Sumy State University
SS Medical Institute
Department of Public Health
Discipline "Microbiology, Virology and Immunology"

The list of practical skills in discipline
«Microbiology, virology and immunology»

Submodule I «General bacteriology»

1. Technique of preparation of smears from cultures grown on solid nutrient medium.
2. Technique of preparation of smears from cultures grown on liquid nutrient medium.
3. Method and mechanism of Gram staining. Perform microscopy of smear after using Gram staining, determine the morphology and tinctorial properties of bacteria.
4. Spore staining method.
5. Capsule detection method.
6. Studying motile microorganisms by wet-mount and hanging drop techniques.
7. Rules for collecting clinical specimens for bacteriological research.
8. Techniques for isolation of pure cultures of aerobes.
9. Techniques for isolation of pure cultures of anaerobes.
10. Hiss media: composition, purpose of application. Draw a conclusion about enzymatic activity of the culture.
11. Endo Agar: composition, characterization of the colonies.
12. Determination of the growth of *Staphylococcus aureus* on differential diagnostic mediums.
13. Kitt-Tarozzi media: composition, purpose of application, characterization of the growth of bacteria in it.
14. Describe the growth of microorganisms on solid and liquid nutrient media.
15. Antibiotic sensitivity testing methods (disk-diffusion method and serial dilution method): describe the principle of the methods, conduct a record of the results.
16. Determine the minimum inhibitory concentration of the antibiotic for the selected pure culture from the patient by the method of serial dilutions, conduct a record of the results.
17. Fortner´s method: principle of method, purpose of application.
18. The methods of phage typing of bacteria by Fisher and Furth: the principle of methods, the purpose of application. Make a record of the results on phage typing of bacteria according to the methods of Fisher and Furth.
19. Liquid and tabletted bacteriophage preparations: composition, purpose of using.
20. Methods of sterilization and disinfection.
21. Sterilization and tests to verify the quality of sterilization.
22. The nature of genetic recombination: transduction, conjugation and transformation.

Submodule II «Immunology»

1. Phagocytosis. The principle of the study of phagocytic activity. Complete and incomplete phagocytosis.
2. Determination of the lysozyme content of saliva by the serial dilution method.
3. Probiotics (Lactobacterin, Bifidumbacterin, Bifikol, etc.) and prebiotics: composition, purpose of using.
4. Scheme of humoral immune response.
5. Diagram of cellular immune response (inflammatory and cytotoxic type).
6. Scheme of antibacterial immune response.
7. Scheme of antiviral immune response.
8. Types of allergic reactions, immunological mechanisms.

9. The human immune status and the first-stage tests (tentative) for its study: determination of the number of the T- and B-lymphocytes in the blood; evaluation of neutrophil phagocytic activity; determination of the main classes of serum immunoglobulins (Mancini method); determination of complement titer. Describe the principles of the tests, make a conclusion.

10. The human immune status and the second-stage tests (analytical) for its study: determination of subpopulations of T-lymphocytes; formulation of tests to evaluate the inflammatory type of cellular immunity for tuberculin and other allergens, to which there is sensitization in the majority of the population; studies of the proliferative activity of T-lymphocytes in the blast transformation reaction to mitogens, antigens; determining the dynamics of the main cytokines which regulate the cellular and humoral immune response (IFN, TNF, IL-4, 5, 6, 10) and which modulate inflammation. Describe the principle of tests, make a conclusion.

11. Antitoxic sera: anti-diphtheria, anti-tetanus, anti-botulism, anti-gas gangrene, etc. Composition, purpose of application.

12. Allergens for skin allergic tests: tuberculin, brucellin, anthraxin, tularin. Composition, purpose of application.

13. Diagnostics and antigens: brucellosis diagnosticm, typhoid and paratyphoid O- and H-diagnosticum, dysentery diagnosticums of Sonne and Flexner, erythrocyte typhoid diagnosticum, gonococcal antigen, pertussis antigen. Composition, purpose of application.

