of enteric rods.



	Capsule	Lactose	H_2S	Citrate	Urease	VP	Indol	Methyl Red	Adonitol
Escherichia coli	+/-	+	-	-	-	-	+	+	-
Klebsiella oxytoca	+	+	-	+	+	+	+/-	-/+	+
Enterobacter	+	+	-	+	+/-	+	-	-	-
Citrobacter	+	+	+	+	+	-	+/-	+	-
Serratia	+	-	-	+	+/-	+	-	+/-	-
Salmonella	+	-	+	+	-	-	-	+	-
Shigella	+	-	-	-	-	-	-/+	+	-
Proteus	+	-	+	+/-	+	+/-	-	+	-
Yersinia	+	-	-	-	+	-	+/-	+	-

9. Prepare the identification of *Shigella* sp. with agglutination method.
10. Study tests for *Clostridium difficile.*
11. Stain a sample of yoghurt or kefir with Gram method (diluted and/or non-diluted sample).
    To write down:
    Microorganisms were stained with.....method.
    The result of staining is..... .
    ……..times magnification was used to observe microorganisms.
    Which specific feature of lactic bacteria do you know?
    .....
    Shape of bacterial cells is.....
    Arrangement of bacterial cells is.....
12. Analyze case reports concerning digestive tract infections.
13. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C9: <u>Urogenital infections. Colloquium no. 2 (C5-C8 and lectures no. 2 and 3)</u>

Knowledge: the student knows:
- the physiological flora of the urogenital system; the risk factors of the urogenital infections
- clinical forms of the urinary tract infections (UTI) and genital infections
- bacteriological analysis of urine – the methods of sampling
- the purity degrees of the vagina; definition of bacterial vaginosis (*Gardnerella vaginalis, Mobilluncus curtisi, Prevotella spp., Peptostreptococcu spp., Veilonella spp., Eubacterium spp., Fusobacterium*)
- the etiological factors of UTI: bacteria (*Enterobacteriaceae* members [*Escherichia coli, Klebsiella spp., Enterobacter spp., Proteus spp.*], *Stahylococcus saprophiticus, Leptospira spp., Corynebacterium urealyticum*)
- the definitions of intrauterine infections, perinatal infections, TORCH
- the etiological factors of vertical infections: bacteria (*Streptococcus agalactiae, Listeria monocytogenes, Treponema pallidum, Chlamydia trachomatis, Mycoplasma* spp., *Ureaplasma* spp., *Neisseria gonorrhoeae*); viruses (parvovirus B19, rubella virus)
- *Lactobacillus spp.* and *Bifidobacterium spp.* – they role in the proper functioning of the human body
- epidemiology, diseases, diagnostics, prevention and treatment for urinary tract, intrauterine and perinatal infections
- the student is able to explain the influence of the virulence factors on the course of infection

Practice:
1. Urogenital infections - describe sampling and transport. Prepare the microscopic slide of lactobacilli stained with Gram method.
2. Study and draw *Lactobacillus sp. s*tained with Gram method.
3. Study the growth of *Lactobacillus* on Rogosa agar.
4. Analyze the role of probiotics.
5. Study and draw slides presenting bacterial vaginosis.
6. Describe bacteriological analysis of urine.
7. Presentation of transport-diagnostic medium – Uricult and results interpretation.
8. Inoculate samples of urine on microbiological media.
9. Study *Mycoplasma/Ureaplasma* test.
10. Analyze of case reports concerning urinary tract infections, perinatal infections, and intrauterine infections.
11. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C10: <u>Sexually transmitted diseases.</u>

Knowledge: the student knows:
- the etiological factors of sexually transmitted diseases: viral (Human Papilloma Virus, Molluscum contagiosum virus); bacterial (*Treponema pallidum*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, *Haemophilus ducreyi*, *Klebsiella granulomatis*, *Mycoplasma* spp., *Ureaplasma* spp.)
- sexually transmitted infections caused by herpesviruses
- epidemiology, diseases, diagnostics, prevention and treatment for genital tract infections
- the student is able to explain the influence of the virulence factors on the course of infection

Practice:

1. Sexually transmitted infections - describe sampling and transport.
2. Study and draw *Neisseria gonorrhoeae* stained with Gram method.
3. Describe API NH kit.
4. Study and draw spirochetes.

   To write down:
   Microorganisms were stained with.....method.
   The result of staining is..... .
   ……..times magnification was used to observe microorganisms.
   Which specific features of spirochetes do you know?
   .....

