REPUBLIC OF UZBEKISTAN
MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION

SAMARKAND STATE UNIVERSITY OF VETERINARY MEDICINE, ANIMAL HUSBANDRY AND BIOTECHNOLOGY

DEPARTMENT OF MICROBIOLOGY, VIRUSOLOGY AND IMMUNOLOGY

"APPROVED"
Deputy-rector of education affairs,

professor_____A.A.Elmurodov
"___" _____ 2022

"VETERINARY MICROBIOLOGY AND IMMUNOLOGY"

STUDY ON SCIENCE - METHODOLOGICAL COMPLEX

Field of expertise:	800000 - Agriculture, Forestry, Fisheries and Veterinary
Sphere of education:	840 000 - Veterinary
Course of study:	60840100 - Veterinary Medicine (by types of activity)

Samarkand – 2022

The curriculum of the subject has been developed in accordance with the approved curriculum, working curriculum, syllabus and working curriculum.

Developers:

Shapulatova Z.J.	SamSVMAHB, Docent of “Epizootology, Microbiology and Virology”.
Khatamov A.Kh	SamSVMAHB, Assistant Professor of “Epizootology, Microbiology and Virology”.

“VETERINARY MICROBIOLOGY AND IMMUNOLOGY”
EDUCATIONAL-METHODICAL COMPLEX OF SCIENCE:

Discussed at the meeting of the Department of “Microbiology, virology and immunology", approved by the Deputy-Rector for Academic Affairs and recommended for use in the educational process (Protocol №. “__” _____ 2022).

Head of the department_____ D.D.Aliyev

Discussed at the Faculty Council of "Veterinary Diagnostics and Food Safety" and approved by the Deputy-Rector for Academic Affairs and recommended for use in the educational process (Protocol №. “__” _____ 2022).

Chairman of the Faculty Council, rofessor _____ R.B.Davlatov

Agreed:

Head of the educational and
methodical department, Docent _____ R.F.Ruzikulov

C O N T E N T S

I. Science curriculum

REPUBLIC OF UZBEKISTAN
MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION

SAMARKAND INSTITUTE OF VETERINARY MEDICINE

"APPROVED" Rector of Samarkand Institute of Veterinary Medicine _____ 2019 "___" _____	"AGREED" Higher and secondary special education Ministry _____ 2019 "__" _____ Registered: № BD-5440100-2.7 2019 "__" _____

VETERINARY MICROBIOLOGY AND IMMUNOLOGY

FAN PROGRAM

Field of knowledge:	400000 - Agriculture and Water Management
Field of education:	440000 – Veterinary
Education directions:	5440100 - Veterinary medicine (by type of activity) 5440100 - Veterinary medicine (cattle diseases) 5440100 - Veterinary medicine (small horned cattle) diseases) 5440100 - Veterinary medicine (horse and camel diseases) 5440100 - Veterinary Medicine (canine and dog diseases) 5440100 - Veterinary medicine (poultry diseases) 5440100 - Veterinary medicine (bee diseases) 5440100 - Veterinary medicine (fish diseases)

Samarkand - 2019

The science program was approved by the Protocol No. ___ of the Coordinating Council of Educational and Methodological Associations in Higher and Secondary Special and Vocational Education in 2019.

Approved by the order of the Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan "___" dated 2019, "___" approved by the basic higher education institution.

The science program was developed at the Samarkand Institute of Veterinary Medicine.

Developers:

Shapulatova Z.J.	SamVMI, Docent of "Epizootology, Microbiology and Virology".
Ruzikulova UX	SamVMI, Assistant Professor of "Epizootology, Microbiology and Virology".
Boltayev DM	SamVMI, Assistant Professor of "Epizootology, Microbiology and Virology".

Reviewers:

Mengliev G'.A.	- Tashkent State Agrarian University, Docent of "General Zootechnics", Candidate of Veterinary ScienceC.
Allamurodova MM	- Director of the Samarkand Regional State Center for Diagnosis of Animal Diseases and Food Safety.

The science program was considered and recommended by the Council of the Samarkand Institute of Veterinary Medicine (Protocol No. 8 of March 29, 2019).

I. Relevance of the subject and its role in higher education

The program covers the content, subject and method of "Veterinary Microbiology and Immunology", the essence of veterinary microbiology and immunology, its goals and objectives, legal and organizational framework for the organization of veterinary activities in the Republic of Uzbekistan, qualification and ethical requirements of the veterinary profession. .

The program "Veterinary Microbiology and Immunology" includes general characteristics, morphology, physiology, genetics and ecology of microorganisms necessary for veterinarians, their metabolism in nature, industry and agriculture, their role in various industries, infectious processes, immunity, its types, the causative agents of major infectious diseases, their diagnosis, specific prevention methods, and similar topics are reflected in a logical sequence in terms of continuity and continuity. In-depth study of the subject "Veterinary Microbiology and Immunology" plays an important role in solving problems in the field of veterinary medicine.

"Veterinary Microbiology and Immunology" is a subject included in the block of general professional disciplines, it is desirable to teach in the 2nd year. This discipline forms the theoretical and practical basis of animal husbandry and veterinary sciences, and in its development serves as a basis for general and specialized disciplines in the field of veterinary medicine.

II. The purpose and objectives of the subject

The purpose of teaching science is to teach students the general characteristics of microorganisms, their role in various biological processes in nature, in the body and in various industries, pathogens, diagnosis of the disease they cause, modern, effective methods of special prevention, formation of theoretical and practical knowledge on the organization of professional services in accordance with the profile of the direction on the applied biopreparationC.

To achieve this goal, students need theoretical knowledge, practical skills, general biological processes of microorganisms , identification of infectious agents, timely and accurate diagnosis of infectious diseases, special preventive measureC. methodological approach to the organization and the formation of the scientific worldview.

The following requirements are set for the knowledge, skills and abilities of students in the subject. ***Student:***

- Knowledge of the systematics and morphology of microorganisms, beneficial and harmful properties of microorganisms, infection, immunity and their types, morphology, cultural, biochemical and biological properties of infectious microorganisms ***;***

- Preparation of smears from microbial cultures and pathological materials, staining, microscopic examination and differentiation, methods of preparation and sterilization of bacteria, spores, capsules and hives, autotrophic and heterotrophic, anaerobic and aerobic microbes, nutrient media for microbial growth, biological sampling collection, separation of pure culture and serological tests, staining of spores, capsules and acid-resistant bacteria in special methods, morphology, culture, biochemical and biological properties of infectious microorganisms, veterinary drugs, their preparation and treatment. ction ***knowledge and access to them;***

- ***have the skills of*** sterilization, serological and allergic reactions, microbial growth and susceptibility to antibiotics, obtaining pathological materials from sick and dead animals, and examination and diagnosis of infectious diseases ***;***

- planning of microbiological examination, preparation of ointments from cultures and pathological materials, microscopic examination and differentiation of staining; ***must be able to*** isolate pure culture and study its properties, take pathological material samples from sick and dead animals, examine and diagnose infectious diseases **.**

III. Basic theoretical part (lectures)

1 - Module. General part of the subject "Veterinary Microbiology and Immunology"

Topic 1. The science of microbiology and the history of its development

The science of microbiology and the history of its development, the role of science in veterinary practice, the results of socio-economic reforms in the field of animal husbandry and veterinary medicine in the country and scientific achievementC. Tasks and prospects of development of science.

Topic 2. Systematics and morphology of microorganisms

Systematic features and systematic methods of microorganisms, nomenclature, classification of microbes . Importance of systematics of microorganismC.

Bacteria. Measurement of microbes, units of measurement. Classification of microorganisms by external signs: spherical, rod-shaped (bacteria, bacilli, clostridia), twisted bacteria. Organs of action of bacteria. The structure of the bacterium. Capsules, spores and sporeC. Structure, differences, shape, role of mycoplasma, rickettsiae, viruses, actinomycetes, microscopic fungi in human, animal and plant pathology.

Topic 3. Physiology of microorganisms

Chemical composition of bacteria. The amount of water, minerals and organic matter in a bacterial cell. Their role in the life activities of bacteria. Enzymes of microorganisms and their classification.

Nutrition and metabolism of microorganismC. Classification of microorganisms by feeding method, autotrophs (photo - and chemoautotrophs), heterotrophs (meta- and paratrophs). A source of carbon, nitrogen, hydrogen, minerals and vitamins for bacteria, the emergence of biologically active products from bacterial metabolism.

Classification of microbes by respiratory type. Digestion is a form of anaerobic metabolism. Methods of induction of anaerobiosis in the cultivation of anaerobes.

Asexual (isomorphic) and sexual (conjugation) reproduction of microbeC. Reproductive phases of microbes in the nutrient medium. Expression of biological properties of bacteria depending on the phase of reproduction.

Topic 4. Distribution of microorganisms in nature

Soil microflora. Soil is the main reservoir of microflora in nature. Dependence of microflora composition on soil depth and type.

Interactions of microorganismC. Storage of pathogenic microbes in the soil and methods of their separation.

Water microflora. The presence of various microbes in the water. Influence of organic matter, water flow rate and other factors on the composition and amount of microbes in water. Methods of sanitary-bacteriological examination of pathogenic microorganisms and water. Evaluation of water quality on microbiological indicatorC. Air microflora.

Topic 5. The role of microorganisms in metabolism in nature

General information about the role of microbes in the utilization of organic and mineral substances in nature. The role of microbes in the nitrogen cycle: ammonification, nitrification, denitrification.

The role of microbes in the carbon cycle: aerobic and anaerobic breakdown of fiber, fermentation of alcohol, lactic acid, propionic acid, fatty acids and acetic acid. The importance of these processes in the production of food, feed and industrial goodC. The role of microbes in the circulation of sulfur, phosphorus, iron in nature.

Topic 6. Influence of external environmental factors on microorganisms

Influence of physical factorC. The effect of temperature. Division of microbes into mesophilic, psychrophilic, thermophilic with respect to temperature. The mechanism of action of high and low temperatures on microorganismC. Effects of drying, pressure, light, electricity, ultrasound, radiant

energy on microorganismC. Prospects for the application of modern physical advances for sterilization and disinfection.

Effects of chemicalC. The concept of bacterial chemotaxiC. The effect of acids, alkalis, heavy metal salts and other substances on the microbial cell. The concept of bactericidal and bacteriostatic effects.

Influence of biological factorC. Antibiotics, bacteriophage, phytoncides, bactericidal factors in the animal body.

Topic 7. The doctrine of infection

Infection. Concepts of infection and infectious procesC. Infectious disease. Influence of immunobiological condition of the organism, microbial virulence and external environmental factors on the occurrence and course of infection. Where the microbe and its toxins enter the body, ways of transmission and location. The concept of sepsis, bacteremia, toxemia and septicemia. Pathogenicity and virulence, their factors: infectivity, invasiveness and toxigenicity.

Topic 8. The doctrine of immunity

Immunity. The concept of "immunity". Doctrines about immunity. Types of immunity. Natural resistance factors of the organism: cellular (phagocytic), humoral (natural antibodies, complement, lysozyme, etc.). Practical application of the doctrine of antigens, antibodies, antigen-antibody reactions, allergies, immunity.

2-Module. Veterinary microbiology and immunology a special part of science

Topic 9. Pathogenic cocci

General characteristics of pathogenic cocci: their distribution, manifestation of pathogenic properties of cocci. History of the discovery of staphylococci and streptococci (morphological and tinctorial, cultural, enzymatic, pathogenic properties). Antigenic structure, resistance. Laboratory diagnosiC. Dumb, infectious mastitis pathogens, pneumococci, pus-forming streptococci.

Topic 10. Pasteurellosis, the causative agent of jaundice

Opening date. Pathogen expression, laboratory diagnostics, applied biopreparationC. Distribution in nature. Role in animal and human pathology. Transient forms of the infectious process in pigs.

Rules for obtaining pathological material.

Topic 11. Colibacillosis, the causative agent of salmonellosis

General characteristics of the pathogen, general laboratory diagnosis of colibacillosis, the order of bacteriological examination of the material, biopreparations.

General characteristics of Salmonella, the main biological characteristics of the causative agents of calf, piglets, sheep, birch salmonellosis, chicken pullorosiC. Laboratory diagnosis of salmonellosiC. Biopreparations.

Topic 12. The causative agent of anthrax

History of the discovery of the microbe, its spread, storage in the environment, susceptibility of animals to disease. General characteristics of the pathogen. Rules for receiving and sending patmaterial. Laboratory diagnosis of anthrax, biopreparations.

Topic 13. Pathogens of tuberculosis

Types of pathogens and their morphological featureC. Durability. General featureC. Laboratory diagnosis, immunity.

Topic 14. Brucellosis pathogens

Opening date. Importance in human and animal pathology. Migration of brucellae. Properties of brucellosis, immunity. Laboratory diagnosis of brucellosiC. Serological diagnosis of brucellosiC. Biopreparations.

Topic 15. Pathogenic anaerobes

Distribution in nature. Preservation in the external environment, its role in animal and human pathology. Sampling rules for inspection. Immunity.

Characteristics and laboratory diagnosis of pathogens of botulism, gas gangrene, gonorrhea, bradzot, infectious enterotoxemia, necrobacteriosiC. Biopreparations.

Topic 16. Leptospirosis pathogens

Leptospirosis pathogenC. Its role in human and animal pathology. Properties of pathogenC. Laboratory diagnostics, immunity, biopreparations.

Topic 17. Pathogenic mycelium and mycoplasmas

Mycosis pathogens, blastomycetes, dermatomyceteC. Their properties, laboratory diagnostics, biopreparations.

Properties of mycoplasmas, laboratory diagnosis, peripneumonia of large horned animals, infectious agalactia of small horned animals, pathogens of avian mycoplasmosis.

Topic 18: Bacterial and mycological diseases of fish pathogens

Types of pathogens and their morphological featureC. Durability. General featureC. Laboratory diagnostics, immunity.

Topic 19: Pathogens of bacterial and mycological diseases of bees

Types of pathogens and their morphological featureC. Durability. General featureC. Laboratory diagnostics, immunity.

IV. Guidelines and recommendations for practical training

The following topics are recommended for practical training:

1. Organization of the microbiology laboratory and its structure, equipment, purpose. Biological microscope, its structure and rules of operation.
2. Bacteriological dyeC. Techniques of drug preparation. Simple staining method, basic forms of bacteria.
3. Gram staining of preparations .
4. Methods of staining spores, capsules, and acid-fast bacteria
5. Study of the morphology of fungi and the movement of bacteria
6. Preparation of nutrient media
7. Methods of sterilization
8. Methods of isolation of pure culture
9. Study of cultural, biochemical properties of bacteria.
10. Determination of antibiotic susceptibility of microorganisms.
11. Methods of infecting laboratory animals.
12. Agglutination reaction
13. Precipitation reaction
14. Complement binding reaction
15. Biopreparations used in veterinary medicine

Methodical instructions and recommendations on the organization of practical classes are developed by teachers of the department. In it, students further enrich their knowledge and skills on the main topics of the lecture by conducting experiments in practical classes.

Practical training should be conducted by one teacher per group in an auditorium equipped with the necessary equipment. It is advisable to conduct classes using active and interactive methods, using appropriate pedagogical and information technologies.

V. Guidelines and recommendations for laboratory training

The following topics are recommended for laboratory classes:

1. Method of bacteriological examination of the body. Obtaining pathological material and

   methods of sending to the laboratory

2. Laboratory diagnosis of staphylococcal infections
3. Laboratory diagnosis of streptococcal infections
4. Laboratory diagnosis of pasteurellosis
5. Laboratory diagnosis of swine fever
6. Laboratory diagnosis of colibacillosis
7. Laboratory diagnosis of salmonellosis
8. Laboratory diagnosis of anthrax
9. Laboratory diagnosis of tuberculosis
10. Laboratory diagnosis of brucellosis
11. Laboratory diagnosis of cholera
12. Laboratory diagnosis of gas gangrene
13. Laboratory diagnosis of joint disease
14. Laboratory diagnosis of botulism
15. Laboratory diagnosis of pathogenic fungi
16. Laboratory diagnosis of leptospirosis.
17. Laboratory diagnosis of bacterial diseases of fish
18. Laboratory diagnosis of mycological diseases of fish
19. Laboratory diagnosis of bacterial diseases of bees
20. Laboratory diagnosis of mycological diseases of bees

Professors and teachers of the department develop passports for laboratory classes, guidelines and recommendations for their organization.

Laboratory classes should be held in groups of two in classrooms equipped with the necessary equipment and reagents.

Laboratory work includes methods of obtaining pathological materials from dead or forcibly slaughtered animals, serological tests, use of various biopreparations, examination of infectious diseases using microscopic, bacteriological, biosynthetic methods, laboratory diagnostics and develops practical skills and competencies in differential diagnostics.

VI. Independent study and independent work

Recommended topics for independent study:

1. Immunofluorescence reaction.

2. Food media used for the growth of anaerobic microbes, their preparation.
3. Bacteriophages.
4. Cultivation of microorganisms
5. Immunoenzyme method of serological testing ((ELISA test).
6. To study the genetics of bacteria. Gene probes method. Polymerase chain reaction - PCR
7. Methods of microbiological examination of environmental objects.
8. Laboratory diagnosis of camel and human plague.
9. The causative agent of pseudotuberculosis.
10. Laboratory diagnosis of tularemia .
11. Listeriosis pathogen and laboratory diagnosis.
12. Pathogens of infectious enterotoxemia and laboratory diagnosis.
13. The causative agent of necrobacteriosis and laboratory diagnosis.
14. Laboratory diagnosis of Bradzot.
15. The causative agent of campylobacteriosis and laboratory diagnosis.
16. Pathogenic rickettsiae and chlamydia.
17. Variability and heredity of microorganisms.
18. Microflora in animals.

It is recommended that students collect online information on the subject, study them, prepare and present an abstract with the help of textbooks on independently mastered topics .

VII. Procedure for conducting internships

Qualification practice on the subject "Veterinary Microbiology and Immunology" is carried out in the vivarium and experimental farm of the Samarkand Institute of Veterinary Medicine, Samarkand Regional State Center for Diagnosis of Animal Diseases and Food Safety and livestock farmC.

Topics for conducting internships:

1. Rules, goals and objectives of laboratory work.
2. Bacteriological dyes used in the department of bacteriology, methods of preparation of their basic and working solutions.
3. Preparation of nutrient media in the department of bacteriology, methods of sterilization.
4. Methods of microscopic, bacteriological examination of patmaterials brought to the department of bacteriology.
5. Methods of biological examination in the department of bacteriology.
6. To study the technique of placing serological reactions in the serology department.

One internship per day is planned for the qualifying internship, which is designed for 6 hourC. Students of each group are divided into small groups and independently perform the tasks of practical training given under the guidance of

teachers of the department. Keeps a log of the work done, analyzes and draws conclusions.

During the internship, each student uses the manuals and Internet information. Then each student will be able to fully perform the tasks set for practical training.

VIII. Basic and additional literature and sources of information

Basic literature

1. Shapulatova Z.J. Microbiology. Textbook Tashkent, 2013.

Foreign literature

1. PJQuinn., BKMarkey and otherC. Veterinary microbiology. This edition first published New Delhi, India 2016 year.

2. Tracy H Vemulapalli. G Kenitra Hammac. Microbiology for veterinary TechnicianC. Textbook copyright Printed in the United States of America 2015 year

3. Kislenko V.N. Practicum on veterinary microbiology and immunology. Uchebnaya posbiya. M.2005 god

4. K islenko V.N., Kolychev N.M., Veterinary microbiology and immunology. Chast 1, Uchebnik.Obshaya microbiology. M.2006 god.

5. K islenko V.N., Kolychev N.M. Veterinary microbiology I immunology. Textbook.Chast 2, Immunology. M.2007 god.

6. K islenko V.N., Kolychev N.M., Suvorina O.C. Veterinary microbiology and immunology. Textbook. Chast 3, M.2007 god.

Additional literature

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU "Uzbekistan", 2017.

2. Mirziyoyev Sh.M. Ensuring the rule of law and human interests is a guarantee of the country's development and the well-being of the people. NMIU "Uzbekistan", 2017.

3. Mirziyoyev Sh.M. We will build our great future together with our brave and noble people. NMIU "Uzbekistan", 2017.

4. Mirziyoev Sh.M. Decree No. PF-4947 of February 7, 2017 "On the strategy of further development of the Republic of Uzbekistan." Tashkent, 2017.

5.Tepper E.Z. , Shilnikova V.K., Pereverzeva G.I. Practicum on microbiology. M.2005 god.

6. Vorobyov A.A. Medical microbiology, virology and immunology. M. 2008

7. Haqberdiyev PS, Kurbanov FI, Karshiyeva V.Sh. "Diseases of fish and bees." Study guide. Tashkent, 2016.

Websites

1. www. ziyo.net.uz.
2. email: zooveterinariya.ru
3. email: sea mail.net 21.ru
4. email: veterinariy.actavis.ru
5. email: fvat.academy . uzsci.net

II. Working curriculum of science

REPUBLIC OF UZBEKISTAN
MINISTRY OF HIGHER AND SECONDARY SPECIAL EDUCATION

SAMARKAND INSTITUTE OF VETERINARY MEDICINE

Registered
№ _____
«___» _____ 2020

"APPROVED"
Vice Rector for Academic Affairs
Docent _____ AAElmurodov
«____» _____ 2020

VETERINARY MICROBIOLOGY AND IMMUNOLOGY

WORKING CURRICULUM OF SCIENCE

Field of knowledge:	400000 - Agriculture and water management
Field of education:	440000 - Veterinary
Education Direction:	5440100 - Veterinary medicine (by type of activity)

Samarkand – 2020

The working curriculum of the science was developed in accordance with the curriculum, working curriculum and syllabus.

Developers:

Shapulatova Z.J. Docent of "Epizootology, Microbiology and Virology".

Rozikulova UX Assistant of the Department of Epizootology, Microbiology and Virology.

Boltayev DM Assistant of the Department of Epizootology, Microbiology and Virology.

Reviewers:

Allamurodova MM Director of the Samarkand Regional State Center for Diagnosis of Diseases and Food Safety *(Customer)*

Daminov AS SamVMI, Professor of "Poultry, fish, bees and fur diseases."

The working curriculum of the subject was discussed at the meeting of the Department of "Epizootology, Microbiology and Virology" No. ____ __ in "__" _____ 2020 and recommended for discussion at the faculty council.

Head of the department, Docent _____ Z.J.Shapulatova

The working curriculum of the subject was discussed and recommended for use by the Board of the Faculty of Veterinary Diagnostics and Food Safety (Protocol No. "__" _____ № __ 2020).

Chairman of the Faculty Council, Professor _____ R.B.Davlatov

Agreed:

Head of the educational and

methodical department, Docent _____ RFRozikulov

I. Relevance of the subject and its role in higher education

The program covers the content, subject and method of "Veterinary Microbiology and Immunology", the essence of veterinary microbiology and immunology, its goals and objectives, legal and organizational framework for the organization of veterinary activities in the Republic of Uzbekistan, qualification and ethical requirements of the veterinary profession.

The program "Veterinary Microbiology and Immunology" covers the general characteristics, morphology, physiology, genetics and ecology of microorganisms needed by veterinarians, their metabolism in nature, industry and agriculture, their role in various industries, infectious processes, immunity, its types, basic The causative agents of infectious diseases, their diagnosis, specific prevention methods, and similar topics are presented in a logical sequence in terms of continuity and continuity. An in-depth study of the subject of "Veterinary Microbiology and Immunology" plays an important role in solving problems in the field of veterinary medicine.

"Veterinary Microbiology and Immunology" is a subject included in the block of general professional disciplines and should be taught in the 2nd year. This science forms the theoretical and practical basis of animal husbandry and veterinary sciences, and in its development serves as a basis for general and specialized disciplines in the field of veterinary medicine.

II. Aims and objectives of the subject

The purpose of the course is to **teach** students the general characteristics of microorganisms, their role in various biological processes in nature, in the body and in various industries, pathogens, diagnosis of the disease they cause, modern, effective methods of special prevention, biopreparationC. formation of theoretical and practical knowledge on the organization of appropriate professional services.