14. Erythrocyte based diagnostic kits: methods of their manufacturing, composition and purpose of application.

15. Diagnostic sera: agglutinating, precipitating and luminescent. Their preparation and use.

16. Live (attenuated) vaccines against: tuberculosis (BCG), polio, measles, mumps, rubella, brucellosis, cholera, influenza, rabies. Practical usage of live vaccines, evaluation of their effectiveness.

17. Killed (inactivated vaccines) against: pertussis, leptospirosis, pneumococcal infection, gonorrhea, brucellosis, hepatitis A. Composition, practical usage of inactivated vaccines and their effectiveness.

18. Toxoid based vaccines against: diphtheria, tetanus, botulism, Staphylococcal infection, cholera, gas gangrene anaerobic infections. Their composition, principles of preparation and purpose of application.

19. Chemical vaccines against: typhoid fever, meningococcal infections, influenza. Their composition, practical usage of chemical vaccines, evaluation of their effectiveness.

20. Recombinant (genetically engineered) vaccines against hepatitis B. Composition, practical usage of recombinant vaccines, evaluation of their effectiveness.

21. Combined vaccines: DTP (adsorbed diphtheria-tetanus-pertussis), sekstaanatoxin (against botulism types A, B, E, against tetanus, against gas gangrene caused by *C. perfringens*, *C. noviy*). Composition, practical use of vaccines, evaluation of effectiveness.

22. Antitoxins (specific antitoxic sera) to diphtheria, tetanus, botulism (monovalent serum type A, polyvalent anti-botulism serum), gas gangrene, etc. Their preparation and use.

23. Reactions of agglutination: slide and tube agglutination tests, hemagglutination test, passive (indirect) hemagglutination test (PHAT), hemagglutination inhibition test (HAIT). Components, principle of reactions, practical using. Evaluate results of reactions.

24. The precipitation reaction (RP) in gel. Components, principles of setting up, practical usage. Evaluate results of the reaction.

25. Ring precipitation test (Ascoli test) in order to identify the antigens of the anthrax pathogen in the extract from livestock materials. Components, the principle of setting up, practical usage. Evaluate results of the reaction

26. Complement fixation test (CFT). Components, practical usage. Evaluate results of the reaction.

27. Immuno-fluorescence assay (IFA). Components, practical usage. Evaluate results of the reaction

28. Enzyme-linked immunosorbent assay (ELISA). Varieties, components, practical usage. Evaluate results of the reaction.

29. Radioimmunoassay (RIA). Goals, components, mechanism of the assay.

Submodule III «Special Bacteriology»

1. Live (attenuated) vaccines against: tuberculosis (BCG), polio, measles, mumps, rubella, brucellosis, cholera, influenza, rabies. Practical using of live vaccines, evaluation of effectiveness.

2. Killed (inactivated) vaccines against: pertussis, leptospirosis, pneumococcal infection, gonorrhea, brucellosis. Composition, practical usage of inactivated vaccines and their effectiveness.

3. Toxoid based vaccines against: diphtheria, tetanus, botulism, Staphylococcal infection, cholera, gas gangrene anaerobic infection. Their composition, principles of preparation and purpose of application.

4. Chemical vaccines against: typhoid fever, meningococcal infections. Composition, practical usage of chemical vaccines, evaluation of their effectiveness.

5. Combined vaccines: DTP (adsorbed diphtheria-tetanus-pertussis), sekstaanatoxin (against botulism types A, B, E, against tetanus, against gas gangrene caused by *C. perfringens*, *C. noviy*). Composition, practical usage of combined vaccines, evaluation of their effectiveness.

6. Antitoxins (specific antitoxic sera) to diphtheria, tetanus, botylism (monovalent serum type A, polyvalent anti-botulism serum), gas gangrene, etc. Their preparation and usage.

7. Allergens for skin allergy tests: tuberculin, brucellin, anthraxin, tularin. Composition, purpose of application

8. Diagnostics and antigens: brucellosis diagnosticum, typhoid and paratyphoid O- and H-diagnosticum, dysentery diagnosticums of Sonne and Flexner, erythrocyte typhoid diagnosticum, gonococcal antigen, pertussis antigen. Composition, purpose of application.