5. Analyze diagnostics of syphilis.
6. Analyze detection of sexually transmitted pathogens with molecular biology methods.
7. Culture samples from hospitals.
8. Analyze case reports concerning sexually transmitted diseases.
9. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C11: <u>Infections of the nervous system,</u>

Knowledge: the student knows:

- the factors predisposing to the central nervous system (CNS) infections, the modes of transmission
- etiological factors of meningitis and brain infections
- microbiological diagnostics of meningitis (sampling and microbiological analysis of cerebrospinal fluid)
- the etiological factors of CNS infections: viral (enteroviruses [coxackie virus A and B, echovirus]; poliovirus, rabies virus, polyomaviruses); bacterial (*Neisseria meningitidis, Streptococcus pneumoniae, Haemophilus influenzae, E. coli* K1, *Streptococcus agalactiae, Listeria monocytogenes)*
- activity of neurotoxins released by *Clostridium botulinum* and *C. tetani*
- CNS complications in bacterial infections (*Mycobacterium tuberculosis, Borrelia burgdorferi, Leptospira interrogans, Treponema pallidum, Francisella tularensis, Brucella spp., Ehrlichia spp*.)
- prions
- postvaccinal viral infections of CNS (mumps virus, measles virus, rubella virus, varicella zoster virus)
- postinfectious viral infections of CNS (mumps virus, measles virus, rubella virus, HIV, influenza virus, herpesviruses: herpes simplex virus, varicella-zoster virus)
- epidemiology, diseases, diagnostics, prevention and treatment for central nervous system infections
- the student is able to explain the influence of the virulence factors on the course of infection

Practice:

1. Nervous system infections - describe sampling and transport.
2. Study and draw bacteria in cerebrospinal fluid.
3. Presentation of Slidex meningite kit 5 latex test.
4. Presentation of an automatic BD Bactec system.
5. Subculture of samples from hospitals.
6. Gram staining of CSF culture.
7. Analysis of case reports concerning nervous system infections.
8. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C12: <u>Bloodstream infections.</u> <u>Zoonoses, vector-borne infections.</u>

Knowledge: the student knows:

- the difference between bacteremia/fungemia/viremia, sepsis, septic shock, and multi-organ dysfunction syndrome;
- etiological factors of bloodstream infections (coagulase-negative staphylococci, toxic shock syndrome caused by *S. aureus*, streptococci – viridans group, *Stenotrophomonas* spp., *Bulkholderia* spp.)

- zoonotic diseases: viral (Flaviviruses/*West Nile virus, St. Louis encephalitis virus, Japanese encephalitis virus, Murray valley virus, Yellow fever virus, Dengue virus/, Togaviruses/Eastern, Western, and Venezuelan equine encephalitis viruses, Chikungunya virus/, Bunyaviruses /La Crosse viru, Rift valley fever virus, California encephalitis Virus, Sandfly fever virus, Congo-Crimean haemorrhagic fever virus, Arenaviridae /Lymphogenic choriomeningitis virus – LCM, Lassa virus, Junin virus, Machupo virus, Filoviridae /Marburg virus, Ebola virus*); bacterial (*Rickettsia spp., Coxiella burnetti, Borrelia spp., Bartonella spp, Brucella spp., Pasteurella spp., Yersinia pestis, Francisella tularensis, Leptospira interrogans, Ehrlichia spp*.)
- HIV
- epidemiology, diseases, diagnostics, prevention and treatment for central nervous system infections
- the student is able to explain the influence of the virulence factors on the course of infection.

Practice:

1. Study the sampling, the storage and transport of blood samples.
2. Presentation of media for blood culture.
3. Study and draw *Streptococcus pyogenes* on blood agar.
4. Study and grow Staphylococcus epidermidis on the blood agar and Chapman medium.
5. Presentation of slides from positive blood cultures.
6. Presentation of ASO latex test (ASL-SLIDEX).
7. Prepare Gram staining from blood culture.
   To write down:
   Microorganisms were stained with.....method.
   The result of staining is..... .
   ……..times magnification was used to observe microorganisms.
   Which specific feature of these bacteria do you know?
   .....
8. Identify strains isolated in hospitals with Phoenix system.
9. Analyze case reports concerning blood stream infections and zoonoses.
10. Learning assessment questions.

The assistant checks your exercise book after finishing tasks.

C13. <u>Hospital-acquired infections. Colloquium no. 3 (C9-C12 and lecture no. 4)</u>

Knowledge: The student knows: the definition of the nosocomial infection; the etiological factors of the hospital-acquired infections, the methods used to control and prevent from nosocomial infections.

Practice:

1. Analyze results from Phoenix system.
2. Study and analyze cases of hospital-acquired infections.
3. Revision of microbiological slides and cultures.
4. Learning assessment questions.