To achieve this goal, science provides students with theoretical knowledge and practical skillC. To achieve this goal, science provides students with theoretical knowledge, practical skills, methodological approaches to microbiological phenomena and processes, and the formation of a scientific worldview.

The following requirements are set for students' imagination, knowledge, skills and abilities in the subject. ***Student:***

- Knowledge of the systematics and morphology of microorganisms, beneficial and harmful properties, infection, immunity and their types, morphology, cultural, biochemical and biological characteristics of infectious microorganisms ***;***

- Preparation of smears from microbial cultures and pathological materials, staining, microscopic examination and differentiation, methods of preparation and sterilization of bacteria, spores, capsules and fungi, autotrophic and heterotrophic, anaerobic and aerobic microbes, nutrient media for microbial growth, biological sampling, isolation of pure culture and be able to know and use serological tests, special staining of bacteria, morphology, culture, biochemical and biological properties of infectious microorganisms, biopreparations used in veterinary medicine, their preparation and application ***;***

- ***have the skills to*** perform sterilization, serological and allergic reactions, microbial growth and susceptibility to antibiotics, obtaining pathological material from sick and dead animals, and testing and diagnosis of infectious diseases ***;***

- planning of microbiological examination, preparation of ointments from cultures and pathological materials, microscopic examination and differentiation of staining; be able to isolate and study pure cultures, take pathological material samples from sick and dead animals, and examine and diagnose infectious diseases **.**

Distribution of lessons on the subject "Veterinary Microbiology and Immunology" by topics and hours :

№	Topics	Total hour	Including			
			Lecture	Practical training	Laboratory	Independent work
1	The science of microbiology and the history of its development	8	2	6	-	-
2	Systematics and morphology of microorganisms	8	2	6	-	-
3	Physiology of microorganisms	16	2	2	-	12
4	Distribution of microorganisms in nature	12	2	4	-	6
5	The role of microorganisms in metabolism in nature	2	2	-	-	-
6	Influence of external environmental factors on microorganisms	10	2	2	2	4
7	The doctrine of infection	6	2	4	-	-

8	The doctrine of immunity	18	2	6	-	10
9	Genetics and variability of microorganisms	4	-	-	-	4
10	Microflora in animals	4	-	-	-	4
11	Pathogenic cocci	6	2	-	4	-
12	Pasteurellosis, the causative agent of jaundice	6	2	-	4	-
13	Colibacillosis, the causative agent of salmonellosis	6	2	-	4	-
14	The causative agent of necrobacteriosis and laboratory diagnosis	6	-	-	-	6
15	The causative agent of anthrax	4	2	-	2	-
16	Pathogens of tuberculosis	4	2	-	2	-
17	Pathogens of brucellosis	4	2	-	2	-
18	Pathogenic anaerobes	10	2	-	4	4
19	Pathogenic anaerobes	8	-	-	4	4
20	Pathogenic anaerobes	2	-	-	-	2
21	Pathogens of leptospirosis	4	2	-	2	-
22	Pathogenic mites and mycoplasmas	4	2	-	2	-
23	Pathogens of bacterial and mycological diseases of fish	6	2	-	4	-
24	Pathogens of bacterial and mycological diseases of bees	6	2	-	4	-
25	The causative agent of listeriosis and laboratory diagnosis	4	-	-	-	4
26	Campylobacteriosis and laboratory diagnosis	6	-	-	-	6
27	The causative agent of camel and human plague	4	-	-	-	4
28	The causative agent of pseudotuberculosis	6	-	-	-	6
29	Laboratory diagnosis of tularemia	6	-	-	-	6
30	Pathogenic rickettsiae and chlamydia	6	-	-	-	6

	Jami	**196**	**38**	**30**	**40**	**88**

The main part

A methodologically integral sequence of science

In the main part (lecture) the topics of science are presented in a logical sequence. The essence of each topic is explained through plan questions and key concepts . It covers all the knowledge and skills that need to be taught to students on the topic on the basis of DTC.

Basic theoretical part (lectures)

1-Module. General part of the science of veterinary microbiology and immunology

1- subject The science of microbiology and the history of its development

The science of microbiology and the history of its development, its role in agricultural practice, the results of socio-economic reforms in the field of animal husbandry and veterinary medicine in the country and scientific achievementC. Tasks and prospects of development of science.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q1; Q5; Q6.

Topic 2. Systematics and morphology of microorganisms

Systematic features and systematic methods of microorganisms, nomenclature, classification of microbeC. Importance of systematics of microorganismC. Bacteria. Size of microbes, units of measurement. Classification of microorganisms by external signs: spherical, rod-shaped (bacteria, bacilli, clostridia), twisted bacteria. Organs of action of bacteria. The structure of the bacterium. Capsules, spores and sporeC. Mycoplasma, rickettsiae, viruses, actinomycetes, structure, differences, shape of microscopic fungi, their role in human, animal and plant pathology.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 3. Physiology of microorganisms

Chemical composition, nutrition and metabolism of microorganisms, respiration, growth and reproduction. The amount of water, minerals and organic matter in a bacterial cell. Their role in the life of bacteria . Enzymes of microorganisms and its classification. Classification of microorganisms by feeding method, autotrophs (photo- and chemoautotrophs), heterotrophs (meta- and paratrophs). A source of carbon, nitrogen, hydrogen, minerals and vitamins for bacteria, the formation of biologically active products

from bacterial metabolism. Classification of microbes by respiratory type. Asexual (isomorphic) and sexual (conjugation) reproduction of microbes . Reproductive phases of microorganisms in food media.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 4. Distribution of microorganisms in nature

Soil microflora. Soil is the main reservoir of microflora in nature. Dependence of microflora composition on soil depth and type. Interactions of microorganismC. Principles of storage of pathogenic microbes in the soil and their separation.

Water microflora. The presence of various microbes in the water. Influence of organic matter, water flow rate and other factors on the composition and amount of microbes in it. Pathogenic microorganisms in water and methods of sanitary-bacteriological examination of water. Assessment of water quality on microbiological indicatorC. Air microflora.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 5. The role of microorganisms in metabolism in nature

General information about the role of microbes in the utilization of organic and mineral substances in nature. The role of microbes in the nitrogen cycle: ammonification, nitrification, denitrification. The role of microorganisms in carbon metabolism, aerobic and anaerobic breakdown of fiber, alcohol, lactic acid, propionic acid, fatty acids and acetic acid. The importance of these processes in the production of food, food and industrial goodC. The role of microbes in the circulation of sulfur, phosphorus, iron.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 6. Influence of external environmental factors on microorganisms

Influence of physical factorC. The division of microorganisms into mesophilic, psychrophilic, and thermophilic with respect to temperature. Influence of high and low temperatures, drying, pressure, light, electron current, ultrasound, radiant energy on microorganismC. Prospects for the application of modern physical advances for sterilization and disinfection. Effects of chemicalC. The concept of bacteriochemistry. The effect of acids, alkalis, heavy metal salts, etc. on the microbial cell. The concept of bactericidal and bacteriostatic effectC. Influence

of biological factorC. Antibiotics, bacteriophage, phytoncides, bactericidal factors of the animal organism.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 7. The doctrine of infection

Infection. Expression of the concepts of infection and infectious procesC. Infectious disease. Influence of immunobiological status, microbial virulence and environmental factors on the onset and course of infection. Where the microbe and its toxins enter the body, and how they spread. The concept of sepsis, bacteremia, toxemia and septicemia. Pathogenicity and virulence, their factors: infectivity, invasiveness and toxigenicity.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 8. The doctrine of immunity

Immunity. Expression of the concept of "immunity". The development of the doctrine of immunity. Types of immunity. Natural resistance factors of the organism: cellular (phagocytic), humoral (natural antibodies, complement, lysozyme, etc.). Practice teaching about antigens, antibodies, antigen-antibody reactions, allergies, immunity.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

2-Module. Veterinary microbiology and immunology a special part of science

Topic 9. Pathogenic cocci

General characteristics of pathogenic cocci: their distribution, manifestation of pathogenic properties of cocci. Staphylococci. Opening date. Expression of pathogenic staphylococci (morphological and tinctorial, cultural, enzymatic, pathogenic properties). Pathogenicity, antigenic structure, resistance, pathogenesis and immunity, specific prophylaxis and treatment methodC. Bacteriological examination. Rules for obtaining and processing patmaterial. Preparation and application of anatoxinC. Use of phage, antibiotics and sulfonamides in staphylococcal infectionC. Streptococci. Opening date. Importance in animal and human pathology. Expression of pathogenic streptococci. Laboratory diagnosiC. Dumb, infectious mastitis pathogens, pneumococci, pus-forming streptococci.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 10. Pasteurellosis, the causative agent of jaundice

Opening date. Pathogen expression, laboratory diagnostics, applied biopreparationC. Distribution in nature. Role in animal and human pathology. Forms of infection in pigs.

Rules for obtaining pathological material.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 11. Colibacillosis, the causative agent of salmonellosis

General characteristics of the pathogen, general laboratory diagnosis of colibacillosis, bacteriological examination of the material, biopreparations.

General characteristics of Salmonella, calf, piglets, sheep, birch salmonellosis, chicken pullorosiC. Laboratory diagnosis of salmonellosiC. Biopreparations.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 12. The causative agent of anthrax

History of the discovery of the microbe, its spread, storage in the environment, susceptibility of animals to disease. General characteristics of the pathogen. Rules for receiving and sending patmaterial. Laboratory diagnosis of anthrax, biopreparations.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q1; Q5; Q6.

Topic 13. Pathogens of tuberculosis

Types of pathogens and their morphological featureC. Durability. General featureC. Laboratory diagnosis, immunity.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 14. Pathogens of brucellosis

Opening date. Importance in human and animal pathology. Migration of brucellae. Properties of brucellosis, immunity. Laboratory diagnosis of brucellosiC. Serological diagnosis of brucellosiC. Biopreparations.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 15. Pathogenic anaerobes

Distribution in nature. Preservation in the external environment, its role in animal and human pathology. Sampling rules for inspection. Immunity.

Characteristics and laboratory diagnosis of botulism, botulism, gas gangrene, measles, mumps, infectious enterotoxemia, necrobacteriosiC. Biopreparations.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 16. Pathogens of leptospirosis

Pathogens of leptospirosiC. Role in human and animal pathology. Properties of pathogenC. Laboratory diagnostics, immunity, biopreparations.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 17. Pathogenic mycelium and mycoplasmas

Mycosis pathogens, blastomycetes, dermatomyceteC. Their properties, laboratory diagnostics, biopreparations.

Characteristics of mycoplasmas, laboratory diagnosis, peripneumonia of large horned animals, infectious agalactia of small horned animals, pathogens of avian mycoplasmosis.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 18: Bacterial and mycological diseases of fish pathogens

Types of pathogens and their morphological featureC. Durability. General featureC. Laboratory diagnostics, immunity.

Applied learning technologies: *dialogic approach, problem-based learning, brainstorming, bliss-questionnaire.*

References: A1; X4; X5; X6; Q5; Q6.

Topic 19: Bacterial and mycological pathogens of bees

Types of pathogens and their morphological featureC. Durability. General featureC. Laboratory diagnostics, immunity.

References: A1; X4; X5; X6; Q5; Q6.

Calendar thematic plan of lectures on the subject "Veterinary Microbiology and Immunology":

T / r	Topics of lectures	Hour
1 - Module. Veterinary microbiology and immunology general part of science		
1.1	Introduction. The science of microbiology and the history of its development	2
1.2	Systematics and morphology of microorganisms	2
1.3	Physiology of microorganisms	2
1.4	Distribution of microorganisms in nature.	2
1.5	The role of microorganisms in metabolism in nature	2
1.6	Influence of external environmental factors on microorganisms	2
1.7	The doctrine of infection	2
1.8	The doctrine of immunity	2
2- Module. Microbiology of pathogens		
2.1	Pathogenic cocci	2
2.2	Pasteurellosis, the causative agent of jaundice	2
2.3	Colibacillosis, the causative agent of salmonellosis	2
2.4	The causative agent of anthrax	2
2.5	Pathogens of tuberculosis	2
2.6	Pathogens of brucellosis	2
2.7	Pathogenic anaerobes	2
2.8	Pathogens of leptospirosis	2
2.9	Pathogenic mycelium and mycoplasmas	2
3.0	Pathogens of bacterial and mycological diseases of fish	2
3.1	Pathogens of bacterial and mycological diseases of bees	2
J ami		**38**

Practical - recommended topics for laboratory classes

Topic 1: The organization of the laboratory of microbiology and its structure, equipment, purpose. Biological microscope, its structure and rules of operation.

Introduction to the equipment of the laboratory, safety, the structure of a simple microscope.

Materials and equipment: microscope, immersion oil, finished drugs.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 2: Bacteriological dyeC. Preparation techniques, simple staining method, basic forms of bacteria.

To study the methods of preparation of dye solutions used in microbiology.

Materials and equipment: Paint set, alcohol lamp, patmaterial, microbial culture, microscope.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 3: Gram staining of drugs.

To study the preparation of ointments and stamps from pathological material from bacterial cultures, simple staining methods

Materials and equipment: Paint set, alcohol lamp, patmaterial, microbial culture, microscope.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 4: Methods of staining spores, capsules and acid-fast bacteria.

To study the essence of staining of bacterial preparations by complex methods , the GRAM method, the basics and essence of methods of staining of spores, A uyeski- Z latogorov, Mixin, Ramonovsky-Gimza methodC.

Materials and equipment: Paint set, alcohol lamp, patmaterial, microbial culture, microscope.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 5: Studying the morphology of fungi and the movement of bacteria.

Microscopic examination of preparations from molds of molds and yeastC. Identification of structural elements of fungi.

Materials and equipment: Microscope, fungal cultures, glassware and glassware, bacterial culture.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 6: Preparation of food environments.

Learn how to prepare artificial media, determine the pH of the medium, filter and pour into solutionC. Autoclave placement.

Materials and equipment: Dry food media, scales, autoclave, test tube, Petri dish.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 7: Sterilization methods.

Preparation of containers for sterilization. Sterilization of nutrient media, glassware, instruments, binders, and gowns.

Materials and equipment: autoclave, Pasteur oven, Cox apparatus, sterilizer, Petri dishes , bacteriological solutions, flasks , prepared food media, gownC.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 8: Methods of isolation of pure culture.

Diagnostic significance of pure culture separation. Methods of separation of pure culture. Separation of a mixture of several species of bacteria (staphylococci, salmonella, hay bale) in a test tube.

Materials and equipment: sterile saline solution; GPA in a test tube, pipettes, sterile Petri dishes, a mixture of bacteria in a test tube.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 9: Study of cultural and biochemical properties of bacteria.

Specific growth characteristics of microorganisms in liquid, semi-liquid and dense nutrient media. The importance of bacteriological diagnosis in determining cultural characteristicC. Determination of their enzymatic activity in the identification of microbes by laboratory methodC. Study of some biochemical methods of microbes.

Materials and equipment: microbial cultures, Levin, Endo, blood agar, indicator goose in Petri dishes .

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 10: Determination of antibiotic susceptibility of microorganisms.

Methods for determining the activity of antibiotics on bacteria. To study the susceptibility and resistance of bacteria to them.

Materials and equipment: GPA cast Petri dishes, pipette, microbial culture, tweezers, paper disc vials soaked in various antibiotics, ruler.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 11: Methods of infecting laboratory animals.

Laboratory animals and methods of their infection, determination of lethal and infectious doses of microorganismC. Vivaria and the species of laboratory animals in it. Study of selection, identification and pest control of laboratory animals.

Materials and equipment: Laboratory animals (white mouse, guinea pig, rabbit), bacterial culture, sterile test tube, sterile saline solution, sterile syringe needle, cotton swabs, alcohol, tweezerC.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 12: Method of bacteriological examination of the body. Methods of obtaining pathological material and sending it to the laboratory.

Bacteriological examination of animal carcasseC. Learn how to obtain and send laboratory materials from dead animals on a farm. Cracking and bacteriological examination of laboratory animalC. Internal organs, fluids, food preparation and planting environments, G ram method to study painting.

Materials and equipment: carcass of a dead laboratory animal, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, brush, test tubes GPB, GPA, alcohol, tampons, 5% phenol solution, cuvette, paint kit, microscope.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 13: Biopreparations used in veterinary medicine.

Vaccines, diagnostics, hyperimmune serums, allergens

Materials and equipment: Diagnostics (antigen, allergen, complement, serum); vaccines, serums used for treatment.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 14: Agglutination reaction .

The essence of serological reactionC. Methods of agglutination reaction. Adoption of test-tube and droplet agglutination reactions.

Materials and equipment: Test tubes, pipettes, Pasteur pipettes, tripods, etc. positive (brucellosis) serum, y.sh.h. normal whey; Brucellosis antigen for AR, saline.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 15: Precipitation reaction .

The essence of the precipitation reaction, the application of the methods of application. Select the components needed to set up the reaction.

Materials and equipment: Extracted antigen, special antigen, precipitating serum, normal serum, Ulengut solutions, tripods, Pasteur pipettes.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 16: Complement binding reaction.

To study the essence of the complement binding reaction, to put the basic experience.

Materials and equipment: test tubes, graduated pipettes, saline solution in a vial, water bath, hemolysin, antigen, complement; test serums, positive, normal serums, sheep erythrocytes 1:40.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 17: Laboratory diagnosis of staphylococcal infections.

Expression of pathogenic staphylococci and streptococci (morphological, cultural, pathogenic and other characteristics). To study the distribution of pathogens in different purulent inflammatory processes, the nutrient media in the isolation and growth of staphylococci, methods for differentiation of pathogenic and saprophytic staphylococci, the susceptibility of isolated staphylococci to antibiotics

Materials and equipment: Patmaterial, purulent exudate, milk sample, nutrient media GPB, GPA, selective medium salt-blood GPA, glucose-whey GPB, Pasteur pipettes

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 18: Laboratory diagnosis of streptococcal infections.

To study the morphological and cultural characteristics of streptococci and diplococci, the procedure for obtaining patmaterial, sending to the laboratory and methods of testing

Materials and equipment: streptococcal culture, patmaterial, whey GPB in test tubes, glucose GPA, blood GPA in Petri dishes; milk (mastitis), pus, Pasteur pipettes, alcohol lamp

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 19: Laboratory diagnosis of pasteurellosis.

To study the procedure for sending laboratory materials for bacteriological examination of pasteurellosis, the morphology of the pathogen, cultural and biochemical propertieC. Bacteriological diagnosis of pasteurellosis, acquaintance with biopreparations

Materials and equipment: GPA, GPB, microbial culture, sterile GPA, GPB, Pasteur pipettes, patmaterial, subject glasses, paint kit, microscope, brush

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 20: Laboratory diagnosis of swine fever.

Morphological and cultural features of SaramaC. Ways to obtain patmaterial. Culture of GPB, GPA-grown parasitic pathogen, simple and gram staining of drugs and microscopic examination of the results in a notebook

Materials and equipment: GPA, GPB, microbial culture, sterile GPA, GPB, Pasteur pipettes, patmaterial, subject glasses, paint kit, microscope, brush

Technologies used *: pop-up study, the problem of education*, a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 21: Laboratory diagnosis of colibacillosis.

General characteristics of the causative agent of colibacillosiC. Laboratory diagnosis of colibacillosiC. To study the morphological and cultural characteristics of colibacillosis, special biopreparations, their preparation and quality control

Materials and equipment: GPA, GPB, Endo medium, microbial culture, sterile GPA, GPB, Pasteur pipettes, patmaterial, subject glasses, paint kit, microscope, brush

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

22 Subject: S **almonellozni laboratory diagnostics.**

General characteristics of salmonellosis pathogenC. Laboratory diagnosis of salmonellosiC. Biopreparations used

Materials and equipment: GPA, GPB, microbial culture, sterile GPA, GPB, Pasteur pipettes, patmaterial, subject glasses, paint kit, microscope, brush

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 23: Laboratory diagnosis of anthrax.

To study the procedure for receiving and sending patmaterial, bacteriological and serological methods of examination. Demonstration of GPB, GPA and GPJ cultures of the pathogen grown on blood agar

Materials and equipment: GPA, GPB, microbial culture, sterile GPA, GPB, Pasteur pipettes, patmaterial, subject glasses, paint kit, microscope, brush

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 24: Laboratory diagnosis of tuberculosis.

General characteristics of the causative agent of tuberculosis . Laboratory diagnosis of tuberculosiC. Application Biopreparations Mycobacterial preparations Sil-Nilson staining under a microscope.

Materials and equipment: sterile glycerin GPB, Petranian medium, ready-made mycobacterial ointments stained by Sil-Nielsen method, ready-made mycobacterial culture, patmaterial, object glass, paint kit, microscope, ointment.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 25: Laboratory diagnosis of brucellosis

General characteristics of brucellosis pathogens . Laboratory diagnosis of brucellosiC. Biopreparations used

Materials and equipment: a set of dyes, brucellosis antigens, bovine serum - positive, normal, test.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X1; X2; X3; Q5; Q6.

Topic 26: Laboratory diagnosis of cholera.

To study the morphological-cultural and biochemical characteristics and growing conditions of pathogenic anaerobeC. Introduction to special biopreparations

Materials and equipment: C *l.chauvoei* culture, patmaterial, sterile Kitt-Tarossi , glucose-blood agar, sterile Pasteur pipettes, ready -made greases, paint kit.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 27: Laboratory diagnosis of gas gangrene.

To study the morphological-cultural and biochemical characteristics and growing conditions of pathogenic anaerobeC. Introduction to special biopreparations

Materials and equipment: *Cl. septicum, Cl. perfringens* cultures, patmaterial, sterile Kitt-Tarossi, glucose-blood agar, sterile Pasteur pipettes, dye collection

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 28: Laboratory diagnosis of joint disease.

To study the morphological-cultural and biochemical characteristics and growing conditions of pathogenic anaerobeC. Introduction to special biopreparations

Materials and equipment: *Cl. Theta* cultures, patmaterial, sterile Kitt Tarossi, glucose and blood agar, sterile Pasteur pipette, paints package

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 29: Laboratory diagnosis of botulism.

To study the morphological-cultural and biochemical characteristics and growing conditions of pathogenic anaerobeC. Introduction to special biopreparations

Materials and equipment: patmaterial, sterile Kitt-Tarossi, glucose-blood agar, sterile Pasteur pipettes, dye set

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 30: Laboratory diagnosis of pathogenic fungi.

General characteristics of pathogenic mycelium and mycoplasmaC. Laboratory of pathogenic mycelium and mycoplasmas . DiagnosticC. Biopreparations used.

Materials and equipment **:** fungal cultures, patmaterial, microscope, mycological loop, object and cover glass

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 31: Laboratory diagnosis of leptospirosis.

General characteristics of leptospirosis pathogenC. Laboratory diagnosis of leptospirosiC. Biopreparations used

Materials and equipment **:** Leptospira cultures, patmaterial, microscope, object and cover glasC.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 32: Laboratory diagnosis of bacterial diseases of fish.

Pathogenic fish bacterial disease common characteristics and laboratory diagnosiC. Biopreparations used

Materials and equipment: bacterial cultures, a set of dyes, ready-made ointments.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 33: Laboratory diagnosis of mycological diseases of fish.

Mikologik fish disease causative agents of general characteristics and laboratory diagnosiC. Biopreparations used

Materials and equipment: cultures of mycological pathogens, a set of dyes, ready-painted ointments.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 34: Laboratory diagnosis of bacterial diseases of bees.

Pathogenic bacterial disease of bees general characteristics and laboratory diagnosiC. Biopreparations used

Materials and equipment: pathogen cultures, a set of dyes, ready-made ointments.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6.

Topic 35: Laboratory diagnosis of mycological diseases of bees

Mikologik bees disease, the causative general characteristics and laboratory diagnosiC. Biopreparations used

Materials and equipment: pathogenic cultures **, a** set of dyes, ready-made ointments.