9. Luminescent sera: cholera fluorescent serum and shigellosis luminescent serum. Composition, principles of production, purpose of application.

10. Shigella and E. coli-Proteus bacteriophage. Composition, principles of their preparation, purpose of application.

11. Make a record and evaluate the results of the precipitation test in gel to determine toxigenicity of the cultures of Corynebacterium diphtheria. Components and the principle of the reaction.

12. Assess the results of enzyme-linked immunosorbent assay (ELISA) in order to detect antibodies to antigens of syphilis. Components and the principle of the reaction.

13. Assess the results of Wassermann test. Components and the principles of the reaction.

14. Assess the results of microprecipitation test for syphilis. Components and the principle of the reaction.

15. Assess phage typing of staphylococcal pure culture. Make a conclusion.

16. Assess the main tests of pathogenicity of staphylococcal pure culture: plasma coagulation test, lecithinase activity test, fermentation of mannitol under anaerobic conditions.

17. The reaction of neutralization of botulinum toxins. Components, the principle of the reaction, evaluate results.

18. Assess the results of the reaction of indirect hemagglutination test (IHAT) to detect antibodies to the shigellosis antigens. Components and the principle of the reaction.

19. Study the results of the reaction to the definition of antistreptolysin and evaluate the results of the Widal test in order to detect antibodies to the typhoid fever antigens. Components and the principle of the reaction.

20. Determine sensitivity of pure staphylococcal culture to antibiotics by disk-diffusion method. Draw conclusions.

21. Study the results of the ring precipitation test (Ascoli test) in order to identify the antigens of anthrax in the extract from livestock materials. Components, principle of reaction, make conclusions.

22. Mantoux test: principle and purpose of the test, interpretation of the obtained results.

23. Carry out a quantitative calculation of the growth of pathogenic microorganisms on a medium from a material of a patient with suspected foodborne toxicoinfection. The principle of the method.

24. Evaluate results of the reaction for determination of antistreptolysin O in the serum of the patient. Components and the principle of reaction, the purpose of the test.

25. Evaluate the results of CFT with the patient's serum and gonococcal diagnostic kit, draw a conclusion. Components of the reaction, the principle of test.

26. Evaluate results of the precipitation test in gel to determine toxigenicity of the culture of Corynebacterium diphtheria. Components of the reaction, principles of the test.

27. Evaluate the results of indirect hemagglutination test (IHT) with paired sera of the patient with candidiasis. Components of the reaction, the principle of test.

28. Schemes of laboratory investigation of bacteria as causative agents of infectious diseases.

Submodule IV «RNA and DNA viruses»

1. Principles and schemes of laboratory diagnostic of viral diseases: influenza, parainfluenza, measles, rubella, epidemic parotitis, enteroviruses, rotaviruses and adenoviruses, human immunodeficiency virus (HIV), enteral and parenteral hepatitis.
2. Live (attenuated) vaccines against measles, mumps, rubella, influenza, polio (Sebin vaccine).
3. Inactivated vaccine against polio (Salk vaccine).
4. Chemical vaccines against influenza.
5. Recombinant (genetically engineered) vaccine against hepatitis B.
6. Specific therapeutic and prophylactic immune sera and immunoglobulins: anti-influenza serum and anti-influenza donor immunoglobulin; measles immunoglobulin, human immunoglobulin.
7. Nonspecific antiviral drugs: human leukocyte interferon, rimantadine, ribavirin.
8. Tests for identification of viruses in the application of the virological method of diagnosis: NT (neutralization test of the cytopathic effect of the virus), RIF, CFT, HAIT, HAT, ELISA. Components for reactions, positive/negative result, practical use for the diagnosis of various viral diseases.
9. Reactions for serodiagnosis of viral diseases: CFT, HAIT, PHAT, ELISA. Components for reactions, positive / negative result, practical use for the diagnosis of various viral diseases.
10. Serological markers for diagnostics of HIV infection. Evaluate results of the ELISA with patient’s serum to detect antibodies against gp120 antigen of HIV (demonstration). Draw a conclusion.
11. Serological markers for diagnostics of hepatites. Evaluate results of the ELISA with patient’s serum to detect antibodies against HBsAg (demonstration). Draw a conclusion.
12. Immunoblotting. Criteria for interpretation of immunoblot result for HIV.
13. Principles of the antiretroviral therapies.
14. Principles and schemes of laboratory diagnostic of viral diseases: European tick-borne encephalitis, yellow fever, Dengue fever, Crimean hemorrhagic fever, hemorrhagic fever with kidney syndrome, rabies, herpesviruses infections.
15. Live (attenuated) vaccines against rabies (Farm vaccine), against chickenpox, attenuated vaccine against yellow fever (from the neurotropic strain Dakar), live smallpox vaccine. Composition, purpose of application, obtaining, evaluation of effectiveness.
16. Killed (inactivated) vaccines: culture vaccine against rabies, inactivated culture vaccine against simplex herpes viruses, against hepatitis A, inactivated culture vaccine against

European tick-borne encephalitis. Composition, purpose of use, preparation, evaluation of effectiveness.

17. Specific therapeutic and prophylactic immune sera and immunoglobulins: anti-rabies immunoglobulin, human immunoglobulin against chickenpox, specific homologous donor immunoglobulin against European tick-borne encephalitis, heterologous immunoglobulin against European tick-borne encephalitis. Composition, purpose of application.

18. Nonspecific antiviral drugs: human leukocyte interferon, rimantadine, ribavirin, acyclovir.

19. Make an assessment of the results of histological examination of material from a patient with suspected rabies infection.

20. Tests for identification of viruses in the application of the virological method of diagnosis: NT (neutralization test of the cytopathic effect of the virus), RIF, CFT, HAIT, HAT, ELISA. Components for reactions, positive/negative result, practical use for the diagnosis of various viral diseases.

21. Reactions for serodiagnosis of viral diseases: CFT, HAIT, PHAT, ELISA. Components for reactions, positive / negative result, practical use for the diagnosis of various viral diseases.

22. Express methods of laboratory diagnosis of viral infections: RIF, ELISA, RIA. Polymerase chain reaction.

23. Principles for the prevention of nosocomial infections. Sterilization, disinfection, aseptic, chemotherapy, immunoprophylaxis, immunotherapy, epidemiological measures.

24. Bacteriological investigation of air. Determination of total bacterial count (TBC) and the number of sanitary-indicative microorganisms. Study the results of bacteriological investigation of air and make a conclusion.

25. Bacteriological investigation of water. Sampling of water. Transportation of samples to the laboratory. Determination of TBC, coli titer, coli index, the number of pathogenic microorganisms. Study the results of bacteriological investigation of water (fermentation method and membrane filter method) and make a conclusion.

26. Bacteriological investigation of soil. Sampling, transportation of samples to the laboratory, preparation for investigation. Determination of TBC, coli titer, titer of *Clostridium perfringens*. Evaluate sanitary conditions of the soil by microbiological indicators.

27. Bacteriological investigation of milk and dairy products. Sampling, transportation, preparation for research. Determination of TBC, coli titer, specific microflora. Evaluate the sanitary and bacteriological state of milk by microbiological indicators.

28. Algorithm for the microbiological diagnosis of dermatomycosis.

29. Algorithm for the microbiological diagnosis of deep mycosis.

30. Algorithm of microbiological diagnosis of mycoses caused by opportunistic fungi. Criteria for diagnosis of candidiasis.

31. Sanitary-bacteriological evaluation of sterility of bandages and surgical materials.

32. Sanitary-bacteriological study of swabs from hands and equipment. Bacteriological quality control of disinfection.

33. Algorithm of microbiological diagnostics of nosocomial infections caused by pathogenic and opportunistic bacteria.

34. Phage typing of bacteria in order to identify the source of infection.

35. Principles of prevention of nosocomial infections. Sterilization, disinfection, aseptic, chemotherapy, immune prophylaxis, immunotherapy, epidemiological measures.