Technologies used: *pop-up study, the problem of education,* a *qliy attack, and Bliss-demand, self-control.*

References: A1; X3; X4; X5; X6; Q5; Q6. Websites

Calendar thematic plan of practical and laboratory classes on the subject "Veterinary Microbiology and Immunology" in the field of veterinary medicine (by type of activity)

№	Practical is the subject of laboratory classes and content	hour	
		Practical	laboratory
1	Organization of the microbiology laboratory and its structure, equipment, purpose. Biological microscope, its structure and rules of operation.	2	-
2	Bacteriological dyeC. Preparation techniques, simple staining method, basic forms of bacteria.	2	-
3	Gram staining of drugs	2	-
4	Methods of staining spores, capsules, and acid-fast bacteria	2	-
5	To study the morphology of fungi and the movement of bacteria	2	-
6	Preparation of nutrient media.	2	-
7	Methods of sterilization	2	-
8	Methods of isolation of pure culture	2	-
9	Study of cultural and biochemical properties of bacteria	2	-
10	Determination of antibiotic susceptibility of microorganisms	2	-
11	Methods of infecting laboratory animals	2	-
12	Method of bacteriological examination of the body. Methods of obtaining pathological material and sending it to the laboratory	-	2
13	Biopreparations used in veterinary medicine	2	-
14	Agglutination reaction	2	-

15	Precipitation reaction	2	-
16	Complement binding reaction	2	-
17	Laboratory diagnosis of Staphylococcal infections.	-	2
18	Laboratory diagnosis of streptococcal infections.	-	2
19	Laboratory diagnosis of pasteurellosis.	-	2
20	Laboratory diagnosis of swine fever.	-	2
21	Laboratory diagnosis of colibacillosis.	-	2
22	Laboratory diagnosis of salmonellosis.	-	2
23	Laboratory diagnosis of anthrax.	-	2
24	Laboratory diagnosis of tuberculosis.	-	2
25	Laboratory diagnosis of brucellosis	-	2
26	Laboratory diagnosis of cholera.	-	2
27	Laboratory diagnosis of gas gangrene	-	2
28	Laboratory diagnosis of joint disease	-	2
29	Laboratory diagnosis of botulism	-	2
30	Laboratory diagnosis of pathogenic fungi	-	2
31	Laboratory diagnosis of leptospirosis.	-	2
32	Laboratory diagnosis of bacterial diseases of fish	-	2
33	Laboratory diagnosis of mycological diseases of fish	-	2
34	Laboratory diagnosis of bacterial diseases of bees	-	2
35	Laboratory diagnosis of mycological diseases of bees	-	2
	J ami	**30**	**40**

It is recommended that students use the Internet to write an abstract and its presentation on the topics of independent study, preparation and preparation of organ preparations, use of literature in foreign languages, case studies, development of case studies.

Calendar thematic plan of practical and laboratory classes on the subject "Veterinary Microbiology and Immunology" in the field of veterinary medicine (by type of activity)

T / r	**Independent study topics**	**Assignments given**	**Completion time**	**Size (per hour)**
1	Immunofluorescence reaction	Prepare from the literature and complete assignments	September	8
2	Food media used to grow anaerobic microbes, their preparation	Prepare from the literature and complete	September	4

		assignments		
3	Bacteriophages	Prepare from the literature and complete assignments	October	4
4	Cultivation of microorganisms	Prepare from the literature and complete assignments	October	6
5	Immunoenzyme method of serological testing (ELISA)	Prepare from the literature and complete assignments	October	4
6	Study of the genetics of bacteria. Gene probes method. Polymerase chain reaction - PCR	Prepare from the literature, write an essay and complete assignments	October	4
7	Methods of microbiological examination of environmental objects	Prepare from the literature, write an essay and complete assignments	November	8
8	The causative agent of camel and human plague	Prepare from the literature, write an essay and complete assignments	November	8
9	The causative agent of pseudotuberculosis	Prepare from the literature, write an essay and complete assignments	November	2
10	Tularemia laboratory diagnosis of the disease	Prepare from the literature and complete assignments	November	6
11	Listeriosis pathogen and laboratory diagnosis	Prepare from the literature and complete assignments	December	4
12	Pathogens of infectious enterotoxemia and laboratory diagnosis.	Prepare from the literature and complete assignments	December	4
13	The causative agent of necrobacteriosis and laboratory diagnosis	Prepare from the literature and complete	December	6

		assignments		
14	Laboratory diagnosis of Bradzot	Prepare from the literature and complete assignments	December	6
15	Campylobacteriosis and laboratory diagnosis	Prepare from the literature and complete assignments	January	2
16	Pathogenic rickettsiae and chlamydia	Prepare from the literature and complete assignments	January	2
17	Variability and heredity of microorganisms	Prepare from the literature, write an essay and complete assignments	January	6
18	Microflora in animals	Prepare from the literature, write an essay and complete assignments	February	4
J ami				**88 hours**

1st Intermediate Assessment Topics: The Science of Microbiology and the History of Its Development.

2 Systematics of microorganisms.
3 Morphology of microorganisms
4 Physiology of microorganisms .
5 Distribution of microorganisms in nature
6 The role of microorganisms in metabolism in nature
7 The role of chemical microbiology in biotechnology.
8 Influence of external environmental factors on microorganisms
9 Theory of Infection
Theory of Immunity (***Independent Study:*** Immunofluorescence Reaction

1. Food media used to grow anaerobic microbes, their preparation
2. Bacteriophages
3. Immunoenzyme method of serological testing (ELISA)
4. Study of the genetics of bacteria. Gene probes method.
5. Methods of microbiological examination of environmental objects

2 Intermediate evaluation topics : Pathogenic cocci

1. The causative agent of pasteurellosis
2. The causative agent of Saramas disease
3. The causative agent of colibacillosis
4. The causative agent of salmonellosis

6. The causative agent of anthrax
7. Pathogens of tuberculosis
8. Pathogens of brucellosis
9. Pathogenic anaerobes
10. Pathogenic mites
11. Pathogenic mycoplasmas

12 The causative agent of leptospirosis (***Independent study:*** The causative agent of camel and human plague)

1. The causative agent of pseudotuberculosis
2. Laboratory diagnosis of tularemia
3. The causative agent of listeriosis and laboratory diagnosis
4. Pathogens of infectious enterotoxemia and laboratory diagnosis
5. The causative agent of necrobacteriosis and laboratory diagnosis
6. Laboratory diagnosis of Bradzot
7. Campylobacteriosis and laboratory diagnosis

Procedure for conducting internships

Qualification practice on the subject "Veterinary Microbiology and Immunology" is carried out in the vivarium and experimental farm of the Samarkand Institute of Veterinary Medicine, the State Center for Diagnosis of Animal Diseases and Food Safety of Samarkand region and livestock farms.

Topics for the internship:

1. Rules, goals and objectives of laboratory work.

2. Bacteriological dyes used in the department of bacteriology, methods of preparation of their basic and working solutions.

3. Preparation of nutrient media in the department of bacteriology, methods of sterilization.

4. Methods of microscopic and bacteriological examination of pathogens submitted to the Department of Bacteriology.

5. Methods of biological examination in the department of bacteriology.

6. To study the technique of serological reactions in the serology department.

One internship per day is planned for 6 hourC. Each group of students is divided into small groups and independently performs the tasks of practical

training under the guidance of teachers of the department. Keeps a log of the work done, analyzes and draws conclusions.

During the internship, each student uses manuals and Internet information. Then each student will be able to complete the tasks set for practical training.

Basic and additional literature and sources of information.

Basic literature

1. Shapulatova Z.J. Microbiology. Study guide. Tashkent, 2013.

Foreign literature

1. PJQuinn., BKMarkey and otherC. Veterinary microbiology. This edition first published New Delhi, India 2016 year.

2. Tracy H Vemulapalli. G Kenitra Hammac. Microbiology for veterinary TechnicianC. Textbook copyright Printed in the United States of America 2015 year.

3. Kislenko V.N. Practicum on veterinary microbiology and immunology. Uchebnaya posobiya. Moscow, 2005.

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Additional literature

1. Mirziyoyev Sh.M. Together we will build a free and prosperous democratic state of Uzbekistan. Tashkent, NMIU "Uzbekistan", 2017.

2. Mirziyoyev Sh.M. The priority of blood and ensuring human interests is a guarantee of the country's development and the well-being of the people. NMIU "Uzbekistan", 2017.

3. Mirziyoyev Sh.M. We will build our great future together with our brave and noble people. NMIU "Uzbekistan", 2017.

4. Mirziyoyev Sh.M. “On the strategy of further development of the Republic of Uzbekistan”Gi February 7, 2017 , No. PF-4947 Farmoni. Tashkent, 2017.

5. Tepper E.Z. , Shilnikova V.K., Pereverzeva G.I. Practicum on microbiology. M., 2005.

6. Vorobyov A.A. Medical microbiology, virology and immunology. Uchebnaya posobiya. M., 2008.

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1. www. Ziyo.net.uz.
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5. www. fvat.academy . uzsci.net

III Basic teaching materials of science:
3.1 Teaching materials for lectures

Introduction. The science of microbiology and the history of its development

Lecture teaching technology

Time: 2 hours	*Number of students:* ___
Form of training	Introduction, visual presentation
Curriculum	1. The importance of microbiology 2. Summary of Microbiology history of development. 3. Advances in microbiology
The purpose of training : the subject and methods of knowledge of the subject "Veterinary Microbiology", the history of its development in relation to other disciplines, the formation of knowledge and a complete picture of the achievements of science.	
Pedagogical tasks: - To acquaint with the importance and tasks of the science of veterinary microbiology, its role in the system of educational sciences; - Interpretation of the structure of the subject of veterinary microbiology and the recommended educational literature; - Coverage of achievements in the field of theory and practice of veterinary microbiology; - Disclosure of the features, timing and forms of evaluation of methodological and organizational work in the field of veterinary microbiology; - organization of the lecture process, describe the general outline of the report process;	*Learning Outcomes:* Students: - Represents the importance and objectives of the science of veterinary microbiology; - Review the structure of the subject of veterinary microbiology and the recommended teaching materials; - Cover the achievements in the field of theory and practice of veterinary microbiology; - Describes the features, timing and forms of evaluation of methodological and organizational work in the field of veterinary microbiology; - Veterinary microbiology describes the general scheme of the process; - The report represents the main stages of the organization of the process;
Teaching methods	Speech, pinboard, mental attack
Form of organization of education	Collective
Educational tools	Lecture text, projector, handouts, graphic organizers.
Teaching conditions	An auditorium equipped with special technical means

Monitoring and evaluation	Oral inquiry: expedited inquiry.

Technological map of the lecture

The work lines and time	Activity content	
	educator	learner
Phase 1. Training training entrance (10 ac.)	1.1. The topic, its purpose, the expected results of the training will be announced.	1.1. Hear, write takes.
Phase 2. Basic (60 minutes)	2.1. Conducts quick questions and answers to get students 'attention and determine their level of knowledge . - What terms do you know about veterinary microbiology? - What do you think is the role of veterinary microbiology in the transition to a market economy ? - What are the branches of veterinary microbiology? 2.2. The teacher continues to narrate the lecture using visual materials. The importance of the science of microbiology, the concept of beneficial and harmful microorganismC. Explains the general laws of life of microorganisms and their role in nature. 2.3. A brief history and achievements of microbiology provide a presentation on the first manifestations that contributed to the development of the science of veterinary microbiology. a) What do you think the science of veterinary microbiology teaches? (b) What responsibilities does he have? c) How does it relate to other sciences and what is its significance? Explains the subject of "Veterinary Microbiology" with questions such as 2.4. Emphasizes that students should pay attention to and write down the basic concepts of the topic.	2.1. He hears. Says the terms without repeating each other in turn. He thinks, the answer will give. Responds and hears the correct answer. 2.2. Schematics and tables discusses the content. Asks questions and writes down key points. 2.3.Remember, write. He tries to answer every question. Writes a description, gives examples
Phase 3.	3.1. Concludes on the topic, draws students'	They conduct self-

The final (10 minutes)	attention to the importance of the work done in their future careers. 3.2. The groups evaluate the work, 3.3. Gives an assignment for independent work and introduces its evaluation criteria.	assessment. They ask questions. Homework they write

Basic expressionC. *Microorganism, bacteria, microscope, general, private, medical, technical microbiology, sanitary microbes, microorganism proteins, bacteriology, mycoplasmatology, rickettsiology, mycology, virology, pure culture, pathogen, immunology, vaccine, serum, genetic engineering.*

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Question 1. The importance of the science of microbiology.

1-ilova.

Microbiology is the science of microorganismC. The microbes are smaller than 0.1 mm in size and can only be seen with the naked eye.

The importance of the science of microbiology in the development of the national economy, in the pathology of animals, humans and plants, in the creation of means of prevention and control of infectious diseases, and even in the maintenance of the permanence of nature.

The diversity of the microbial world has led to the differentiation of a number of branches and directions of microbiology.
At present, microbiology is divided into a number of independent areas: general, private, medical, veterinary, agricultural, technical (industrial), water (marine), space microbiology, etc.

2-ilova.

Veterinary microbiology is closely related to medical microbiology because the pathogens of many infectious diseases are common to animals and humans **.** Thus, veterinary microbiology studies pathogens that are common to agriculture, domestic and wild animals, humans and animals, as well as

microorganisms that play an important role in the production of animal feed and food products.
This science examines bacteria, viruses, pathogenic fungi, rickettsiae, mycoplasmas, chlamydia. Based on the data of veterinary microbiology develops diagnostic measures for infectious diseases of animals, their special prevention, treatment.

3-ilova.

The science of veterinary microbiology studies the general characteristics, morphology, physiology, genetics and ecology of microorganisms necessary for veterinary medicine, their metabolism in nature, industry and agriculture, their role in various industries, infectious processes, immunity, its types, basic infectious pathogens of diseases, including their diagnosis, special prevention methods.

4-ilova.

The purpose of the science is to teach students the general characteristics of microorganisms, their role in various biological processes in nature, in the body and in various industries, pathogens, the diagnosis of the disease they cause, modern effective methods of special prevention. is the formation of knowledge, skills and competencies appropriate to the profile of the direction on biopreparationC.
The task of science is to teach students the general characteristics of microorganisms, their role in various biological processes in nature, in the body and in various industries, pathogens, timely accurate diagnosis of diseases they cause using modern effective methods of science and special training in the proper organization of preventive measures, the development and implementation of research methodologieC.

Question 1. The importance of the science of microbiology.

Microbiology is the science of microorganismC. The microbes are smaller than 0.1 mm in size and can only be seen with the naked eye. Microbes include some protozoa, single-celled algae, microscopic fungi, bacteria, viruses, and so on. Optical microscopes with a magnification of 3,000 times and electron microscopes with a magnification of tens to hundreds of times are used to examine them. Combining all microorganisms with a single term can be called microbeC. The term was coined by the French scientist Seddilo in the late 19th century. The name of this science was also proposed by the French scientist E. Duclos, which consisted of three Greek words: "micros" - small, "bios" - life, "logos" -

science. That is microbiology. This science is the study of the morphology, physiology, genetics, ecology of extremely tiny organisms - microbes - and their role and importance in the lives of animals, plants and humanC.

Microorganisms are very common in nature: in the soil, water, air, on the surface of plants, in the skin of animals and humans as well as in the intestines, in the skin of animals, in all objects of the environment. Microbes are also found in the depths of mines and on the seabed, in the stratosphere at altitudes of several tens of kilometers.

There are beneficial and harmful microorganismC. Some plant debris, animal carcasses rot and clean the earth, while others cause disease and great harm to plants and animalC.

Microorganisms are actively involved in metabolism in nature . It is also important in digestive processes, especially in chewing gum. In the large abdomen of cows, germs can reach 3 kg.

The importance of the science of microbiology in the development of the national economy, in the pathology of animals, humans and plants, in the creation of means of prevention and control of infectious diseases, and even in the maintenance of the permanence of nature.

The diversity of the microbial world has led to the differentiation of a number of branches and directions of microbiology.

At present, microbiology is divided into a number of independent areas: general, private, medical, veterinary, agricultural, technical (industrial), water (marine), space microbiology, etc.

Table - 1

Microbiology	
General	**Private**
Microbes:	Medical microbiology
Anatomy (composition)	Veterinary microbiology
Physiology	Bacteriology
Biochemistry	Virology
Genetics	Mycology
Evolution	Protozoology
Ecology	Sanitary microbiology
	Clinical microbiology
	Agricultural microbiology
	Marine microbiology
	Space microbiology
	Industry (biotechnology)

General microbiology studies the general properties of microorganisms , the general laws of life and their role in nature, special microbiology studies the individual representatives of the microbial world.

Medical microbiology is the study of pathogenic microbes (bacteria, viruses, pathogenic fungi, protozoa, etc.) for humans.

Veterinary microbiology is closely related to medical microbiology because the pathogens of many infectious diseases are common to animals and humans **.** Thus, veterinary microbiology studies pathogens that are common to agriculture, domestic and wild animals, humans and animals, as well as microorganisms that play an important role in the production of animal feed and food products.

This science examines bacteria, viruses, pathogenic fungi, rickettsiae, mycoplasmas, chlamydia. Based on the data of veterinary microbiology develops diagnostic measures for infectious diseases of animals, their special prevention, treatment.

Agricultural microbiology is the study of microorganisms that infect plants.

Marine microbiology is the study of microbes that live in the sea, ocean, and other bodies of water.

Space microbiology - studies the representatives of the cosmic microworld.

Industrial microbiology is the basis of biotechnology, which is used to obtain various bio-products (vaccines, enzymes, diagnosticum, nucleic acids, etc.) from microbes on an industrial basis.

Each direction, branch of microbiology differs in accordance with its purpose, function and the specificity of the studied microcosm.

Bacteriology is the vital activity of bacteria, which deals with the bacteriological diagnosis of infectious diseases they cause, the prevention of disease.

Virology as a separate science deals with the vital activity of viruses, the diseases they cause, their diagnosis by virological methods, disease prevention.

Mycology - organizes microscopic fungi.

Protozoology is the study of diseases caused by the common people, their diagnosis and prevention.

Question 2. A brief history of the development of microbiology.

Microbes appeared on our planet before animals and humans.

Humans used microbiological processes in baking, dairy products, and wine even before microorganisms were identified. Pathogenic microbes that cause infectious diseases in humans have been proven to exist since ancient times.

In ancient times, scientists thought that an infectious thing could pass from a sick organism to a healthy one. In 2000, people in China, India and the Caucasus were vaccinated against smallpox, and in Africa, cattle were vaccinated against pneumonia. In ancient Egypt, silage was used to feed cattle.

So, before the discovery of microbes, people assumed that there were some external factors that caused the disease. It follows that microbiology still appeared before our era, and it has gone through a long period of development. According to the level of knowledge about microbes, the history of microbiology can be divided

into five periods with the discovery of new fundamental innovations and the emergence of methods, as well as the formation of new directions:

1) heuristic; 2) morphological; 3) physiological; 4) immunological; 5) molecular genetics.

1. Heuristic period. During this period, Hippocrates (III-IV centuries BC) made the hypothesis that he transmitted diseases from person to person by some invisible substance that appears in rotten swamps (heuristics - hypothesis, fantasy, suspicion) starts from time. He called these substances "miazms." During the early development of science, physicians and research naturalists tried to determine the cause of infectious diseaseC. Hippocrates (460-377 BC), Varron (116-27 BC), Lucretius (99-55 BC), Pliny (23-79 BC), In the major manifestations of that period, such as Galen (130-200 BC), scientists made earlier hypotheses about the living pathogens of infectious diseases.

The people of Asia had a certain idea about the contagion of leprosy and isolated the sick from otherC. Abu Ali Ibn Sina (980-1037 BC) believed that the cause of infectious diseases were extremely tiny living things that could not be seen with the naked eye and were spread through water and air. He wrote in his Laws of Medicine that the causative agents of plague, smallpox, and other diseases were "invisible" pathogenC.

Only in the XY-XII centuries did the Italian physician and poet Geralimo Fracastro (1476-1553) call the disease "living contact" that passes through air or objectC. , substantiated his views on the destruction of the pathogen, etc.

Thus, over the course of two thousand years, scientists have come a long way from assuming and assuming that the disease in humans is caused by some invisible living being.

The science of microbiology began to develop only after the discovery of microorganisms.

2. Morphological period. This period began in the late seventeenth and early eighteenth centuries, when the Dutch naturalist Anthony van Leeuwenhoek (1632-1723) discovered bacteria. A. Levenguk was born and died in the small Dutch town of Delft. He was a movut seller. In his spare time, he was involved in grinding windows and making lenses for microscopes, which was a tradition in Holland at the time. The microscope he created magnified objects up to 150-300 timeC. In it, he saw water, tooth decay, blood, semen, etc., and found many living "animals" and called them "animalkulyus." He drew and wrote a picture of them. Of course Levenguk's observations were soda and primitive, but the forms of microorganisms he described were surprisingly clear and reliable.

Antoni Van Levenguk (1632-1723), a Dutch lens polisher, was the first to discover the world of invisible microbes under a microscope he created, and described them in three main forms in his book The Mysteries of Nature Discovered by AV Levenguk . .

Thus Levenguk's discovery led to a morphological period in the development of microbiology.

MMTerekhovsky (1740-1796) was the first to study infusoria using the experimental method. The tool introduced a harmless strain by boiling the utensils.

DSSamoylovich (1744-1805) believed that the cause of human plague was a microbe, tried to find it under a microscope and proposed a method of vaccination against human plague.

In 1891, XIGelman used mango and tuberculosis to diagnose allergens.

A sharp turn in the science of microbiology is associated with the name of the French scientist, the founder of the science of microbiology Louis Pasteur (1822-1895). Thanks to his discoveries, the physiological period in microbiology began in the second half of the nineteenth century . Pasteur proved in 1861 that microorganisms were the cause of putrefaction and fermentation processeC. Pasteur discovered that some groups of microbes survive without molecular oxygen (under anaerobic conditions). Pasteur great discoveries in the field of veterinary microbiology, anthrax, rabies, swine erysipelas, chicken plague pathogen, but bringing the study of classical studies on the virulence microbes subdued, prepared vaccines against diseaseC. Pasteur developed a method of killing germs (sterilization in an autoclave). Pasteur's contribution to industrial and technical microbiology is significant. He discovered that the causes of wine disease were microbes and invented a method of protecting wine from spoilage by heating it to 55 ^{0}C (pasteurization).

German scientist Robet Cox (1843 - 1910) proposed the use of dense nutrient media to isolate pure microbial cultures, isolated the causative agent of tuberculosis and plague microbes from humans and cattle, and proposed experimental methods for infecting laboratory animals with microbeC. , introduced the practice of staining drugs with aniline dyes , the application of an immersion system, and microphotography. The causative agent of anthrax has been found to produce spores .

DI Ivanovsky (1864-1920) played a special role in the history of microbiology. He studied the mosaic disease of tobacco leaves and in 1892 identified the viruseC. This proved that microorganisms are invisible under a normal microscope, do not grow in normal nutrient media, and pass through blood filters that trap bacteria .

IIMechnikov (1845-1916) created a complete theory of phagocytosis and its role in immunity. Identified gi antagonism between putrefactive and lactic acid microbes .

LSSenkovsky (1822 - 1887) was the first in Russia to prepare anthrax vaccine and put into practice successful vaccination methods.

SNVinogradsky (1856 - 1953) is the founder of soil microbiology. He studied sulfur, iron, nitrifying bacteria, determined the state of chemosynthesiC. It offered elective food environments.

VLOmelyansky (1867- 1928) identified the pathogens that stimulate cellulose, and studied in detail the processes by which they are formed . He studied

the physiology and distribution of nitrogen-fixing bacteria. He authored a textbook, Fundamentals of Microbiology .

Other scientists have also made significant contributions to the development of microbiology. SAKorolev (1874 -1932) developed the theoretical foundations of technical microbiology in dairy farming. AFVoytkevich (1876 - 1950) proved and theoretically substantiated in his researches the therapeutic and dietary importance of acidophilic cultures in young farm animalC. VNShaposhnikov (1884 - 1968) is the founder of technical microbiology. He was the first to organize the production of lactic acid, acetone, butyl alcohol. In 1948 he wrote the book "Technical Microbiology".

NAMixin (1872 - 1946) was one of the founders of veterinary microbiology. He wrote the first textbook, A Private Microbiology Course for Veterinarians and StudentC. He found the causative agent of leptospirosis, developed methods of preparation of formalvaccine and serum against diseases of young animals.

NDIyerusalimskiy (1900- 1967), NAKrasilnikov (1896-1973), AAImsheneskiy, Ye.N. Mishustin and others have made known contributions to the development of general microbiology.

Veterinary university, biocombinat, veterinary laboratories and other specialized veterinary institutions are successfully operating in Uzbekistan. The features of dozens of infectious diseases in the country, such as salmonellosis, calibacteriosis, brucellosis, tuberculosis, pasteurellosis, tetanus and proteinuria, and measures to combat them have been thoroughly studied by Uzbek scientistC.

Question 3. Advances in microbiology

Livestock products play an important role in further strengthening the independence of the Republic in a market economy, improving the welfare of people and adequately meeting their food needC. In achieving this, we emphasize the role of microbiology in the national economy.

Based on the science of microbiology, nutrient protein, vitamins, enzyme antibiotics and other biologically active substances necessary for animal husbandry are obtained from microorganisms . Scientific and technical achievements in the field of biotechnology and genetic engineering are widely used to more fully meet the needs of agriculture in microbiological synthesis productC.

Many more biological synthesis products are obtained using microorganisms . - amino acids, organic (citric, acetic, lactic) acids; chemicals (ethanol, butanol, acetone, glycerin), polysaccharides, etc.

With the help of genetic engineering - insulin-protein hormone is obtained. It is used in the treatment of diabetes in humanC. Mass production lowers the cost of insulin.

The science of microbiology also plays an important role in the prevention of infectious diseaseC. Microbes not only cause disease, but they are also a means of treatment. Vaccines, serums, phages, etc. are being developed for this purpose.

A few more examples of the importance of microbiology as a science in the national economy can be cited.

Application of microbes in metallurgy.

Some microbes have the ability to dissolve metalC. In the old, less ore, abandoned quarries in the metal used. Leokin is such a microbe - iron bacteria - that erode iron and cause damage as well. (In Kharkiv, Kiev subways - demolished steel structures)

Microbes can not only melt iron, but also produce it.

Microbes are also sorbents of metalC. With the help of biosorbent microbes, it cleans industrial effluents (waste) from heavy metal salts and protects the environment from pollution.

Microbes increase the strength of concrete. When one to one kilogram of biomass is added to a ton of concrete , its strength and flatness increase.

Sanitary - germC. They clean the earth, water from plant debris, rotting animal carcasseC. At present, great attention is paid to water purification. Cellulose-degrading microorganisms are used in the disposal of paper mill waste .

Germs can clean the air by absorbing various odors.

Control questions:

1. What does microbiology teach?
2. What are the branches of microbiology?
3. The importance of microbiology in the national economy.

Systematics and morphology of microorganisms.

Lecture teaching technology

Time: 2 hours	*Number of students: 50*
Form of training	Information, visual presentation.
Curriculum	1. The concept of systematics and classification of microorganisms. 2. Structure and morphology of microorganisms. 3. The role of prokaryotes and eukaryotes in animal pathology .
Course Objectives: To analyze the role of systematics and classification of microorganisms in the study of microorganisms, the structure and morphology of microorganisms, the role of prokaryotes and eukaryotes in animal pathology .	
Pedagogical tasks: - To reveal the essence of the systematics and classification of microorganisms; - Introduction to the structure and morphology of microorganisms; - Explain the role of prokaryotes and eukaryotes in animal pathology.	*Learning Outcomes:* Students: - Describe the systematics and classification of microorganisms; - Describe the structure and morphology of microorganisms ; - Gain an idea of the role of prokaryotes and eukaryotes in animal pathology ;
Teaching methods and techniques	Lecture, problem solving, sinkway, O'TV / CT, blitz-questionnaire, graphic organizer: cluster, conceptual table.
Teaching aids	Projector, handout, graphic organizers, blackboard, chalk
Form of teaching	Individual, frontal, collective and pair work
Learning conditions	An auditorium equipped with a projector and a computer

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Topic, purpose and planned training announces the results. 1.2. Representing a plan and problematic situations displays questions.	1.1. They hear, they record. 1.2. Attention they give.
Phase 2. Activation of knowledge (10 min.)	2.1. Demonstrates key categories and concepts and issues to be addressed at the end of the lecture. 2.2. Criteria for evaluating learning activities are known is done.	2.1. Accuracy they enter. Asks questions.
Phase 3. Basic (55 min.)	3.1. It raises the following question: Tell me, what do you mean by systematics, classification, nomenclature of microorganisms? It defines the systematics, classification, nomenclature to strengthen knowledge on this issue. Examples are given to him. Explains the binomial nomenclature of K. Liney. Gives an idea of culture, strain, clone. 3.2. Explains the structure and morphology of microorganisms (Bacteria, rickettsiae, chlamydia, mycoplasma, actinomycetes, spirochetes, fungi, viruses). 3.3. Explains the role of prokaryotes and eukaryotes in animal pathology .	3.1. Factors classify. Write definitions they get. Grouping criteria explain. 3.2. They record. They discuss. 3.3.WRITE. They discuss.
Step 4. Final (10 min.)	4.1. Summarizes the topic. Encourages students to take an active part in the learning process. 4.2. Independent work and theoretical knowledge asks questions to reinforce: Berg assigns a brief study of the importance of the bactericidal determinant in the study of the systematics and morphology of microorganisms .	4.1. He hears. Defines. 4.2. They write down the assignment.

Basic expressionC. *Prokaryotes, eukaryotes, morphological structure, systematics, classification, spores, capsules, hives, gram-positive, gram-positive, cytoplasmic membrane, cytoplasm, inclusions, bacilli, actinomycetes, fungi, clones, strains, deuteromycetes, cultures, cells virus, viroid, genome.*

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1. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013
2. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 268 p
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4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. Chast 3. Chastnaya microbiology. M.2007 g.

1-ilova.

Systematics or taxonomy, a special branch of biological science, deals with the grouping of living organisms according to their general similarities . The process of characterizing and identifying taxonomic groups (taxa) is called **classification,** and the methods of naming them are called **nomenclature** . Bacteria are named in accordance with the rules of the International Code of Bacterial Homenclature.

Prokaryotes include all bacteria and blue-green algae (cyanobacteria). Eukaryotes include microscopic fungi, microscopic animals (protozoa), and microscopic algae (except blue-green algae).

With the help of "Bergi bacterial detector" the task of rapid identification of prokaryotic organisms is more fully realized. The first edition of the detector was published in 1923 by a group of American bacteriologists led by DHBergey (DHBergey, 1860-1937); the ninth edition, consisting of four volumes, was published in 1984-1989. In the ninth edition of the Berg bacterial detector, all the identified organisms were included in the kingdom of Procariotae and divided into 33 groupC. The main purpose of Berg classification is to easily (lightly) identify bacteria.

2-ilova.

In microbiology , terms such as "culture," "strain," and "clone" are used.
Culture is microorganisms grown in nutrient media from animal, human, plant or external substrateC. **A strain** is a **culture** that belongs to the same species but is separated from different animals and substrates and differs with less variation in their mutual propertieC. **A clone is** a culture of microorganisms isolated from a single cell.

3-ilova.

Microbes are very small and are measured in micrometers (μm) and nanometers (nm).
1mkm = 10^{-6} meters, 1nm = 10^{-9} meters, 1 mm = 1000mkm, 1 mkm - 1000 nm.

4-ilova.

Viruses are cell-free microorganisms that parasitize all types of organisms - animals, humans, plants, insects, bacteria, fungi, and simple animal cellC. They have a special genome in their cell that has the ability to reproduce.

1.question. The concept of systematics and classification of microorganisms.

Systematics is the science of the diversity of organisms and their interrelationships.

Systematics or taxonomy, a special branch of biological science, deals with the grouping of living organisms according to their general similarities . The process of characterizing and identifying taxonomic groups (taxa) is called **classification,** and the methods of naming them are called **nomenclature** .

One of the tasks of systematics is to classify most organismC. But first it is necessary to describe the objects as fully as possible and to distinguish (compare) them on the basis of the obtained data. This leads to the identification of an organism with known or unknown traits and, accordingly, is placed in a new taxon at a certain level or included in specific taxa.

Organisms use to describe the different characters: morphology, cytology, cultures, physiological, biochemical, Immunological and detail description of the objects, etc. If the size limit, in order to identifikasiya organiznlarni taxonomic groups to be sufficient for a limited amount of information can be used.

A special section of taxonomy - the *nomenclature* - deals with the rules of naming the expressed objectC. In the taxonomy of bacteria, the binomial nomenclature of Carl Linnaeus (K. Linne, 1707-1778) is used to name an object. According to K. Liney's binomial nomenclature, the name of the microbe is pronounced in two wordC. Generation capital letter, type name is written in lower case. For example: *Bacillus anthracis* - anthrax rod , *Basillus subtilis* - hay rod.

Bacteria are named in accordance with the rules of the International Code of Bacterial Homenclature.

All organisms made up of cells (*Chatton*, 1937) are divided into invertebrates (prokaryotes) and nucleates (eukaryotes) . Inorganic organisms include blue-green algae, bacteria, rickettsiae, actinomycetes, and mycoplasmaC. Stem cells include simple animals, fungi, plant and animal cellC. Prokaryotic cells have a nuclear membrane, no reticulum within the cytoplasm, and have ridges .

A hierarchical system classification was adopted to group prokaryotes, according to which the species, which is the lowest level of the taxonomic layer, belongs to generation, generation to family, family order, order to class, class to division, and division to the world of microorganismC.

In microbiology , terms such as "culture," "strain," and "clone" are used.

Culture is microorganisms grown in nutrient media from animal, human, plant or external substrates.

A strain is a **culture** that belongs to the same species but is separated from different animals and substrates and differs with less variation in their mutual properties.

A clone is a culture of microorganisms isolated from a single cell.

The task of rapid identification of prokaryotic organisms will be more fully accomplished with the help of the Berg bacterial detector, published jointly by the American Society of Bacteriologists and leading experts in the field of study of certain bacterial groupC. The first edition of the detector was published in 1923 by a group of American bacteriologists led by DHBergey (DHBergey, 1860-1937); the ninth edition, consisting of four volumes, was published in 1984-1989. In the ninth edition of the Berg bacterial detector, all the identified organisms were included in the kingdom of Procariotae and divided into 33 groupC. The main purpose of Berg classification is to easily (lightly) identify bacteria. To do this, a set of characteristics is used: morphological (cell shape; hivchin, presence or absence of capsule; spore formation, structure of the inside of the cell; Gram staining), cultural (determined when growing pure culture in the laboratory) characters); physiological-biochemical (methods of energy production; nutrient requirements; relationship to environmental factors; sequence and nucleotide composition of nucleotides in the DNA molecule; nature and presence of minor bases in DNA; nucleotide composition of ribosomal RNA; sequence of amino acids in enzymatic proteins).

The value of the identifier is that it provides an extremely complete summary of known bacterial forms and is the most up-to-date guide for identifying bacteria. In it, prokaryotic microorganisms were united into the kingdom of Procariotae and divided into four sectionC. They are subdivided into sections, classes, rows, families, generations, species, in turn.

Section I. Gracilicutes (from the Latin gracilus - thin, slender, cutes - leather). Contains gram-negative microorganismC. The department has nine sectionC. Spirochetes, Spiral and twisted aerobes, gram-negative inert twisted bacteria, aerobic gram-negative rods and cocci, gram-negative facultative anaerobes, solid anaerobes, sulfate dissimilating and fermenting bacteria, anaerobic gram-negative cocci, rickettsiae.

Section II. Firmicutes (from the Latin firmis - hard, cutes - leather). The section mainly includes gram-positive bacteria. Gram-positive cocci, spore-forming gram-positive rods and cocci, non-spore-forming gram-negative rods, intracellular gram-positive rods that do not form spores, mycobacteria, nocardia.

Section III. TenericuteC. The cell devoir is absent, but gram-negative prokaryotes with a cytoplasmic membrane are fused. Mycoplasmas, Endosymbionts

Section IY. MendosicuteC. Prokaryotes without intermediate pathogenic bacteria; methane-forming, sulfur-oxidizing, halophilic, mycoplasma-like, thermoacidophilic, and other older bacteria (archaebacteria) in origin.

2. Structure and morphology of microorganisms.

Microbes are very small and are measured in micrometers (μm) and nanometers (nm).

1mkm = 10^{-6}meters, 1nm = 10^{-9}meters, 1 mm = 1000mkm, 1 mkm - 1000 nm.

In bacteria, the peptidoglycan is a regid layer that forms and gives density to the shell. In the cell wall of Gram-negative bacteria is 50-90% multilayered peptidoglycan, which also contains proteins and polysaccharideC. Gram-negative bacteria contain 1-10% single-layer peptidoglycan, which has an outer membrane on top.

Bacteria are single-celled microorganisms that differ in shape, size, and some biological properties, and are spherical (cocci), rod-shaped (bacteria, bacilli, and clostridia), and twisted (vibrio, spirilia, spirochetes).

Cocci - (Latin - coccuc - spherical) are spherical bacterial larvae with a diameter of 1-2 micronC. After division, cocci are located differently relative to each other and are divided into several groups: 1) micro-cocci - one irregular, 2) diplococci - two; 3) tetracocci - four - four, 4) staphylococci - grape-like, 5) streptococci - chain, 6) sarsina - in the form of a packet (cubic).

Rod-shaped bacteria and bacilli. Some of the microbes in this form are called bacteria and some are called bacilli. The rods that produce spores are basil and the ones that do not are bacteria. Depending on the location of the rod bacteria are divided into monobacteria (monobacilli), diplobacteria (diplobasilla) and streptobacteria (streptobacilli). Hence, spore-forming rod-shaped bacteria are called differently. If the spore is not larger than the diameter of the bacterium that formed it, it is called a bacilli. If the spores are larger than the transverse surface of the microbe, they are called clostridia. The spores of bacilli are mainly located in the center of the microbial cell. If the spore is located between the clostridia, it is called a central spore, if it is at one end - a terminal spore, if it is close to one end - it is called a subterminal spore.

Spiral-shaped bacteria. These include vibrios (comma-shaped, single-folded), spirillas (two-, three- to five-folded), spirochetes (very small, long and thinly folded).

The bacterial cell consists of a shell, a cytoplasm, and a stem apparatus.

The cytoplasm is a complex colloidal system composed of water, protein, carbohydrates, fats, nucleic acids, and various organic and inorganic substanceC. It

is clear, often homogeneous (sometimes homogeneous), containing mitochondria, mesosomes, ribosomes, various inclusionC. Vacuoles are formed in the cytoplasm.

The center of the cytoplasm is thinner, the edges are denser, and this dense part is called the cytoplasmic membrane. It is the inner wall of the cell membrane where the enzymatic substances are located. In the cytoplasm, the cell's metabolism takes place. That is, it undergoes various enzymatic processes, including nutrition and respiration, the synthesis of proteins and other organic substances - carbohydrates, lipids, acids, toxins and enzymeC.

Cytoplasms have been found to contain DNA molecule-like plasmidC.

A nucleus is a DNA molecule that belongs to a single chromosome located in the nucleus vacuole. It has no membrane, that is, the cortex that separates it from the cytoplasm. A DNA molecule is a strand made up of nucleoid chromatin strandC. It is located in the center of the cytoplasm and is ring-shaped, elongated, loop-shaped. Depending on the location of the nuclei, it is possible to stain the bacteria with aniline dyeC. The nucleus accumbens is involved in the metabolism of the bacterial cell and is responsible for the transmission of its biological properties - pathogenicity, variability, etc.

The shell is made up of a thin membrane that surrounds a bacterial cell. The shell gives the bacteria a certain shape, through which various substances necessary for the vital activity of the cell pass and protect the bacteria from various harmful effects of the external environment. The cortex of bacteria consists of 2-3 layers, the cytoplasmic membrane, the cell wall, and in some cases the third outer layer - the capsule. It is through this biological membrane that the cell's metabolism with the external environment takes place. The bacterial cell wall consists of three layers - the outer lipoprotein, the middle lipopolysaccharide and the inner mucopolymer . It contains enzymes that carry saltC. Its inner surface is tightly touched by the cytoplasmic membrane. It consists of lipid and protein layerC. The cytoplasmic membrane has an active enzymatic system and acts as an osmotic barrier .

Bacteria without a cell wall are called protoplasts (mycoplasmas, L -shaped bacteria).

Bacteria that do not have a cell wall are called protoplasts (mycoplasmas, L -shaped)

Spores and spore formation - a spore is a round or oval shaped 1-2 μm x 0.1 μm long product. Spore formation is a trait that has emerged as a result of an evolutionary struggle for the survival of certain specieC. Spores are protective adaptations that are formed when unfavorable conditions for bacterial growth emerge. The bacterium loses a lot of water (45-55%) during spore formation, the cytoplasm thickens and wraps around it to form a new, resistant, double-layered membrane; the inner layer - the outer layer of the intina - is called the exine. The exine layer is rich in fat, wax, potassium, calcium, sodium saltC. One spore is formed in each cell. Once the spore formation process is complete, the

spores separate from the cell. Spores are highly resistant to external factors and are stored for a long time in adverse conditionC.

The capsule is a separate mucous sheath that surrounds the body of the bacterium, mucus the cell wall.

The capsule contains polysaccharides, glycoproteins or polypeptides, proteinC. The capsule is a protective agent that protects bacteria from the effects of phagocytosis and antibodieC.

The capsule contains 98% water, which creates an additional osmotic barrier, protecting the cell from mechanical damage, build-up. The bacterium forms a capsule in the body, in bloody, whey nutrient media. The capsule determines the virulence factor of some bacteria, acting as a diagnostic marker in distinguishing bacteria.

Hivchins - Many species of bacteria **act** independently and using **hivchins** formed from the ectoplasm of the cell . Determining the movement of the microbe is important in making a diagnosiC. Bacteria are divided into 4 groups according to the number and location of hives:

1. Monotrix is a fungal bacterium.

2. Lofotrix is a bacterium that has a ball of hair on one end of its body .

3. Amphotrix is a bacterium that has a single ball at the two opposite ends of the body.

4. Peritrix - a bacterium with hives on all sides of the body.

Bacteria on one side of the body of the hives move in a straight line, while peritrix and amphotrix bacteria move in all directions.

Hivchins are made up of protein moleculeC. Xivchinli speed and action of bacteria office respects and environmental properties of the mucus, temperature, pH, osmotic pressure, etc. The speed of the bog'liq.Bakterial sometimes 1daq.20-60 microns, 200 micronC.

Fimbriae and **pili** , i.e. **hairs** (vorsinka). In addition to hivchins , bacterial cells also have long, thin, straight, filamentous fimbriae. Fimbriae are much shorter, thinner, and more numerous than hivchinC. It occurs in both moving and inactive organismC. Fimbriae are 0.3–4 μm long and 5–10 nm wide. Their number can range from 100 to 200 to several thousand in a single bacterial cell. Fimbriae are composed of protein-pilin. There are two types of fimbriae. The first is that it helps the bacterial cell to attach to other cells, participating in the formation of a membrane on the surface of the fluid. It is therefore a sticking organ. The second is the sexual fimbriae, or elephants, which carry genetic material from one cell to another in a bacterial conjugation. Pili also serves to attach pathogenic bacteria to animal and human tissueC.

Rickettsiae are single-celled, immobile, polymorphic, gram-negative organisms located between bacteria and viruseC. Contains DNA, RNA, protein and 40% lipidC. It resembles bacteria in shape and size, and viruses in cultural and biological properties.

Rickettsiae were first identified in 1909 by the American scientist G. Ricketts, then R. Wilder, C. Provachek.

Rickettsiae parasitize lice, mites, and fleas and cause disease when they enter the body of animals and humanC. The disease is commonly referred to as rickettsiosis, which includes typhoid fever, measles, and others.

According to PFzdrodovsky, 4 different forms of rickettsiae are distinguished; coccygeal, rod-shaped, basil-like, and fibrouC. They can move from one form to another without losing their biologically specific yachtC. Does not form capsules and sporeC. Rickettsiae do not grow in artificial nutrient media. They grow only in living tissue cells - chicken embryo, tissue culture. Thermolobil toxin produces poison. It decomposes at a temperature of 66 ° C, is well stored in a dry vacuum and at a temperature of 50 - 70 ° C.

Chlamydia -grekchadan *Chlamys* -mantiya the word, because they are infected cells in the mantle surrounded by a shell, similar to hide.

In the development of chlamydia, initial bodies appear in the intermediate stage of development, followed by the formation of tiny elementary bodieC. Elemental and initial bodies vary in infectious activity, size, and density.

The cleaned elemental bodies have an infectious form with a diameter of 200 to 400 nm. Elemental bodies have a spherical shape, an electron-less dense central mass with less electron density, and a flat surface structure. The inner material that forms the nucleoid of the elementary particle appears to be away from the dense, bounding membrane. The nucleoid is homogeneous, eccentrically located, sometimes resembling a tightly wrapped fiber bundle. The rest of the body is composed of a dense substance made up of ribosomes.

Intermediate noninfectious forms of chlomidia are called reticular bodies and range in size from 500 to 1000 nm. Reticular bodies have a particle size of 1600 nm in diameter. In thin incisions, the reticular bodies are irregular or round in shape. The density of the inner part of the reticular bodies is moderate, reminiscent of a net.

Mycoplasmas are polymorphic microorganisms that pass through filters of **100-150** nm, do not form spores, capsules, gram-negative inactive microorganismC. It grows in nutrient media that do not contain living tissue cellC. Propagated by division.

There are mycoplasmas that occur in the form of saprophytes, as well as those that cause disease in humans, animals and plantC. Polymorphism is due to the presence of a thin three-layered lipoprotein membrane in mycoplasmas instead of the actual cell membrane.

Mycoplasma has spherical, filamentous, cylindrical and other formC. The cell contains DNA, RNA ribosome and other componentC.

It grows in a dense nutrient medium with the addition of 10-20% horse blood serum .

Examples of diseases caused by mycoplasmas are pleuropneumonia, infectious agalactia of cattle, respiratory mycoplasmosis of birds.

Actinomycetes (Greek - *actis* - light, *mykes* - fungus) - light fungi. Single-celled gram-positive microorganismC. Eight families of this group belong to the family ActinomucetaleC. Actinomycetes are structurally similar to bacteria and fungi and belong to the group of microorganisms between bacteria and fungi .

The mycelium is not divided into joints, there are gifs of different lengths on each side, at the ends of which are exosporeC. Their reproduction is by means of these sporeC.

Actinomycetes resemble lower fungi - in the presence of single-celled mycelium, propagated by spores and oedipals, forming mycelial colonies in dense nutrient media. Bacteria are characterized by the thickness of the mycelial hyphae (seen in the immersion system of the microscope) staining with aniline dyes , the presence of acid-resistant forms, the growth of meat peptone agar at 35-37 ^{0}C, prokaryotic cell type looks like.

In an agar medium, actinomycetes form a dense colony with a round center. The colony is firmly attached to the nutrient medium. They come in red, white, red, green, brown and other colors.

Actinomycetes are common in nature, common in soil, cereals, dung, mildew. Actively participates in the processes of decay and soil enrichment. From most of them are obtained biologically active substance - antibiotics (streptomycin, biomycin, tetracycline, neomycin).

In addition to the beneficial actinomycetes, there is a type of pathogen. It causes actinomycosis , a serious disease that destroys soft tissues and bones in humans and animalC.

Spirochetes are motile microorganisms that are thin and spiral-shaped, with many tiny foldC. Inside the cell is a straight arrow-shaped strip, around which is placed the cytoplasm with the nucleus substance and various inclusions in the form of tiny foldC. Spirochetes differ from bacteria in some respectC. Therefore, in grouped lentospira, they do not have a cell shell, do not form spores, capsules, do not have spines, they act like a snake as a result of shrinkage of the cytoplasm.

Spirochetes are common in nature and include saprophytic and pathogenic specieC. Pathogens include the causative agent of leptospirosis.

Fungi - (*Fungi*) - are chlorophyll-free organisms that enter the plant world and belong to eukaryoteC. They live on the surface of various substrateC.

Needs nutrient environmentC. Most fungi are characterized by the presence of mycelium, a heterotrophic type of nutrition.

Propagated vegetatively, sexually and asexually (spore formation, budding, mycelial parts, addition of gametes).

Mycelial fungi studied by microbiologists include certain representatives of the following three classes: zygomycetes, ascomycetes, deuteromycetes.

1. Zygomycetes are single-celled organisms with highly developed mycelium that reproduce asexually and sexually. In asexual reproduction, zygospores or oospores are formed during sexual intercourse (oogomy) through

spores formed in sporangia. An example of this class is mukor (head mold), which is found in bread, vegetables, manure, zach rooms, etc.

The mold fungus breaks down carbohydrates to form alcohols and organic acids, which are used in the food industry.

2. Representatives of the class Ascomycetes (sack fungi) are yeastC. They are single-celled without mycelium, chlorophyll. The cells are round, elliptical, and ovoid in shape, about 10 microns in diameter . Yeast cells are common in nature. They reproduce sexually, mainly through splitting, simple division, and in some cases spore formation.

Yeast is used to make alcohol. They are widely used in the preparation of bread, wine, beer, as well as silage and dairy productC. They contain a useful protein for the body , B - vitamin group .

Some types of yeast cause disease . For example, epizootic lymphangitis in horses , blastomycosis in humans and animals - a disease caused by African mango.

3. Deuteromycetes (immature fungi) - have multicellular mycelium. Propagated by cones and conidia. Widespread in nature, there are more than 25,000 species of fungi belonging to this class.

Deuteromycetes include Aspergillus and Penicillium fungi . The representative of *Aspergillus* is *Aspergillus niger* . Its mycelium is divided into jointC. The ends of the conical branches are as thick as the head of a pin, from which chain-like exospores emerge all around as light scatter. Some species are used to separate citric and shavel acids from sugar solution, some species are involved in the mineralization of organic matter, while others are derived from antibiotics such as aspergillin, fuligasin, clavacin. The pathogenic type causes aspergillosis in chickenC.

4. Basidiomycetes belong to advanced fungi such as ascomyceteC. Basidiomycetes mainly include cap fungi. They do not enter microorganisms and are studied in botany.

3. ViruseC. Their structure and classification

Viruses are non-cellular microorganisms that parasitize the cells of all types of organisms - animals, humans, plants, insects, bacteria, fungi, and simple animalC. They have a special genome in their cell that has the ability to reproduce. Viruses come in two forms: extracellular - dormant and intracellular (vegetative).

Peaceful forms of viruses are called "virus fragment", "viral corpuscle", "virion", and the vegetative form is also called "virus cell" complex.

Viruses are classified according to the type of nucleic acid in it, its percentage in the virion, the number of helixes, the relative molecular weight, the structure of the virus, its reproduction, and so on.

Viruses are divided into two major groups by nucleic acid type; RNA viruses and DNA viruseC. Currently, viruses are included in 19 familieC. 12 are

RNA genome viruses and 7 are DNA genome viruseC. They will be one or two spirals depending on the number of spirals.

Coded notation (cryptogram) is used to describe the main features of viruseC. Symbols are used in the cryptogram: nucleic acid type (RNA - *R* , DNA - *D* , its relative molecular mass), virion shape *(S* - spherical, *Ye* - elongated, *X* - mixed content), host (*A* - actinomycetes, *F* - fungus 's *V* - umirtqalilar , etc.) and dish (*es* - Canada, *Di Si* fly and fly, lice, etc.) For example, the generation of enterovirus kriptogrammasi *R* \ 1: 2.5 \ 30: *S* \ *S VO* follows o' doeC.

RNA is a helical, relative molecular weight of 2.5 million daltons (30% of the mass of the virion), spherical in shape, parasitizes in vertebrates, propagated without a carrier.

Depending on the shape of the virion, viruses are divided into four groups:

1. spherical - ie spherical - (influenza, mumps, measles, leukemia viruses, arbovirus, etc.);

2. rod-shaped - (the causative agent of mosaic disease);

3. Cubic-like (smallpox, adenovirus, enterovirus);

4. Spermatozoids (bacterial viruses - phages).

It consists of a nucleic acid (DNA or RNA) or a nucleoprotein wrapped in one or two shells located in the center of the virion. The first shell - which contains nucleic acid - is called a capsid. The capsid contains repeating protein fragments - capsomerC. They are composed of monomers composed of one or more protein moleculeC. The number of copomers in each virus capsid is constant. For example, in the mosaic virus - 2000 and so on

A compound consisting of a nucleic acid and a capsid is called a nucleocapsid. The nucleocapsid is coated with an outer lipid and carbohydrate protective shell. (complex viruses).

Viruses fall into two major groups: simple and complex. A virion consisting of a single nucleocapsid is called a simple virus.

The nucleocapsid is a shell-coated virion containing lipids and carbohydrates called viruseC. This outer shell supercapsid consists of a two-layered membrane: lipid or protein. The supercapsid contains carbohydrate proteins - glycoproteins.

Capsomers are arranged in a certain order, (symmetry) and accordingly viruses are divided into three, spiral, cubic and mixed symmetry type.

The nucleocapsid of helical symmetry viruses is in the form of a tube composed of nucleic acid wrapped in capsomers.

Cube symmetric viruses (isometric viruses) come in three forms known from crystallography. 1) tetrahedron (axis of symmetry 2: 3); 2) octahedron (axis of symmetry 4: 3: 2); 3) icosahedron (axis of symmetry 5: 3: 2).

Mixed symmetry viruses have a nucleocapsid cubic symmetry, in which the nucleoprotein spiral is symmetrical.

The size of the viruses ranges from 20 to 350 nm. It is passed through filters of 1) exact size, 2) ultrasonic centrifugation, 3) diffusion, and 4) imaging (under an electron microscope).

Features of viruses:

1. It is too small to be seen under a normal microscope.
2. Filtration - that is, it passes easily through filters that trap bacteria.
3. Artificial food does not grow in the environment.
4. Parasite (develops in a living tissue cell and has no metabolism.)
5. Grows in chicken embryos and developing tissue cultureC.
6. Cell-free microorganism.
7. RNA or DNA contains only one type of nucleic acid.
8. Tropism is well developed in viruses and multiplies rapidly and actively in some tissueC.

In 1935, W. Stanley isolated the mosaic drive in crystalline form. When these crystals were sent to a tobacco plant, it showed signs of mosaic disease. Since then, a number of other viruses have been isolated in crystalline form.

Viruses of bacteria and actinomycetes are called phages - bacteriophages and actinophages, viruses of fungi - mycophages, algae cyanophages.

“Phagos” is a Greek word meaning to eat. The phages were identified in 1915 by F. Tuort and in 1917 by the FDErrells without their knowledge. The phages have a polygonal prism-shaped head and tumor. The head is 60-100 nm long and the tumor is 100-200 nm long. The head is made up of a shell made of copoms and a single or double stranded DNA inside. The tail portion is a proteinaceous sternum covered with a contractile shell consisting of capsomeres arranged in a spiral. It ends with a basal plate with 5-6 tumors of the tail. From this plate thin threads - adsorption organs are spread. Through the tail part the DNA in the head of the phage passes to the cell of the infected microorganism. The mechanism of action of bacteriophage on the bacterial body:

1. Adsorption - a phage particle enters the body of the bacterium and sticks to the tail part;
2. The phage enters the bacterium by breaking the cell membrane, or directs the DNA from its head into the cell like a syringe without entering;
3. Under the influence of phage DNA, the metabolism of the bacterial cell changes, in which young bacteriophage particles multiply and develop. 4. Finally, as bacteriophage particles multiply, the bacterial body swells, cracks, and dieC. Hundreds and thousands of mature bacteriophages emerge from it.

Phages are found in water, soil and other natural objectC. Some phages are used in disease prevention, diagnosis, and so on.

In addition to viruses, there are infectious agents called viroidC. They contain RNA. Molecular weight 1000000- 130000 D. No protein shell. Pathogenic in plantC. (potato chips, citrus peels, etc.)

3. The role of prokaryotes and eukaryotes in animal pathology.

The role of prokaryotes and eukaryotes in animal pathology is enormouC. Prokaryotes include all bacteria and blue-green algae (cyanobacteria). Eukaryotes include microscopic fungi, microscopic animals (protozoa), and microscopic algae (except blue-green algae).

Pathogenic, conditionally pathogenic bacteria are the causative agents of many infectious diseaseC. Pathogenic cocci (staphylococci, streptococci) cause dumbness in horses, infectious mastitis in cows, diplococcal infection in young animals, purulent processeC. Gram-negative spore-forming bacteria cause very dangerous, acute anthrax, anaerobic bacteria - scurvy, botulism, measles, gas gangrene, bradzot, infectious anaerobic enterotoxemia. They called severe infectious or intoxication processes in animals and humans

Basillas are resistant to adverse environmental conditions and can live for several 10 years to 100 yearC. As a result, they remain a source of infection for a long time. In recent years, foot-and-mouth disease has become more common in livestock farms in Uzbekistan, especially among ungulateC. The occurrence of the disease in pedigree, valuable horses in the sport, which is involved in horse breeding, delays its timely detection, late diagnosis and proper treatment, the animal dies without treatment due to severe poisoning. When the disease occurs sporadically, it causes great economic damage.

The spread of colibacillosis and salmonellosis among young animals causes great economic damage in increasing the number of livestock and in the cultivation of livestock productC. In addition, microorganisms belonging to the group of salmonellosis also affect the quality of meat. People get sick through contaminated meat and meat productC. Poisoning from meat products, toxic infections are caused by bacteria of the salmonellosis group (salmonella dubbin, C. Typhimurium C. Choleraesuis). Of course, such problems are very relevant at a time when it is necessary to provide the population with quality food productC.

Economic studies show that 50-80% of calves born in the country each year are infected with salmonellosis, with an average of 70% dying from them. There is a huge economic damage, including the cost of death, forced slaughter, weight loss, treatment, disinfection, vaccination. The damage from salmonellosis, especially in lambs and piglets, is enormous.

Swine fever - zooanthroponosis is an infectious disease characterized by the presence of septicemia and inflammatory erythema in the acute course, endocorditis and arthritis in the chronic course. Pigs from three months to one year of age , lambs older than three to four weeks are sick. The disease is rare in other specieC. People also get sick socially.

The causative *agent of* swine *fever* is *Erysipelothrix rhusiopathiae,* belonging to the genus *Erysipelothrix* (*erisipelotrix*). Private, auxiliary, pig farming is unsustainable on farms and is causing them economic

damage. This includes the cost of mortality of sick animals (55-80% of deaths), forced slaughter, disease control and prevention measureC.

Mycobacteria are widespread in nature, their pathogenic and saprophytic species occur. Saprophytes live in soil, water bodies, dung, milk, grasC. Pathogens - mainly tuberculosis mycobacteria cause disease in humans and animals . Mycobacteria are also the causative agent of leprosy in humans and the causative agent of paratuberculosis in large horned animals .

Brucellae call brucellosiC. Brucellosis is an infectious, chronic disease. All kinds of domestic and wild animals, people also get sick. It is a sick animal to humans, passing through its productC. At the onset of brucellosis enzooticity is manifested by mass abortion in animals, resulting in rapid separation of the placenta, endometritis, infertility. In most cases it passes without clinical signs.

The migration of Brussels sprouts from one species to another is of great epizootiological and epidemiological significance. For example *Br. melitensis is* found in cattle and pigs , so such animals remain a source of brucellosis in humans (Ye.V. Kozlovskii, 1954-1956 and others). In addition, *Br.suis* cattle and sheep, goats, *Br abortion*, sheep, goats and pigs migration is clear.

Humans can be infected with all types of brucella germs, but sheep and goat brucellae are extremely contagious to humans and the disease is severe.

Pathogenic microscopic fungi cause many dermatomycoseC. Dermatomycoses include mycoses that infect the skin and its tissueC. The pathogen parasitizes tissues that have keratin. The pathogens deuteromycetes enter immature fungi (class *Deuteromycyetes*) and are grouped into three generations - trichophyton, microsporon and aharion. All types of farm animals, fur and wild animals, rodents are affected. People get sick too.

Dermatomycoses are mycotic diseases that not only cause great economic damage to livestock, but also pose a threat to human health. Trichophytia, microsporidia diseases of young animals in particular are common and cause great economic damage, including the cost of death, forced slaughter, weight loss, treatment, disinfection, vaccination.

In general, 20-28% of infectious diseases in farm animals are caused by this type of disease.

Simplified diseases such as trichomoniasis, tryponosomosis, eimeriosis.

The role of prokaryotes and eukaryotes in animal pathology is enormouC. The study of their characteristics is extremely important in the timely, accurate and precise diagnosis of the disease, the study, development and implementation of effective measures to prevent and combat the disease. Of course, in this case, laboratory diagnostics is the basis of the final, conclusive diagnosis.

Control questions

1. Name the main groups of microorganisms found in nature .
2. Give an idea of what the systematics, classification, nomenclature.

3. What does the classification of microorganisms depend on?

4. Explain the basic forms of bacteria.

5. The structure of the bacterium ; capsule, spore, hivchin, fimbriae and their functionC.

6. Describe the morphology and structure of spirochetes, actinomycetes, mycoplasma, rickettsiae.

7. State the classification, morphology, structure of fungi .

8. State viruses, their structure, form, classification.

Physiology of microorganismC.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Informative lecture, co-reading method and BBB table using a graphic organizer
Curriculum	1 . Chemical composition and nutrition of microorganisms. 2. Enzymes of microorganisms. 3. Respiration of microorganisms.
The purpose of the lesson: to give students a clear idea of the physiology of microorganisms.	
Pedagogical tasks: - provide information on the chemical composition of microorganisms; - Clarification of feeding methods of microorganisms; -explain the properties of enzymes of microorganisms; - Description of enzymes by classification; - Distinguish respiratory types of microorganisms.	*Learning Outcomes:* Students: - Describe the chemical composition of microorganisms ; - describe the nutrition of microorganisms; - describe the properties of enzymes: - Describe the classification of enzymes; - Distinguish the types of respiration of microorganisms in terms of their relationship to molecular oxygen.
Teaching methods and techniques	Information lecture, Insert, blitz-questionnaire, presentation, graphic organizer techniques, case solving, BBB
Form of teaching	Frontal speech, individual, group work
Teaching aids	Lecture text, projector, paper, marker, CT / OTV, blackboard, chalk
Learning conditions	Equipped auditorium

Technological map of the lecture

The work lines	Activity content

and time	educator	learners
Phase 1. Training training introduction 10 min.	1.1. Introduces the topic and plan of the training. Introduces the results to be achieved. He announces that the training will be problematic.	1.1. They hear, they record.
Phase 2. Basic (60 minutes)	2.1. Focuses students 'attention on the questions in the plan and the concepts in them. Conducts a blitz survey. 2.2. In order to further clarify the knowledge, he suggests drawing a BBB table in a notebook (Appendix 1). Brings it to the side of the blackboard. 2.3. Asks problematic questions and encourages them to read together: 1. What do you think is the role of water in the chemical composition of microorganisms? 2. From what organogens and their compounds do microorganisms synthesize proteins, carbohydrates, lipids, nucleic acids, enzymes, vitamins, etc.? To answer these questions, we first explain the chemical composition of microorganisms. 2.4. It clarifies in what ways microorganisms are fed. 1. The concept of autotrophic microorganisms? 2.The concept of heterotrophic microorganisms? 3. Enzymes of microorganisms and their classification? 4. How do the respiratory types of microorganisms differ in their relationship to molecular oxygen? 2.5. What do you mean by the physiology of microorganismC. What are the laws of nutrition, respiration, reproduction? raises the question.	2.1. Students answer, notebooks draw the table Columns 1 and 2 fill. 2.2. Focus on the problem and take notes. 2.3. They wrote and with their own knowledge compare. 2.4. Problem own offer solutionC. Discussion they do. They answer. 2.5. Optimal solutions make suggestions. Column 5 of the BBB table they fill
Phase 3. Final (10 minutes)	3.1. Summarizes the topic. 3.2. Active in achieving the planned result encourages participants. 3.3. Provides a task for independent work: preparation for problematic questions.	They hear themselves correct. They write

Basic expressions *. Free, bound water, simple and complex proteins, proteins, lipids, nucleic acid, dry matter, ribonucleic acid, deoxyribonucleic acid,*

polysaccharides, minerals, trace elements, enzymes, biological catalysts, cell metabolism.

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1-ilova.

Among organic substances, protein is the most important vital substance of the cell. In the body of pathogenic microbes, **protein makes up** more than half of the dry matter, while in others it is up to 80%. Antigens, toxins, enzymes are proteins and play an important role in microbial cell life .

2-ilova.

Living things feed on two methods - golozoic and holophyte. Galozoy feeding method is specific to animals (high and simple). In this case, the animal swallows the food and the food is digested in the digestive tract. The method of feeding holophytes is specific to plants and microorganismC. They consume the aqueous solution of nutrients in the form of small molecules with their whole body through the shell at the expense of bilateral osmotic event and diffusion.

3-ilova.

To date, more than 2,000 enzymes have been identified. According to the classification developed in 1961 by the Special Commission of the United International Biochemists , all enzymes are divided into six classeC.

Question 1. Chemical composition and nutrition of microorganisms.

Chemical composition of microorganismC. Water is one of the key components on which microbial cell life activities depend. Its content averages 75-85% and is in a cohesive and free state. In the cell spore, water is accumulated, and in its vegetative form it is in a free state. As part of the cytoplasm , water is bound to proteins, carbohydrates, fat molecules and other compoundC. Therefore, it cannot be a solvent. Free water serves as a solvent for crystalline substances, a medium that drives ions and electric chargeC. Physiological and biochemical processes take place in the cell in the presence of water.

15-25% of microbes are dry matter: 8-15% nitrogen, 45-55% carbon, 25-30% oxygen, 6-8% hydrogen, 2-15% minerals (macronutrients - sulfur,

phosphorus, potassium, calcium, magnesium, iron, sicily, chlorine and trace elements - manganese, molybdenum, zinc, copper, cobalt, nickel, vanadium, chalk). From these organogens and their compounds, microorganisms synthesize proteins, carbohydrates, lipids, nucleic acids, enzymes, vitamins and so on.

Among organic substances, protein is the most important vital substance of the cell. In the body of pathogenic microbes, **protein makes up** more than half of the dry matter, while in others it is up to 80%. Antigens, toxins, enzymes are proteins and play an important role in microbial cell life . Simple proteins are proteins, complexes are proteinC. Proteins form amino acids as a result of hydrolysiC. According to AMKuzin, pathogenic microbes contain 9 amino acids in the protein: lysine, argenin, histidine, proline, tryptophan, tyrosine, valine, phenylalanine and leucine.

Other microbes contain 15 to 20 amino acidC. **Proteidlar** - simple proteins (proteins) and protein groups that are not complex. Proteins combine with nucleic acid to form - nucleoproteins, with polysaccharides - glycoproteins, with fatty substances - lipoproteinC. Nucleoproteins form the main part of the microbial protein and are actively involved in cell proliferation, the transmission of genetic markerC.

The role of nucleic acids in the life of a microbial cell is enormouC. The two nucleic acids are known ribonucleic acid - RNA, deoxyribonucleic acid - DNA. DNA is in the cell nucleus and RNA is in the cytoplasm. Three different types of RNA are distinguished: ribosomal, informational, and transport. In viruses, there is only one nucleic acid, RNA or DNA.

Carbohydrates are represented by polysaccharides in the microbial cell. In the cytoplasm, carbohydrates are present in the form of starch and glycogen granuleC. They mainly serve as energy material and make up about 12 to 18% of the microbial cell. Capsule microbes such as nitrogen bacteria, anthrax, etc. are rich in carbohydrates.

Each microorganism contains a specific polysaccharide that allows the microbe to differentiate. The pathogenic microbial capsule, which is composed of carbohydrates, increases their virulence and performs a protective function.

Lipids . Their amount ranges from 3.8 to 40%. Lipids support the specific structure of the cytoplasm and are part of the cytoplasmic membrane. Lipids are not evenly distributed in the microbial cell. It is more common in the surface layer of the cytoplasm and in the cell membrane . Lipids and lipoids increase the resistance of microbes to acids and other substanceC. Although tuberculosis, the causative agent of swine fever, does not have spores and capsules, with the help of lipids they can be stored for a long time in adverse environmental conditionC.

Nutrition of microorganismC. Living things feed on two methods - golozoic and holophyte. Galozoy feeding method is specific to animals (high and simple). In this case, the animal swallows the food and the food is digested in the digestive tract. The method of feeding holophytes is specific to plants and microorganismC. They consume the aqueous solution of nutrients in the form of

small molecules with their whole body through the shell at the expense of bilateral osmotic event and diffusion.

Metabolism - assimilation (anabolism) and dissimilation (catabolism) occur.

Microbes thus obtain the energy sources and substances needed to biosynthesize the components (parts) of their cells from the external environment.

The mechanism of this phenomenon is based on the difference in osmotic pressure of soluble substances in the cell and in the external environment. The concentration of solutes is high in the cell and less in the surrounding environment. The shell of the cell is a semiconductor that carries water and dissolved substances in it. Complex colloidal substances must be broken down by microbial enzymes before they can enter the cell. Protein substances synthesized in the cell body are used as plastic (building) material. The need for nutrients in different groups of microorganisms is not the same.

According to the type of nutrition, all organisms are divided into two main groups, autotrophs and heterotrophC. According to the energy source of electrons, they are divided into chemolithotrophs, chemoorganotrophs and photorganotrophC.

Autotrophic microorganisms (chemolithotrophs, photolithotrophs) derive carbon from atmospheric carbon dioxide - i.e. , a source of CO_2 carbon, inorganic salts (ammonia salts, nitric acids), and water. It uses energy generated during the oxidation (chemosynthesis) of some mineral compounds or solar energy (photosynthesis).

In chemolithotrophs, the energy generated during the oxidation reaction in the event of chemosynthesis is used by bacteria to assimilate carbon and form organic matter . Photolithotrophs (blue-green algae, purpura sulfur bacteria, microbes, etc.) have the property of photosynthesis because they contain pigmentC. These pigments are close in composition to plant chlorophyllC. Photobacteria, like plants, take carbon from carbon dioxide and solar energy to form organic matter. Autotrophic type feeding is mainly found in saprophytes because they are unable to assimilate complex compounds . Therefore, they are not pathogenic and aggressive to animals .

Heterotrophs (chemoorganotrophs) - get carbon for nutrition from ready-made complex organic compounds (nitrogen compounds - protein, ammonia, some minerals - macro and microelements, vitamins). These include saprophytes and parasitic microorganismC. Metatrophs (saprophytes) feed on dead tissues of animals and plants (putrefactive bacteria, yeasts).

Paratrophs (parasites) feed and live as parasites (pathogens) at the expense of organic compounds present in the body of living organisms, ie humans, animals and plants.

Photorganotrophs (sulfur-free sulfur bacteria) are facultative anaerobes that thrive in both light and dark. They get the energy they need not only from the sun, but also from the oxidation of organic matter .

Heterotrophic microorganisms are enzymatically active, producing protein-like catalysts - enzymes that accelerate biochemical reactions, and under their influence break down organic matter necessary for nutrition.

Microorganisms are divided into the following groups according to the assimilation of nitrogenous substances: 1) proteolytics - they break down protein peptides, amino acids and assimilate nitrogen; 2) deaminizers - break down amino acids; 3) nitrite - microbes that feed on nitrate salts; 4) nitrogen-fixing bacteria that feed on free nitrogen in the atmosphere.

Sources of carbon for microbes are often sugar, alcohol, organic acids, peptone, amino acids and ammonium salts as a source of nitrogen.

The need of microbes for minerals is not great, but without them microbes cannot live.

Question 2. Enzymes of microorganisms

Enzymes of microorganisms are synthesized by microbial cells and have a complex structure. Microbial enzymes are divided into endo and exoenzymeC. Enzymes involved in metabolism are present in the body's cells and are called endo enzymeC. The cell of a microorganism releases some enzymes into the external environment, which are called exoenzymeC. Exoenzymes convert nutrients into simple compounds that pass through the microbial cell shell and serve as a plastic material . Enzymes are named by adding the suffix "mourning" to the names of the substances they affect. For example, the enzyme that affects starch - amylase, fats - lipase, proteins - proteinase.

Properties of enzymeC. All the processes that take place in the microbial cell depend on the activity of enzymeC. Enzymes are soluble in water, salts, acids, alkaliC. They have a large molecular weight and an electric charge. Enzymes are a protein complex. It is in the form of crystalC. There are two groups of enzymes: simple and complex. The first is called a one-component - protein carrier, ie the apoenzyme, and the second is called a non-protein active group - coenzyme. They do not have enzymatic properties on their own, they only have enzymatic properties when combined. One of the characteristic features of enzymes is their special effect. They are exposed to specific chemicals or compounds close to it. For example, lactase breaks down milk sugar - lactose, urease - hydrolyzes urea, catalase breaks down hydrogen peroxide, etc. The catalytic activity of enzymes is very strong. 1 g of amylase converts 1 t of starch into sugar, 1 g of chymosin dissolves 12 t of milk, 1 g of pepsin breaks down 50 kg of coagulated ink, etc. Enzymes are thermolabile. The optimum temperature of their action is 30-50 ° C, and that of enzymes derived from animals is 37-40 ° C. Enzymes act at a certain environment - pH. For example, pepsin in an acidic environment (pH - 1.5-2.5), trypsin - in a weakly alkaline (pH-7.8-8.7) catalase and urease in a neutral environment (pH-7). Enzymes do not change at the end of the reaction, they are not part of the reaction product. They are not poisonouC.

This is often important in sectors of the economy.

To date, more than 2,000 enzymes have been identified. According to the classification developed by the Special International Commission of Biochemists in 1961, all enzymes are divided into six classes:

1) oxidoreductases - enzymes that carry hydrogen and oxygen, respiration, digestion (oxidation - reduction);

2) Transferases are carrier enzymeC. They transport individual groups, radicals and atoms between molecules and within them.

3) hydrolases - accelerate the hydrolysis reaction. Enzymes that combine or break down water particles in proteins, fats, and carbohydrates ;

4) lyases - enzymes that bind or separate various binary compounds without the presence of water;

5) isomerases - enzymes which carry out conversion of organic compounds into their isomers;

6) lipases - enzymes.

The enzymatic activity of bacteria and fungi is widely used in industry in the manufacture of vinegar, milk, oats, citric acid, dairy products (cheese, acidophilus, koumiss), wine, brewing and other sectors of the economy. From the final products of decomposition (acid, alkali, CO_2 carbon dioxide, hydrogen sulfide formation) it is possible to know that the microbes belong to a certain group. Some ferment carbohydrates to form acids and gases, while others ferment proteins to form indole, ammonia, hydrogen sulfide, and so on.

Knowledge of the enzymatic processes of microorganisms allows to determine their type, and therefore helps to diagnose the disease in a timely manner.

Question 3. Respiration of microorganisms.

Respiration of microorganismC. The metabolic processes that take place in a microbial cell require a certain amount of energy. During biochemical processes , the energy required for microbial cells is released and is called their respiration. Microorganisms differ in their relationship to molecular oxygen: 1) aerobic microbes - they assimilate oxygen in the atmosphere, biologically oxidize organic and inorganic substances and release a certain amount of energy; 2) anaerobic microbes - by decomposing organic compounds without oxygen and nitrogen. In this process, the enzymes that break down sugars act on hydrocarbons to produce oxygen and energy. Facultative anaerobic - breathing takes a mixed round. Microaerophiles (bovine brucellosis, leptospirosis) - require a small amount of molecular oxygen (about 1%) in the first stage of reproduction. Obligatory aerobic microbes (anthrax, tuberculosis rods) develop only under anaerobic conditions when only molecular oxygen is sufficient. Respiratory processes of microorganisms are sequential oxidation-reduction reactions involving enzymes by transferring electrons from a system of negative potential to a system of positive potential . In some cases, microbes are unable to absorb all the heat energy generated during respiration. Energy is released into the external environment - an exothermic reaction occurC. During the

exothermic reaction, the temperature rises to 60-70 ° C and the environment is biologically disinfected.

Toxins of microorganismC. Many pathogenic microbes - toxins - produce toxins . Toxins are broken down into exotoxins that microbes produce in the external environment and endotoxins that bind to the microbial cell body . Exotoxins can be separated by filtering broth cultures of toxin-producing microbeC. The toxigenic properties of botulism, tetanus, diphtheria pathogens are strongly developed. Endotoxins are released (physically, chemically, biologically) only after the microbial cell has broken down.

Microbial exotoxins are proteinaceous in nature, are active antigens, and the body produces antibodies to them. Antitoxic serums have an anti-toxin effect, not on the microbial cell .

Some bacteria and fungi form **pigments** - **pigments** . In this case, the colonies formed by microbes in a dense nutrient medium are of different colors - red, blue, white, golden, green, black, etc.

There are also microbes that **radiate in** nature . They are called photobacteria and produce radiation from wood, fish coins, meat, seawater and so on. Some bacteria produce **fragrant substances** - they make wine, dairy products, hay, etc. fragrant.

An increase in the number of microorganisms is an increase in the number of microbial cells as they multiply (divide) spontaneously. (Division) of bacteria through sexual kopulyasiya increase.

It goes through several stages in the growth of microbial cultures in the nutrient medium. Some authors categorize them into 8 stages, others into 4 stages.

1. The initial phase (lag-phase). At this stage, the culture adapts to the nutrient environment.

2. Exponential (logarithmic) phase - the maximum number of cells in the culture. There will be geometric multiplication (1,2,4,8,16,256, etc.) At the end of the phase, the growth of the culture slows down.

3. Stationary phase - the mature period. The amount of newly formed and dead cells is equal.

4. The death phase - in which cells not only shrink, but also change. Spores are formed. Knowledge of the laws of microbial cell proliferation is of great practical importance in the cultivation and storage of cultures in nutrient media.

Control questions:

1. What is included in the physiology of microorganisms?
2. What is the chemical composition of microorganisms?
3. Name the methods of nutrition of microorganisms.

4. What do you mean by respiration of microorganisms?

Distribution of microorganisms in nature

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Visual presentation, two-way analysis.
Curriculum	1. Soil microflora. 2. Water microflora. 3. Air microflora.
The purpose of the training: the distribution of microorganisms in nature - the ecology of the entire ecological system of the earth's biosphere (soil, water, air, etc.) and the specific microflora of each ecosystem. explanation	
Pedagogical tasks: - Explains the conditions for the life and activity of microbes in the soil, the fact that the number and quality of microbes in different layers vary, the special role of pathogenic microbes as a source of infection; - gives an idea of its own microbes that live in water, adapted to its conditions, and microbes that come from outside. - Explains the environment in which air transmits pathogenic microbes, in which microbes spread by airborne droplets or airborne dust, the emergence of general diseases.	*Learning Outcomes:* Students: - describes the soil microflora and explains the importance of its study; - Explains the aquatic microflora into three zones, depending on the microcenosis ; - The composition of the air microflora. Explains ways to learn it; - tells what sanitary indicators should be checked in the study of soil, water, air microflora.
Teaching methods and techniques	Lecture, story, information

Teaching aids	Group, collective
Form of teaching	Lecture text, projector, O'TV / KT graphic organzaer, blackboard, chalk
Learning conditions	Equipped auditorium

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (10 minutes)	1.1. The topic and plan of the lecture will be announced. Links to the previous topic through questions and answers.	1.1. They hear, write, answer they give.
Phase 2. Basic (60 minutes)	2.1. Offers problematic questions to cover the topic. 2.2. Questions will be distributed at the beginning and end of the lesson to complete the “I knew-know” table. 2.3. Soil microflora illuminates its composition. 2.4. Illuminates water microflora, coli titers, coli indiceC. its contents. 2.5. The air microflora highlights its role in the spread of infectious diseases. 2.6. BBB suggests filling in column 2 of the table.	2.1. Problematic attention to questions of the "I knew I knew" table 1st column fill. 2.2. They hear, they write. 2.3.BBB table Fills column 2
Phase 3. Final (10 minutes)	3.1. Draws conclusions on the topic. Focuses on the main issue. Analyzes the questions and answers in filling out the BBB chart and evaluates active students. 3.2. Gives assignments for independent work: "Microflora in animals." preparing for problematic questions.	3.1. They hear, asks questions and writes down. 3.2. assignments they write.

Basic expressionC. *ecological system, quantity and quality of soil microflora, coli-titer, coli-index, polysoprob, mesasoprob, oligasoprob zones, water sourceC.*

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1-ilova.

Microorganisms are widespread in nature, in which they take an active part in the metabolism , which occurs continuously. Microorganisms can be found in all ecological systems of the earth's biosphere (soil, water, air, etc.)

2-ilova.

Microbiological examination of soil is of great sanitary importance. For bacteriological examination, soil is taken from a depth of 1-2 cm, and the degree of microbial contamination is determined by the number of microbes in 1 g of soil. The titer of Escherichia coli and the number of pathogenic microbes in the soil are also determined. Scientists such as SNVinogradsky, VL Omelyansky, NGKholodniy developed methods for testing soil microbes and applied them in agriculture.

3-ilova.

Diseases transmitted by water become widespread. To determine the sanitary condition of water, the number of microbes in it, Coli-titre, Coli-indices are determined.

4-ilova

Air is an environment that transmits and spreads pathogenic microbeC. In it, germs spread by air-drop or air-dust method. Influenza, tuberculosis, smallpox, anthrax, spores of mold fungi, etc. are spread through the air. In the drop method, the protein, e.g. peripneumonia, harmful catarrh of the upper respiratory tract, plague pathogens, etc.

Question 1. Soil microflora

Soil microflora. Microbes are abundant in the soil within all objects in the external environment. Microbes spread from soil to water and air. The soil has the most favorable conditions for the life and activity of microbes, such as organic and mineral substances, sufficient moisture, protection from sunlight. In different layers of soil microbes are not evenly distributed. In the top layer, germs are rare because there the germs dry out and die quickly under the influence of sunlight. In the layer of soil 10-20 cm deep, microbes are most abundant. As the soil deepens,

the behavior of the microbes changes and their total number decreases, and at a depth of 4-5 m, the soil can become almost sterile. But microbes can also be in much deeper layerC.

Soil microflora also varies in quantity and quality depending on soil composition, lighting conditions, humidity level, seasons, climatic conditions and other factorC. For example, in rocky, sandy soils, germs are rare. Abundant in plowed, fertilized soilC. There can be several million or even billions of bacteria in the soil. 1 billion graves of soil were found to contain 19 billion bacteria. Spore aerobes, spore anaerobes, thermophilic bacteria, pigment generators, cocci are common in the soil . Soil nitrification, denitrification, nitrogen accumulation, sulfur bacteria, fiber breaker; there will be mold fungi, yeasts, simple animalC.

Pathogenic microbes are also found in the soil. They fall to the ground with animal carcasses, its various separations, contaminated runoff, and various wasteC. Some pathogenic microbes (anthrax, tetanus pathogens) grow in the soil. Bacteria live at different distances in the soil depending on the conditionC. For example, tuberculosis for 5 months to 2 years, brucellosis for up to 100 days, swine fever for up to 5 days, etc. They live for many years and the soil contaminated with them is a source of disease and is very dangerouC. Microbiological examination of soil is of great sanitary importance. For bacteriological examination, soil is taken from a depth of 1-2 cm, and the degree of microbial contamination is determined by the number of microbes in 1 g of soil. The titer of Escherichia coli and the number of pathogenic microbes in the soil are also determined. Scientists such as SNVinogradsky, VL Omelyansky, NGKholodniy developed methods of testing soil microbes and applied them in agriculture.

Question 2. Water microflora

Water microflora. Because water contains the conditions for microorganisms to live and multiply, it will always contain microbeC. The microflora of rivers, lakes, seas, oceans and other water sources varies depending on the conditionC. They are more common near the shore , more on the surface, farther from the shore, and less in depth . The presence of microbes in water depends on many factors: the amount of organic matter in it, the location and level of contamination of the water basin, the speed of water flow, the ambient temperature and the season, and so on.

It has its own microbes that live in water, adapted to its conditions, and there are microbes that come from outside. Depending on the presence of microcenosis in water, it is divided into three zones.

1. Polysaprobic zone - water is highly polluted, low in oxygen, rich in organic compoundC. 1 ml of such water contains up to several million microbeC. More *YE. - coli* and anaerobic bacteria that cause putrefaction and fermentation.

2. Mesosaprobic zone - microboscenosis develops in an environment with less organic matter. It undergoes strong mineralization, as well as oxidation and

nitrification processeC. The amount of Escherichia coli is reduced, the total amount of microbes is up to 100 thousand in 1 ml of water. It is a moderately polluted zone.

3. Oligasaprob zone - is characterized by clean water. Its microcenosis is not so great: in 1ml of water there are tens, hundreds of microbial cells, there is no intestinal rod.

The microbiocenosis includes various algae, simple animals, fungi, phages and other microorganismC. There is a complex relationship between them. Algae - the chlorella of bacteria - are intestinal rod antagonistC. One infusoria swallows 30,000 microbial cells in 1 hour. Pathogenic microbes die faster in dirty water and slower in clean water. Because dirty water contains antagonistic microbes, phages and other inconvenient factorC.

According to their origin, waters are divided into three:

1. Atmospheric water (rain, snow);
2. Surface waters (river, lake, sea);
3. Groundwater (wells, artesian, groundwater).

Atmospheric water (rain, snow) contains very few microbeC. A raindrop, a piece of snow, picks up germs in the air before it falls to the ground. In 1ml of such rainwater there are several to 300-400 microbeC. The microflora of rivers, lakes, seas and other water sources varies according to conditionC. Before the river reaches the cities and villages, it has less microflora, and after it flows, it multiplies, because there are a lot of microbes in the water, along with various wasteC. The addition of a new stream of water to the river, the reduction of nutrients in the water due to the mineralization of organic compounds, the sinking of water-insoluble organic compounds with microorganisms, the effects of sunlight, the loss of antagonistic microbes, the mechanical effects of water movement and the extinction of ordinary animals causes the river water to be cleaned of microbeC. In addition, various hairy worms, mollusks, shrimp feed on microbes.

There are different amounts of different microorganisms **in tap water** . If water comes to it from an open body of water, then there will be a lot of microorganisms, such water is cooled, filtered, chlorinated.

The microflora of the **lakes is** also different. After the rain, the germs multiply a lot, and the weather is a bit less on open dayC. Near the shore of the lake, the microbe is abundant, with little in the middle. At a depth of 5-20 cm there is a lot of microbes relative to the water surface .

Seawater contains fewer microbes than river and lake water. In addition to microbes that are adapted to live in salt water in the sea, there are also microbes that live in a normal saline environment. Actinomycetes, spores, spore-free bacteria, less cocci, molds, and yeasts are found in seawater.

In terms of sanitation, distilled water, artesian well water, spring and atmospheric water contain very few microbeC. In distilled water, the microbe comes from air or a contaminated container. There are about 10 microbes in 1 ml

of artesian water, which can get mixed up as water passes through the pipes . The lack of microbes in the spring water and its proliferation is due to the fall of various wastes in the water collected around the spring.

The microflora of **well** water is highly variable and the amount depends on where the well is drilled, the structure of the well and the method of its use. Well water contains fewer microbes than surface water because the water is filtered out of the earth's crust. If there is a barn or a toilet near the well, there will be a lot of different microbes in its water. If pathogenic microbes - pathogens - enter the well water, such a well becomes a source of disease. Diseases transmitted by water become widespread. It is important to know the number of microbes to determine the sanitary condition of the water.

The number of **microbes is the number** of colonies in which 1 ml of water is inoculated into meat peptone agar in Petri dishes (GPA) for 24 hours at a temperature of 37 ^{0}C. The total number of microbes in 1 ml of tap water should not exceed 100. If 100-150, the water is suspicious, if 500 and more, it is polluted. Open water basins should not exceed 1000 per 1 ml of well water.

The results of the detection of Escherichia coli in water are expressed in coli-titers, coli-indices **.**

Coli-titer - the presence of even a single intestinal rod in the least amount of water (ml);

Coli-index is the amount of intestinal rod in 1 liter of water.

To convert a coli-titer to a coli-index, you need to divide 1000 by the coli-titer index. 1000: 500 = 2; to convert a coli-index to a coli-titer, divide 1000 by the coli-index index. The coli-titer of tap water should not be less than 500, coli-index should not be more than 2, coli-titer for well water and open sources should not be less than 111, coli-index should not exceed 9.

Question 3. Air microflora.

People have long noticed the presence of microorganisms in the air. L. Pasteur was the first to prove the existence of microbes in the atmosphere. The amount and types of microbes in the air vary. The conditions for the survival and growth of microorganisms in the air are unfavorable. Therefore, most microbes live less in the air. Only yeasts, fungi, spores and pigmented microorganisms live long in the air because they are resistant to drought and exposure to ultraviolet light. Microorganisms pass into the air mainly through dust. Germs found in humans, animals and plants also pass into the air. This happens, for example, when a person sneezes, coughs or spitC. Some microbes pass into the air from the animal's saliva, manure, and some microbes pass into the air through water droplets.

Pathogenic microbes pass from human and animal waste, dead and various wastes into the soil, dry up and rise into the air with dust, playing an important role in the spread of various infectious diseases.

When a person or animal sneezes, about 4,500-150,000 bacteria are released into the air.

Pathogenic microbes in the air of residence include tuberculosis, anthrax and spores, pneumococcus, gas gangrene, streptococcus, staphylococcus and others.

Air is an environment that transmits and spreads pathogenic microbeC. In it, germs spread by air-drop or air-dust method. Influenza, tuberculosis, smallpox, anthrax, spores of mold fungi, etc. are spread through the air. In the drop method, the protein, e.g. peripneumonia, harmful catarrh of the upper respiratory tract, plague pathogens, etc.

The vast majority of pathogenic microbes are found in indoor air, in poorly ventilated, dark, animal-dense indoor air. The amount of microbes in different parts of the cattle air varieC. The middle part of the building is very much in the air, a little on the sides of the wall, very little in the air in front of the door because fresh air enterC. Microbes in the air of the barn multiply when the cattle are given rough hay, their bodies are cleaned, and the building is cleaned. In the air of large industrial cities, microbes are abundant, while in rural air they are few; microbes are somewhat rare in the air of forests, gardens, pastures, especially in the air of rivers, oceans and snowy mountain peakC.

According to Voytkevich, the number of microbes in 1 m $^{3\,of}$ air is as follows: 1-2 million in the yard where pets live, up to 20 thousand in the living room, up to 5 thousand on the city street, 1-2 in the sea air, 1 in the North Pole air pieces or not. Compared to the lower layer of air, microbes are less common in the upper layer. After rain and snow, the number of microbes in the air is significantly reduced. There are fewer germs in the winter than in the summer.

Various methods are used to determine the total amount and types of microbes in the air. Cox method and others.

Control questions:

1. Tell us about the soil microflora and its microbiological examination?
2. What are the methods of determining the water microflora and its sanitary status?

The role of microorganisms in metabolism in nature	
Lecture teaching technology	
Time: 2 hours	*Number of students: 100 people*
Form of training	Lecture - conference.
Curriculum	1. The role of microorganisms in the nitrogen cycle 2. The role of microorganisms in the carbon cycle 3. The role of microorganisms in the metabolism of sulfur, phosphorus, iron
Course Objectives: To provide students with a deeper understanding of the prevalence of microorganisms in nature , their active participation in the metabolism, their role in the metabolism of nitrogen, carbon, sulfur, phosphorus, iron.	
Pedagogical tasks: - Substantiate the need to know that the metabolism, which occurs continuously in nature, maintains the permanence of nature, with the active participation of microorganisms ; - To describe the role of microorganisms in the nitrogen cycle, the transition of organic nitrogen to mineral nitrogen, the conversion of mineral nitrogen to organic nitrogen in several stages and give examples; - to provide information on the fact that the carbon cycle in nature occurs as a result of fermentation of nitrogen-free organic compounds; - Explain the role of microorganisms in the metabolism of sulfur, phosphorus, iron.	*Learning Outcomes:* Students: - explain that as a result of changes in organic and inorganic substances in nature, their forms also change; - illuminate the stages of the nitrogen cycle; - explain the types and processes of fermentation that occur in the carbon cycle; - Explain the role of microorganisms involved in the metabolism of sulfur, phosphorus, iron. - Explain the characteristics of individual and historical development of muscles.
Teaching methods and techniques	Lecture - conference, problem speech, brainstorming, discussion, presentation
Teaching aids	Lecture text, projector, graphic organizers - O'TV / KT
Form of teaching	Frontal, individual, group work,
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (10 minutes)	1.1. The topic announces its purpose and the intended outcomes of the training session. The session will be held in the form of a conference-discussion: 1) suggests the topics of the report, which will be addressed in this session. 2) explains their importance in mastering the subject, as well as their importance in acquiring a future specialty. 3) directs literature, magazines to prepare the report. 4) All students are asked to prepare a question for the speakers on the text of the lecture. 5) introduces evaluation criteria. 6) introduces the prepared abstracts. Asks questions if necessary.	1.1. They prepare for the lecture. Speakers presentation preparations and abstracts plan for possible. Get acquainted with the evaluation criteria. To report prepare.
Phase 2. Basic (60 minutes)	2.1. Organizes presentations on reports and information: - pays attention to logic in the coverage of the topic; - When it is necessary to discuss the narrated material, stop the speaker and allow a collective discussion. 2.2. Organizes a collective discussion of the report. Along with the starter: -asks questions; -determines the basic instructions; -reports to the report, asks to pay attention to the statistical material.	2.1. Participants read reports or explain orally. 2.2. Participants collectively discuss the lesson. 2.3. Experts each discussion on the topic evaluates the results. 2.4. The best report is recommended to the conference as an incentive are given.
Phase 3. Final (10 minutes)	3.1. Summarizes the activities of all participants and concludes the session. 3.2. The report evaluates the activity of the speaker, reviewer and opponents at the conference. 3.3. Emphasizes the importance of acquired knowledge and research skills in future activities. 3.5. Provides a task for independent work: preparation for problematic questions.	3.1. Experts: 1) speaker reviewer, opponents readiness defines; 2) evaluation results announces. 3.2.Hearing, accuracy they enter, they write. They get the assignment.

Basic terms: *organic nitrogen, decomposition, putrefactive enzymes, urobacteria, urea, nitrogen-fixing bacteria, nitrification, denitrification, fermentation processes, phosphorus, sulfur, iron bacteria.*

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Question 1. The role of microorganisms in the nitrogen cycle

Microorganisms are widespread in nature, in which they take an active part in the metabolism , which occurs continuously.

As a result of changes in organic and inorganic substances in nature, their forms also change. The state that is not quantitatively complete and does not arise again is called the exchange of matter and energy.

In nature, the change of matter occurs continuously. All plants take in carbon dioxide from the air, break it down, and release oxygen into the external environment, where they form organic matter from mineralC. Animals, on the other hand, get the organic matter they need from plants and excrete it in their urine and feceC. Also, large amounts of organic matter fall into the soil with plant debris, animal carcasseC. But these organic substances are unsuitable for plant nutrition. Only as a result of the vital activity of microorganisms do organic substances gradually decompose into simple compounds that plants can assimilate. From them new organic substances are synthesized in plantC. This means that microorganisms are actively involved in metabolism, they break down various complex organic substances using their enzymes, synthesizing new compounds that are essential for the formation of plant and animal protein.

Nitrogen cycle . There is 75.5% nitrogen in the atmosphere and the remaining 24.5% is in the form of organic and mineral compounds in water and soil. The protein content is 16-18%, the soil contains about 6-18 tons of accumulated nitrogen, but animals and plants can not use nitrogen in the air. Nitrogen in free and accumulated air must first be converted by microorganisms into a form that can be consumed by plants and animalC. The conversion of organic nitrogen to mineral nitrogen and mineral nitrogen to organic nitrogen takes place in several stages.

Decomposition of proteins is carried out by putrefactive microbeC. They break down the protein into a compound of intermediates (albumin, peptone, amide, amino acids), foul-smelling substances (indole, scotol, hydrogen sulfide, volatile fatty acids) and ammonia. This is called **ammonification** , and the stimuli are called **ammonifiers** . This process is important in cleaning up

nature. *Rotational* microbes include *Cl.sporogenes, cl.septicum, cl.purtificus, p.vulgaris, b.subtilis,* fungi, and the like. They produce a proteolytic enzyme.

Urea accumulates in the animal's body as a result of protein metabolism and is excreted in the urine. Urobacteria break down urea under the influence of the enzyme urease - water, carbon dioxide and ammonia. Ammonia is absorbed by plantC.

The second stage of microorganisms in the nitrogen cycle after ammonification is nitrification.

During nitrification , nitrifying microbes oxidize ammonia and ammonium salts to nitrites ($2NH_3 + 3O_2 = 2HNO_2 + 158$ cal) and nitric acids ($2HNO_2 + O_2 = 2HNO_3 + 48$). The resulting nitric acid combines with alkalis in the soil to form nitrate. Saltpeter is well soluble in water and is absorbed by plantC. As a result of this process, the soil is enriched with nitrogen and its fertility increaseC. *Nitrifying* microbes include *Nitrosomonas, Nitrosocystis, Nitrospira* .

Denitrification is the opposite of nitrification. At the same time, under the influence of denitrifying microorganisms, nitric acid salts are returned to the molecular nitrogen and blown into the air, resulting in a decrease in soil fertility. To prevent it, the soil should be plowed frequently. One of the denitrifying bacteria in nature is *Tiolacillus denitrificans, PC. Aeruginosa, PC. Fluorescens, Ps.stutzeri*, etc. are common.

Nitrogen- fixing **bacteria** fix molecular nitrogen in the atmosphere to form compounds that are suitable for plantC. Nitrogen- fixing bacteria include azotobacter, clostridium, and endogenous bacteria.

Question 2. The role of microorganisms in the carbon cycle

Carbon cycle . Carbon is present in atmospheric air in the form of carbon dioxide 0.03%. Carbon dioxide is absorbed by plants and undergoes complex changes, resulting in the release of oxygen into the air. In nature, the carbon cycle occurs as a result of the fermentation of nitrogen-free organic compoundC. As a result of fermentation, carbon dioxide, water and intermediate compounds - alcohols, acids (lactic, acetic, fatty acids) are formed. The resulting carbon dioxide is released into the atmosphere, and plants absorb it and produce oxygen. Thus carbon is exchanged in nature.

The fermentation process is formed under the influence of enzymes of a number of microorganismC. There are several types of baking.

Alcohol brewing. It is widely used in all areas of human activity - brewing, winemaking, baking, alcohol production, etc. In this case, under the action of the enzyme zimase of yeast, glucose is broken down into ethyl alcohol and carbon dioxide. It includes beer, bread, wine, kefir yeast.

Ethyl alcohol (C_2H_5OH) or ethanol from various raw materials:

a) sugary (sugar beet, molasses, sugar cane, fruit juices),

b) starchy (potatoes, corn, barley, oats, millet, wheat, etc.),

c) cellulose (wood, agricultural residues).

This is due to the yeast fungus *Sacchoromyces* . In 1897, Buxner proved that the yeast fungus produces the enzyme zimaza, and under its influence, glucose is broken down into ethyl alcohol and carbon dioxide.

$C_6H_{12}O_6$---- $2C_2H_5OH + 2CO_2$ +117.3 kDj

Cultural yeasts are used in industrial production. Depending on the structure of the yeast mass, they become powdery or granular. Powdered yeasts are used in the preparation of alcohol, granules in the production of wine, beer. Yeasts thrive well in acidic environments (pH 4-6), resistant to 15-17% alcohol solution. Depending on the conditions under which the process takes place (aerobic or anaerobic), the top - *Sacch. cerevsiae* and lower - *Sacch. The* yeast of *vini* fermentation is different. The upper brewer's yeast is used in winemaking and baking, the lower in brewing.

In acetic acid fermentation . Due to the activity of special acetic acid-forming bacteria, ethyl alcohol is oxidized to acetic aldehyde, which in turn becomes acetic acid. Acetic acid bacteria - *Acetobacter - ferment* grape wine and beer. In industry, vinegar is obtained from weak wine or alcohol (French and German methods).

$CH_3CH_2OH + O_2$----- $CH_3HOOH + H_2O$ + 494.4 kj

Ethyl alcohol acetic acid

If a muesli with up to 14% alcohol is placed in a warmer place in an open container with a beer mouth, the alcohol in it will oxidize to form acetic aldehyde and then acetic acid. Pasteur discovered the presence of bacteria in 1868, and 10 years later his pathogen, *Mycoderma aceti* culture , was *isolated by* Ganzen. Acetic acid bacteria are short, gram-negative, chain-shaped rodC. Does not form spores, motile and inactive strains occur. Because they are serious aerobes, they grow to form a membrane on the surface of the environment. All species of vinegar bacteria (25) belong to the genus *Acetobacter* .

Acetobacter aceti is a short, gram-negative, motionless, sporeless stick. in the form of a chain, can grow at a temperature of 34^0C, in an environment containing 11% alcohol. Creates a stain on the surface of the beer. Dyed yellow with iodine.

The form of *Acetobacter pasteurianum* is similar to *Acetobacter aceti* . Forms a dry layered film on the surface of the medium. It turns blue under the influence of iodine. *Acetobacter orleanense grows in* weak solutions of grape wine and forms a very ripe film. Resistant to up to 12% alcohol, produces up to 9.5% vinegar. Used in the slow extraction of vinegar from grape wine. *Acetobacter schuetzenbachii is used in the* German method for the rapid extraction of vinegar from alcohol. Bacteria form a complete membrane on the surface of the medium, forming 11.5% acetic acid during development. A 10-12% solution of ethyl alcohol is used to prepare acetic acid. The difference between acetic acid-producing bacteria and other microbes is that they do not completely oxidize nutrients until organic acid is formed. In this process, ethyl alcohol is oxidized by acetic acid-forming bacteria first to acetic aldehyde and then to acetic acid. This is

the basis of technical production of vinegar. In industry, vinegar is prepared in two wayC.

1. French or Orleans method. In this method, vinegar is made from weak wineC.

Bacteria *Acetobacter orleanense* type. This slow method of obtaining vinegar is one of the oldest methods, which allows you to get a high quality product. The process is carried out in flat or horizontal vesselC. At the end of the process, 10% of the liquid is removed from the container and replaced with the same amount of wine, and so on

2. German method . In this case, vinegar is quickly prepared from alcohol. *Acetobacter schuetzenbachii* bacteria type is used. Up to 11.5% of vinegar accumulates in the environment. Diluted alcohol is used in the preparation of vinegar by this method, and the bark of the beech tree is fermented in filled cylindrical or conical barrels, as this bacterium grows well in the bark of the beech tree. In both cases there is a need for air to enter the bloodstream .

In modern plants, acetic acid bacteria are grown in closed devices (fermenters). Aerobic conditions are created by stirring the medium and sending sterile air. This method prevents the culture from being damaged by foreign microflora, improves the quality of the product and production.

Fatty acid fermentation is characterized by the decomposition of carbohydrates, fats and proteins into fatty acids, carbon dioxide and hydrogen under the influence of spore anaerobic microbes belonging to the group of clostridia. More than 25 species of fatty acid-producing bacteria have been identified.

Hence, fatty acid fermentation releases fatty acids, carbon dioxide (CO_2), hydrogen, and energy.

$C_6H_{12}O_6$ ---- $CH_3CH_2CH_2COOH + 2CO_2 + 2H_2 + 62{,}8$ kj

glucose fatty acid

Fatty acid is a volatile liquid with an unpleasant odor. The essence of this fermentation process was discovered in 1861 by Pasteur, who isolated the causative agent. This microbe is mainly anaerobic and sometimes breaks down proteins and lactic acid salts even under aerobic conditionC. In fatty acid fermentation, first the intermediates are pyruvic acid, acetic aldehyde and aldol, then the fatty acid and secondary products: butyl alcohol, acetone, CO_2 and hydrogen. 25 species of fatty acid-forming bacteria have been identified. They are gram-positive, motile, spore-forming anaerobic rods belonging to the genus *Clostridium* , common in manure, soil, dirty water. Due to the presence of glycogen and starch granulose, it turns brown or blue when stained with iodine.

The most characteristic stimuli of fatty acid fermentation are:

1. *Clostridium pasteurianum* - absorbs atmospheric nitrogen, decomposes sugars and other organic substances to form fatty acids, SO_2 and hydrogen.

2. *Clostridium felsineum* differs from other fatty acid-producing bacteria in that it breaks down pectin-containing substances by releasing the enzyme pectinase.

3. *Clostridium butylicum* - butyl alcohol, fatty acid is formed when carbohydrates are crushed.

Such fermentation occurs in nature in carbohydrate, fatty and protein environmentC. The industry uses starch, bran, wood chips, potatoes, grain waste, and more to produce fatty acidC. Starch is hydrolyzed with 0.4-0.5% sulfuric acid. After neutralizing the medium with lime and nitrogen preservatives, a pure culture of the pathogen is added. As a result of fermentation, fatty acids are formed. It is used in the form of ether in the perfumery and confectionery industry

Lactic acid **fermentation** - In the process, glucose is broken down into two molecules of lactic acid. Lactic acid bacteria are widely used in dairy products, butter, cheese, sauerkraut, cucumbers and silage - they are called typical lactic acid microbeC. Non-typical lactic acid microbes (intestinal rods and bacteria close to it) produce atypical lactic acidosiC. As a result, in addition to lactic acid, additional products are formed - vinegar, propionic acid, ethyl alcohol, etc. Lactic acid bacteria have an antagonistic effect on putrefactive bacteria.

It unites lactic acid bacteria into a single physiological group, the main feature of which is the ability to survive due to fermentation and the formation of lactic acid as the main product.

Lactic acid bacteria are usually inactive, do not form spores , stain positively by gram, do not return nitrate to nitrite, do not form pigment, and have low proteolytic activity.

Lactic acid bacteria are divided into two major groups :

1. *Homoenzymatic; 2. Heterofermentative.*

Homoenzymes form mainly lactic acid in the fermentation process , and very small amounts of other products (volatile acids, ethyl alcohol, and carbonic acid) may be formed. $C_6H_{12}O_6$--- $2C_3H_6O_3$+ 94.5 kj. Of course, this is the final product, which is formed by the combination of intermediate products - pyruvic acid and hydrogen. $2C_3H_4O_3$+ $2H_2$--- $2C_3H_6O_3$

Heterofermentatives , in addition to lactic acid, produce carbon monoxide, acetic acid, or ethyl alcohol, all of which are formed by the fermentation of up to 50% hexases .

Lactic acid bacteria *belong to the* families *Lactobacillus, Leuconostoc, Streptococcus* and *Pediococcus* . *The* family *Lactobacillus* combines rod-shaped bacteria, which come in a wide variety of shapes - from short coccyx to long coccyx. According to Orea-Jensen (1919-1943), this series is divided into 3 categories:

Streptobacterium, Thermobacterium and *Betabacterium* . The preparation of lactic acid products is based on the use of special yeasts for each product. For example: *Streptococcus lactis, C. lactis subsp. diacetilactis is* used. The same species and similar *C. cremoris* are added to the yeast when making cream. In

the preparation of *cottage* cheese *C. lactis* and *C. Lactis subsp. diacetilactis* is used, yeasts mixed in equal amounts with thermophilic *C. thermophilus* and mesophilic streptococci are used to obtain the product quickly ; Fermentation is carried out at 38–40 ° C.

Acidophilus milk and acidophilus paste are obtained by fermenting pasteurized milk with *L. acidophilus* bacteria.

It is obtained through the use of several products- (kefir, koumiss, etc.) multi-component yeastC. In addition to lactic acid bacteria , yeasts are added to them. Often acetic acid bacteria are also added. Qimizda usually *Lactobacillus bulgaricus* , *C. thermophilus, Sacch.lactis Sacco. Cartilaginosus, Acetobacter aciti,* etc. are used.

"Kefir fungus" and artificial yeast are used as yeast for the production of kefir . Lactic acid bacteria, yeast and acetic acid bacteria are added to the yeast selected for kefir .

This yeast kefir causes the formation of a dark blood consistency and gives it a special taste.

Yeast for the preparation of butter contains *Streptococcus lactis* **,** *Streptococcus cremoris as* acid-forming agents: *C. lactis subsp. diacetilactis* is added as a separator of pleasant, fragrant substances (diaisetyl, acetoin). Fragrances sometimes accumulate up to 10-30 mg in 1 liter of milk .

Fiber fermentation is the breakdown of plant cellulose and the release of carbon. Microorganisms that break down cellulose secrete the cellulose enzyme. Cellulose is broken down by aerobic, anaerobic bacteria and fungi. Depending on the type of bacterium involved in the process, the final product is methane or hydrogen. The humus produced by these bacteria fertilizes the soil. During digestion, it breaks down 75% of cellulose and increases the digestibility of coarse hay. But the downside is that they break down paper and wood. The industry produces various organic acids and alcohols from the decomposition of cellulose.

Baking with pectin . The substance that binds plant cells together is called *pectin* , an intercellular substance that strengthens plant cells and transforms them into tissueC. They are insoluble in water and are present in significant amounts in any plant residue. It is especially abundant in tree bark and fruits, from which fruit extracts are used, which are widely used in the confectionery industry in the preparation of marmalades, pastilles, etc.

Pectins complex polysaccharide, three types of case: *protopektin* - insoluble component of the cell wall, *pectin* - metilefir related galakturon acid is a water-soluble polymer, *pectin, acid* -metilefir garden galakturon acid is a water-soluble polymer.

Bacteria and yeasts break down pectin, protopectin, pectic acid under aerobic and anaerobic conditionC. They are found in large quantities in the soil. *Bac* from aerobic bacteria . *macerans, Bac.polimixa* and *Cl from* anaerobes . *pectinovorum, Cl. felsineum, Cl. aurantibutericum,*

Cl. pectinolyticum, Cl. corallinum, Cl.flavum , etc. are involved in this fermentation procesC. Microorganisms synthesize three exoenzymes that break down pectin : *protopectinase* - forms pectin, which decomposes *protopectin* , *pectinesterase* - hydrolyzes the methyl ester of pectin to form *pectic* acid and methyl alcohol, *pectinase* - completely hydrolyzes pectin, as a result of hydrolysis of pectin. , xylose and methyl alcohol are formed.

Products formed from the decomposition of pectic acid are oxidized or fermented by microorganismC. Under anaerobic conditions, *Cl. pectinovorum* fermentation results in the *formation* of oil, acetic acid, H_2 and CO_2 gaseC. *Cl. felsineum* also produces small amounts of acetone and butyl alcohol.

Pectin fermentation is widely used in the separation of fiber from flax, cannabis, hemp, hemp and other plants.

Question 3. The role of microorganisms in the metabolism of sulfur, phosphorus, iron

Phosphorus cycle . Soil is rich in phosphorus in proteins and lipidC. When organic matter decomposes, phosphoric acid is formed and combines with potassium, magnesium, and iron salts in the soil. Phosphorus microbes bring this compound to the plant assimilation-soluble state. Nitrifying, sulfur, thion bacteria are involved.

A pure culture of phosphorus microbes is used in the preparation of bacterial fertilizer - phosphobacterin. (*Bas.megaterium var phosphaticum*). They mineralize organic phosphorus and improve the phosphorus nutrition of plants

Sulfur metabolism . Sulfur is a major component of animal and plant protein, mostly organic and inorganic compoundC. It falls to the ground with plant and animal remainC. When the residue decomposes, sulfur is released in the form of hydrogen sulfide. Hydrogen sulfide oxidizes in the presence of sulfur bacteria to form sulfuric acid and water.

$$\mathbf{2H_2S + O_2 - 2H_2O + 2S + 532.1;\ 2S + 3O_2 + 2H_2O - 2H_2SO_4 + 1231.9}$$

Sulfur-accumulating bacteria are autotrophs, and sulfur is a nutrient for them. They are common in soils, swamps, lake waters, especially in sulfur spring waters.

Exchange of iron compoundC. Iron is a component of hemoglobin protein in erythrocyteC. It is important in human and animal respiration. Iron bacteria *Leptothrix, Crenotrix, Chlamydothrix* , etc. *oxidize* iron in their cell and accumulate it on the surface of the body. Iron bacteria are found in mines, large pools, and springs with iron compoundC. Where these bacteria accumulate, a dark red mucous membrane is formed.

Control questions:

1. The role of the metabolism of microorganisms in nature website
2. What is the essence of the nitrogen cycle in nature?
3. The importance of the carbon cycle in the light industry?

Influence of external environmental factors on microorganisms.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation, problem solving
Curriculum	1. The effect of physical factors on microorganisms 2. The effect of chemical factors on microorganisms 3. The effect of biological factors on microorganisms.
The purpose of the training: to reveal the anatomical structure of the skin and its derivative organs, their distinctive features in animals, the mechanisms of development.	
Pedagogical tasks: - The effect of physical factors on microorganisms to give an idea about; - The effect of chemical factors on microorganisms acquaintance with; - to form an idea of the effect of biological factors on microorganisms ; - To acquaint with the role of environmental factors in microorganisms in veterinary practice.	*Learning Outcomes:* Students: - describe physical factors and their effects; - describe chemical factors and their effects; - biological factors describe biological factors and their effects; - Say the essence of disinfection, aseprika, antiseptic; - The influence of environmental factors on the isolation of cultures of microorganisms, their artificial cultivation, the fight against infectious diseases, prevention.
Teaching methods and techniques	Lecture, cluster, discussion, technique: presentation, blitz-questionnaire, graphic organizers
Teaching aids	Lecture text, projector, OTV / CT technology, whiteboard, chalk
Form of teaching	Frontal speech, group and pair work
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (10 minutes)	1.1. Introduces the topic, purpose and plan of the lecture, introduces the expected learning outcomes of the lesson. 1.2. Reminds you to pay attention to the analysis of specific situations during the lesson (students have lecture notes distributed at the end of the previous lesson).	1.1. He listens and they write.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to recall the previous topic and determine what he or she has learned as a result of reading the lecture text. Lectures on the basis of visual materials: - addresses the question of what environmental factors affect microorganisms ; - Explains the impact of environmental factors on microorganisms with the help of specific examples. 2.2. Provides information on the effects of physical factors on microorganisms. - suggests studying the effects of temperature on microorganisms in three groups. 2.3. In explaining the effects of chemical factors on microorganisms: - positive chemotaxis; - illuminates negative chemotaxis. - microorganisms adapted to the pH of the environment; description of disinfectants, aseprika, antiseptics. - Explains the effect of biological factors on microorganisms.	2.1. He remembers, answers questions. He writes. They form a cluster in the category of mechanical antiseptics. 2.3. Venn diagram they draw. 2.4.Venna diagrams prepared by them make a presentation.
Phase 3. Final (10 minutes)	3.1. Summarizes the topic, forms general conclusions, encourages students to actively participate. Explains the importance of the knowledge gained. 3.2. Gives extra assignment to inactive students. 3.3. Task for independent work: to write an essay on "Derivative organs of the skin."	3.1. Hear, identifies. They write assignments.

Basic terms: *optimal temperature, psychrophilic, mesophilic, thermophilic bacteria, drying and vacuum effect, positive chemotaxis effect, effect of disinfectants, disinfection of microorganisms, antibiotics, phytoncides, antiseptics, asepsiC.*

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1. Question. Influence of physical factors on microorganisms

Microbes are affected by many environmental factorC. They are extremely adaptable to different conditionC. For this reason, microorganisms change their properties by being affected by physical, chemical, biological and other natural factorC.

Physical factors:

The effect of temperature. Microbes require a certain optimal temperature for survival. When the temperature is too high or too low, the microbial life activity slows down or stopC. The temperature requirements of microorganisms are not the same. Temperature has three different effects on the microbe: optimal-favorable for the microbe, maximum-excess and minimum-insufficient. Knowing this is essential when growing microbes in the laboratory. Depending on the adaptation of microorganisms to temperature, they are divided into three physiological groups in nature.

1. Psychrophiles (Greek "psychros" - cold and "filo" I love) are microbes that have learned to live at low temperatureC. They live at temperatures of +15 - 8 ^{0}C. 2. Mesophylls (Greek “mesos” - average) Bacteria accustomed to moderate temperatures thrive at temperatures between 20 ^{0}C and 40 ^{0}C. 3. Thermophiles (Greek “thermos” hot) require a high temperature of 40 ^{0}to 80 ^{0}C for development. At optimal humidity , thermophiles raise the temperature of organic matter, decompose, resulting in the accumulation of gases such as methane, hydrogen, and the spontaneous combustion of heated plants, wool, cotton.

The effect of high temperature on microbeC. Vegetative forms of the microbe are more susceptible to high temperatures . The higher the temperature, the more destructive the microbeC. Typhoid bacteria die after 2 hours at 47 ^{0}C and after 21 hours at 59 ^{0}C. Spores also die after 20 hours at 100 ^{0}C and 2-4 minutes at 130 ^{0}C (VIVashkov 1956). Microbes are more affected by hot steam than dry heat. For example, the spores of anthrax die after 1 minute at 102 $^\circ$C under steam and at 180 $^\circ$C in dry heat .

The effect of low temperature on microbeC. Low temperatures usually do not kill germs, but stop them from growing and multiplying. Microorganisms can be stored in an anabiotic state for up to 12,000 years.

Drying and vacuum effects on microbeC. As a result of drying, the moisture in the microbial cell is lost, the vital activity of the microbe is reduced and it becomes anabiotic. In this case, especially in a vacuum, the microbial cells are stored for 10 yearC. Pathogenic streptococci survived for 25 years, while the causative agent of tuberculosis survived for 17 yearC. Rapid drying in a vacuum at low temperatures (sublimation method) is used in the preparation of live vaccines (tuberculosis, brucellosis, influenza), vitamins, enzymes and other biological drugC.

The effect of light on microbes . The bactericidal effect of light depends on its wavelength, the shorter it is, the stronger the effect. Under the influence of direct sunlight, many pathogenic microbes die (tuberculosis pathogen 3 - 5, protein virus within 2 hours).

The effect of X-rays on microbes . Since 1898, under their influence, Escherichia coli has been known to kill Staphylococcus aureus, plague vibrio, and other microbeC. Young cells are more exposed to radiation, especially during division and development. The bactericidal effect of radiation is widely used in practice. Bactericidal, boxed under the influence of ultraviolet rays of quartz lamps, is used to sterilize the air in the operating rooms (lit 2-3 hours). Various radioactive vaccines exposed to ionizing radiation are currently being used.

The effect of ultrasound on microbes . Ultrasound waves affect the culture of microorganisms, causing a large difference in pressure and damaging the cell. Some microbes die quickly, while others are subjected to strong mechanical vibrations, resulting in disruption of physiological processeC. The cytoplasm dissolves, expands in size, and the cell wall ruptureC. Therefore , ultrasound is used to separate toxins, enzymes and antigens .

The effect of electric current on microbeC. Constant and variable electric power has little effect on microbeC. High-wave electricity kills germC. In this case, the microbe dies as a result of the vibration of the cell molecules.

The effect of magnetic fields on microorganismC. Like other living things, magnetotropism has been identified in microbeC. Microbes are sensitive to any force of the geomagnetic field. This leads to changes in the morphological, cultural and biochemical properties of microbeC. Cells increase in size, form long filaments, form pigment-free colonies in dense nutrient media (staphylococcus, excellent rod). Sometimes changes in metabolism, virulence, increased resistance to antibiotics, and so on

The effect of hydrostatic pressure on microbes . Pressures above 108-110 a denature the protein, inactivate enzymes, enhance electrolytic dissociation, increase the elongation of fluids , and sometimes kill microbeC. But such barophilic microorganisms live and multiply at high pressure. For example,

the growth and multiplication of microorganisms in the seabed and ocean floor at a pressure of 113-116 amperes has been identified.

The effect of vibration on microbeC. The effects of concussions often kill bacteria (not just viruses).

Effect of suspension on microbeC. We know that macroorganisms in space conduct suspension largely unchanged. *Bac subtilis* culture (spores) was found to grow 30% faster on Earth than in the Solyut-6 orbital station at the same nutrient medium and temperature . In this case, it is assumed that the gravity of the earth leads to cell interference in the colony, improves the conditions of metabolism, whereas in space there are no such conditionC.

Question 2. Influence of chemical factors on microorganisms

Chemical factorC. Chemicals have different effects on microorganismC. Under the influence of some chemicals, the microbe begins to approach this substance (positive chemotaxis), and sometimes when the microbe is exposed to another chemical, the microbe runs away from it (negative chemotaxis). This phenomenon is called chemotaxiC. For example, in meat extract, microbes begin to approach the peptone, which is a positive chemotaxis, away from strong toxins (acids, alkalis), which is a negative chemotaxiC. In the event of chemotaxis, some microbes can also accumulate in toxic chemicals and, conversely, move away from certain nutrientC. Microbes are adapted to live in a certain environment: some (mold fungi) in an acidic environment, others (plague vibrio) in an alkaline environment, and most in a neutral environment (pH 6.5-7.5). This is important in growing microbes in an artificial nutrient medium. A number of chemicals are toxic to microbes and are used to kill germs i.e. disinfect. Alkalis (*NaOH, KOH*) from disinfectants , acids (sulfuric acid, *HCL* , etc.) chlorinated lime contains 28-38% of active chlorine. Phenols (without carbolic acid crystals), oxidants (potassium permanganate), formalin (40% solution of formaldehyde in water), etc. are more commonly used. The higher their concentration, the stronger the effect on the microbial cell.

Disinfection. It is performed by mechanical, physical, chemical and biological methodC. Unlike sterilization, disinfection kills only pathogenic microbes, while sterilization kills all germs in a product.

Antiseptic-chemical disinfectants kill germs in wounds and other objects.

Asepsis is aimed at preventing germs from entering the wound Asepsis is done by completely destroying the germs in the items that come in contact with the wounds (instruments, dressings and sutures, surgeons ’hands, etc.).

Question 3. Influence of biological factors on microorganisms.

Biological factorC. In addition to physical and chemical factors, microbes are also affected by biological factorC. When microorganisms live in natural conditions, they interact not only with the environment but also with various microbes and other living organisms, and it is called biocenosis.

Symbiosis is when two or more species of microbes live and multiply in the same environment without interfering with each other.

Commensalism is the relationship between two organisms in which one organism benefits from its separation or nourishment without harming the other.

Metobiosis - in which the same type of microorganism creates favorable conditions for the growth and development of another microorganism in its life.

Satellism is the growth, development, intensification, and coexistence of one microbe under the influence of another microbial product.

Synergism is when two or more types of microbes contribute to each other. For example azotobacter and *Bac. Mycoides* together form heteroauxin substances that make plants grow well. *Bac when* pure azotobacter culture produces 173 mg of getroauxin . *Produces* 220 mg when *grown* together with *mycoides* .

Antagonism is the **inability** of one type of microbe to develop in a microbial environment.

Parasitism is a relationship between microbes in which the parasite benefits from this relationship and harms its host, causing it to die.

The relationship between microbes of different structure and size **- phage -** is important. This is the relationship between viruses and bacteria, actinomycetes, green algae. Biological factors affecting microorganisms include antibiotics, phytoncides, and bacteriophageC.

The term **antibiotic was introduced to** science by ZAVaksman (1942) (*anti-against* , *bios*- life) Antibiotics are produced by microorganisms (actinomycetes, fungi, bacilli, bacteria), plant and animal organismC. Russian scientists VA Manassein and VA Palotebnov (1871-1872) were the first to observe that penicillium stops the growth of other bacteria. Antibiotics are formed as a protective agent during the mutually antagonistic life of microorganisms and are released into the environment. The potency of antibiotics against microbes can be different — bacteriostatic (stops growth), bactericidal (completely kills), bacteriolytic (dissolves). Determination of susceptibility of microorganisms to antibiotics is now widely used in practice

PhytoncideC. The scientist VPTokin was the first to prove the existence of antibiotic-like substances in plants in 1928-1930 , calling them phytoncideC. Phytoncides are found in plant leaves, flowers, roots, fruitC. Phytoncides are mainly used in the local treatment of purulent processes **.**

Bacteriophages are parasites of bacteria, and the dissolution of bacteria under the influence of phage is called bacteriophage. Bacteriophages are used to identify the type of microorganisms, diagnose diseases and treat infectious diseaseC.

Control questions:

1. You know the effect of physical factors on microorganisms.
2. State the effect of chemical factors on microorganisms.
3. State the relationship of microorganisms in the biocenosis.
4. State the effect of antibiotics, phages, phytansides on microorganisms.

The doctrine of infection

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Visual, informative report
Curriculum	1. Infection, infectious disease, types of infection. 2. The concept of pathogenicity, virulence. 3. The role of macroorganisms and environmental factors in the course of infectious diseases.
The purpose of the training : to acquaint with the role of macroorganisms and environmental factors in the course of infectious disease, pathogenesis, virulence, infection, infection, infectious disease, types of infection .	
Pedagogical tasks: - To give a general idea about infection, infectious disease; - know the pathogenicity and virulence; - give an idea of the types of infection; - To give an idea of the role of macroorganisms and environmental factors in the course of infectious diseases; - To provide information on the periodic stages, classification of infectious diseases.	*Learning Outcomes:* Students: - Describe the infection and infectious disease, its characteristics; - Representatives of the group comment on each method of competition and give their example; - describe the properties that cause virulence; - analyze the types of infection; - The role of microorganisms, macroorganisms and environmental factors in the development of infection; - Analyze the periodic stages, classification of infectious diseases.
Teaching methods and techniques	Information-lecture, insert, collaborative teaching techniques, sinkway
Form of teaching	Frontal, in groups
Teaching aids	Lecture text, projector, graphic organizers, O'TV / KT
Learning conditions	Sample audience

Technological map of the lecture

The work lines	Activity content

and time	educator	learners
Preparation phase (5 min)	At the end of the previous lesson, the text of the lecture is given to the studentC. Reading is assigned using the "insert" technique. For group teaching, each group task is developed and a plan for conducting it is announced. Announces teaching in a interactive way of teaching.	They take on the task and do it.
Phase 1. Training training introduction (10 minutes)	1.2. Reminds students of the task assigned to them. He asks what new information they got on the subject. 1.3. Writes them down on the board to see what questions arise	1.1. They hear, they write they get. 1.2. They ask questions.
Phase 2. Basic (55 min.)	2.1. Divides students into small groups. Each group declares that they will be “experts” on a particular topic and will teach otherC. Expert leaflets, white paper (A32) hand out markerC. Explains the content of the questionC. Explains which material can be used. The work schedule introduces the evaluation criteria and announces the start of the training (Appendix 1.2). 2.2. Announces group discussion and presentation of topic questions. 1) acts as a consultant-arbitrator; 2) Asks additional questions. 3) At the end of each question discussion, organize a mutual assessment, draw a final conclusion and draw students' attention to important aspects of the issue. 2.3. Invites students to answer topic questions in order to test their knowledge. Conducts a quick question and answer or test	2.1. Groups task- and discusC. They start working in small groups. 2.2. Prepares answers in a group. They prepare visual material. 2.3. Group leaders or members of their own provide information on questionC. From visual material use and answer additional questions. 2.4. Another group evaluates the answers, they ask questions.
Phase 3. Final (10 minutes)	3.1. Summarizes the learning activitieC. Announces mutual learning outcomeC. Identifies active participants and emphasizes the future importance of the knowledge gained. 3.2. Provides a task for independent work: preparing a cluster on the topic.	They record the task.

Basic terms: *infection, infectious disease, infectious process, macroorganism, pathogenicity, virulence, invasiveness, toxigenicity, capsule, antigenic properties, gateway to infection, bacteremia, septicemia, toxemia.*

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Question 1. Infection, infectious disease, types of infection.

Infection - (from Latin *infectio*) means to infect. Infection is a complex biological process that occurs between the animal organism and the pathogen in the external environment. The most pronounced form of interaction between the organism and microbes is an infectious disease. This is a condition of the body in which certain pathological processes develop in response to the stimuluC. Infectious processes are greatly influenced by environmental factors.

The infection is latent and with obvious clinical signs, abortive, etc. They play an important role in the timely and accurate diagnosis of the disease. Infectious diseases:

1. Presence of a live pathogen or a specific cause (viruses and other organisms that store RNA or DNA);

2. Transmission from a diseased organism to a healthy organism;

3. Having a latent period of the disease;

4. Formation of antibodies (specific reactions develop in the body).

5. It is characterized by the formation of immunity in the diseased organism.

Although microorganisms enter the animal's body, they do not always cause disease. This requires certain conditionC. The appearance and development of the infection depends on:

a) the level of pathogenicity of the microbe; b) the immunological state of the macroorganism: c) the conditions of the external environment;

Question 2. The concept of pathogenicity, virulence.

Pathogenicity. The ability of a microbe to cause a specific infectious disease under certain conditions is called pathogenicity. It is a type-specific, changeable character.

Virulence. The degree of pathogenicity of a microbe is called its virulence, i.e., virulence is an individual characteristic of the microbe and varies under

different conditionC. Virulence is determined by infecting laboratory animalC. The lowest amount of culture that can kill animals is an indicator of microbial virulence of *DLM (dosis letalis minima)* .

Properties that cause virulence

1. Invasiveness is the **ability of** microorganisms to enter, spread and multiply in the tissues of macroorganismC. The effect of substances secreted by some microorganisms - reduces the protective forces of the macroorganism, mainly phagocytosis.

2. Toxins are harmful substances produced by microorganismC. Toxin poisoning is called intoxication. The ability of a microbe to produce toxins is called toxigenicity. Exo and endotoxins are different. Exotoxins (protein substances) are excreted from the body of the microbe during its life or after death. Endotoxins are firmly attached to the bacterial cell, especially its wall. Therefore, they are released only after the microbe dieC. They cause complex pathological changes in the body, mainly affecting the capillary endothelium, leukocytes, lymphoid tissue and the autonomic nervous system. Exo - endotoxin - forming microorganismC.

Toxins (toxins, botulism, diphtheria poisons) lose their toxicity when exposed to 0.3-0.4% formalin at a temperature of 38-39 °C for a month , but the immunogenicity is preserved. Anatoxins are prepared by these methods and used as vaccine drugs to produce some toxicoinfectious larvae (scabies, botulism, diphtheria) .

3. Capsule formation. Capsule formation leads to aggressive microbeC. The capsule performs a protective function, increasing the resistance of the microbe to phagocytosis in the microorganism, multiplying rapidly, increasing virulence, becoming aggressive and causing disease.

The microbe enters the body in certain ways, which are called the **gateway to infection** . Under natural conditions, the pathogen is often transmitted to the body through the alimentary tract (feed, water), aerogenous - through the respiratory tract, in contact with each other, by insect bites, by injection with a nosteril needle passeC. Injured skin, eyes, and mucous membranes of the urinary tract can also be a gateway to infection. Pathogenic microbes spread throughout the body in different ways: through the blood (hematogenous), through the lymph (lymphogenic), through nerve fibers (neurogenic). The growth of a microbe in the blood and its transmission through the blood to the whole body is called **septicemia** . It passes very quickly and usually ends in death. The appearance of the microbe in the blood is sometimes very short-lived, where the microbe does not multiply, but the blood spreads the microbe to all organs, which is called **bacteremia** . Some microbes multiply in the injured area (tissue), the resulting toxin enters the bloodstream and poisons the whole organism. This is called **toxemia** .

Types of infection . There are exogenous and endogenous infections depending on the cause. Exogenous pathogens enter the animal's body from the external environment. Endogenous pathogens are usually present in the body and only develop when the condition worsenC. This includes conditionally pathogenic microbes, latent viruses, etc. It is observed in simple and mixed form, depending on the type and amount of pathogen entering the body. Diseases caused by a single type of pathogen are called **mixed infections** that result **from the** entry of two or more **simple** pathogens . Mixed infections are severe. Sometimes, when an animal recovers from a disease, it does not develop immunity and becomes infected again, which is called **reinfection .**

In some cases, there is a balance between the organism and the pathogen during the development of the infection. However, when an additional amount of the pathogen enters such an organism, the disease intensifies again - this is called **superinfection** . Sometimes, even after the disappearance of clinical symptoms, the organism is not free of the pathogen, and under certain conditions, the disease re-exacerbates and clinical symptoms of the disease appear, which is called **relapse** .

Question 3. The role of macroorganisms and environmental factors in the course of infectious disease .

The role of macroorganisms and environmental factors in the course of infectious disease. The emergence and development of infection in the animal depends on three conditions: 1) the immune status of the animal; 2) the level of pathogenicity of pathogenic microbes; 3) environmental conditions (effects). First of all , we will focus on the role of the immune status of the animal in the emergence and development of infection . The resistance of a macroorganism to infectious diseases depends on its anatomical and physiological properties, the innate protective means of the organism that prevent the entry and proliferation of infectious agents into tissues .

The reactivity of the set of protective agents that occurs in the animal's body creates a *stressful* situation in the body. At this time, the interaction of harmful factors - pathogenic microbes with various organs and tissues that perform a protective function in the macroorganism - is manifested . Involvement of protective agents and activation of other neurohumoral rhythms are performed by the hypothalamic and gor monal systems located in the brain . That is, the pathogen weakens the microbes in the body , the disease does not develop, and if it occurs, it passes easily. If the animal's defenses are not fully involved due to various influences (starvation, poor care and feeding), its normal state is disrupted and the infectious process actively develops, resulting in an infectious disease.

One of the conditions for the development of infection is the influence of the external environment on micro and macroorganismC. That is , starvation of animals to external environmental factors that increase the susceptibility of farm animals to infection , feeding with malnutrition and poor quality food, colds that weaken tissue resistance - cold solidification (slows phagocytosis, increases the

permeability of vascular walls), maintenance in unsatisfactory conditions: (lack of ventilation, increased humidity, proliferation of microbes in the air of cattle, contamination of animal bodies , activation of microbes in the skin and respiratory tract, etc.), etc.

The relationship between micro and macroorganismC. There is a complex relationship between micro and macroorganisms in infectious processeC. This is the result of adaptation, which depends on the amount and virulence, resistance of microbial cellC. Macroorganism resistance depends on a number of other factorC. There must be a certain amount of microbial cells and favorable conditions for the development of the infectious process and the appearance of symptoms of the disease.

Most animals are carriers of pathogenic microbes and do not show signs of disease. In a prone organism, many microbes cannot find a comfortable environment for themselves, and many die. The rate of development of the infectious process depends on the site of entry of the pathogen, the closer it is to the site of development, the faster the disease will appear. For example, in tuberculosis, the pathogen enters the lungs, and in rabies - in the nervous tissue, especially in the vicinity of the head or spinal cord, the infectious process develops rapidly.

Periodic stages of the infectious process.

The first stage in the development of the infectious process in the body is called the **incubation** period. It includes the time from the time the microbe enters the body until the first clinical signs of the disease appear, passing without clinical signC. Its duration varies from a few hours to a year or more.

The second stage is called the **prodromal** period , which is characterized by the appearance of general symptoms specific to certain infections . For example, fever, fatigue, loss of appetite and reduced animal productivity. Such symptoms can occur in any disease. **The** third stage, which is characteristic of the developing disease , is replaced by a period in which specific clinical signs appear . This is of great importance in practice in diagnosing the disease. The fourth stage is **a period of decline in** which the clinical signs and functional disorders gradually disappear. The last is the period of recovery or **reconvolution** . In this case, sick animals recover, but they can still retain the pathogen in the body.

Acute and chronic diseases are distinguished by their course. When the disease is acute, the symptoms become apparent and pass in a short time. In chronic nightmares, the infectious process lasts a long time and does not always end in death. This causes profound changes in the body, damaging the external environment with excitatory secretions.

Classification of infectious diseases . As mentioned above, infectious pathogens have adapted to certain types of animals during the evolutionary procesC. These are called carrier carrierC. Accordingly, infectious diseases are: 1) animal-specific (zoonotic); 2) unique to humans (anthroponosis); 3) transmitted to

humans by infecting animals (zooatroponosis); 4) diseases that have the ability to infect each other (anthropozoonosis) by infecting animals and humans.

Control questions:

1. State the difference between the concepts of infection and infectious diseases
2. What microbes are called pathogenic microbes.
3. Explain the concepts of pathogenicity and virulence.
4. What is the course of infectious diseases.
5. How is a latent infection different from a microbial infection?

The doctrine of immunity.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Binary lecture in collaboration with students.
Curriculum	1. Importance, development, history of the science of immunology. 2. Immune responses of the body.
The purpose of the course *: to* study the importance, development, history of the science of immunology, immunity and its types, the practical application of the doctrine of immunity.	
Pedagogical tasks: - Introduction to the importance, development and history of immunology ; - Introduction to immunity and its types; - Introduction to non-specific resistance factors of the organism; - Introduction to antigens, antibodies and their interactions; - Introduction to immunodiagnostic methods; - To show the role of immunoprophylaxis and immunotherapy in veterinary practice.	*Learning Outcomes:* Students: - know the importance, development and history of the science of immunology; - Analysis of immunity and its types; - to tell about non-specific resistance factors of an organism; - knowledge of antigens, antibodies and their interactions; - knowledge of each immunodiagnostic method; - In immunoprophylaxis and immunotherapy Analyze the biopreparations used.
Teaching methods and techniques	Lecture, 2-person (binary) dialogue, cluster, Insert
Form of teaching	Frontal, collective, in groups

Teaching aids	Lecture text, projector, graphic organizers, O'TV / KT
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	Educator	learners
Phase 1. Training training introduction (10 minutes)	1.1. Communicates the topic, purpose, and planned learning outcomes. 1.2. Introduces the plan and binary (2-person) lecture feature. 1.3. The main categories and concepts in the report include questions for independent work, a list of additional literature. 1.4. In this session, the performance indicators and evaluation criteria will be announced.	They hear. They record. Accuracy they enter.
Phase 2. Basic (60 minutes)	2.1. Recalls quick questions related to the topic. 2.2. The syllabus defines the content of the doctrine of immunology, immunity: - illuminates the non-specific resistance factors of the organism. 2.3. Describes antigen, antibody, and their interactions. 2.4. Refers to a specialist in immunodiagnostic coverage. - Which of the most commonly used immune reactions. - What reactions are highly sensitive in the diagnosis of infectious diseases; Focuses on AR, PR, CBR reactions. Students answer the question.	One answer after another they give. They take notes. They write, remember they take. They hear. They think, they ask questions.
Phase 3. Final (10 minutes)	3.1. Summarizes the topic, focusing students 'attention on key issues. 3.2. Assigns the task of creating a cluster related to the types of immunity. 3.3. Demonstrates and evaluates the 2 best	They form a cluster To the show are prepared.

	clusters. 3.4. Provides 3 questions to strengthen theoretical knowledge for independent work	They record.

Key words: *emergence of resistance, types of immunity, infectious, non-infectious immunity, non-specific resistance factors, natural barriers, humoral cell factors, phagocytosis processes, antigens, antibodies, immunoglobulins, antigen-antibody interactions, allergies, anaphylaxis , idiosyncrasy.*

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Question 1 **. Importance, development, history of the science of immunology.**

Immunity (Latin *immununias* - to be free, to get rid of) The body's resistance to a pathogenic microbe or toxin is called immunity. Immunity is the body’s defenseC. The science that tests immunity is called immunology. The history of the development of immunology is closely linked to the development of medical microbiology, and for a long time was mainly focused on the development of means to combat diseases caused by many viruses and microbeC. Just as L. Pasteur was the founder of microbiology, he is also the founder of immunology. He was the first to develop methods of vaccination against anthrax and rabies, and explained the mechanism of action of the smallpox vaccine, developed by E. Jenner in the late 18th century. In infectious immunology, the work of E.Ru in France and E.Bering in Germany on the production of antitoxin serum that neutralizes the toxins of the diphtheria bacillus was of great importance. P. Erlix (1854-1915) and II Mechnikov (1845-1916), the founders of humoral and cellular immunity, also played an important role in the development of immunology. Later, in the 60s and 70s of the 20th century, the interrelationship between humoral and cellular immunity was discovered, and the doctrine of the immune system of the organism, which is the basis of modern immunology, emerged. In 1908, II Mechnikov and P. Erlich were awarded the Nobel Prize for their great work in the field of immunology .

The emergence of resistance to infectious diseases is infectious immunity. The application of the laws of immunology to animal protein and cells has defined non-infectious immunity. Such immunity becomes the basis of the doctrine of tissue incompatibility (nesovmestimost). It occurs through adaptation in the fight against pathogenic microbes and the products they produce. In this biological process,

phagocytosis, the fight of organs and tissues against microbes and their toxins is intensified. The doctrine of infectious immunity was inspired by the work of the English physician E. Jenner (1749-1823). He was the first to suggest a smallpox vaccine. While working in the village, he noticed that people who had contracted cowpox were not suffering from true smallpox. E. Jenner vaccinated a child with smallpox in 1796, as a result of which the child became immune to smallpox. This drug, which artificially helps to create active immunity in the body, is a vaccine (Latin *Vacca* - cow), and the method of immunization began to be called vaccination. The term was coined by L. Pasteur in honor of E. Jenner . Only in 1881, thanks to the work of L. Pasteur, the doctrine of immunity became scientifically based. Ways to weaken the virulence of chicken pox, anthrax, rabies pathogens have been found, making it possible to use these cultures for vaccination purposeC.

NNChistovich and N. Bordelar discovered in 1898 that immunity can occur not only to bacteria but also to the cells of the organism. This laid the foundation for a more in-depth study of non-infectious immune problems and finding solutions.

With the advent of organ and tissue transplantation, noninfectious immunity began to play an important role. Noninfectious immunity for this condition was not considered good and was even considered harmful. A new concept of immunological tolerance (resistance) has emerged about overcoming non-infectious immunity, i.e. resistance , and the body's adaptation to resistance. F. Burnett mentioned this in his time. P. Medavar and M. Gashek proved it in practice. In 1953, P. Medovar and M. Gashek found that when an antigen was sent to animals during embryonic development, they did not respond to that antigen when they were adultC. So they have tolerance.

The emergence of immunity (especially against infectious diseases), the degree of its manifestation, depends on the condition of the organism.

As mentioned, immunity can be infectious and non-infectiouC. Infectious immunity is divided into specific and non-specific immunity, respectively. Non-specific immunity is a natural, innate resistance of the organism to various environmental conditions: mechanical, physical, biological factors .

Specific immunity is formed as a result of the entry of certain protein cells (microbes, toxins, tissues) into the body, which produce special protective agents (antibodies or immunoglobulins).

Non-specific immunity. Natural (innate, genetic) immunity depends on the specific type of animal. It appears throughout evolution and is passed down from generation to generation like biological traitC. In this case, animals of one species are resistant to infectious diseases of animals of another specieC. For example, large horned animals in horses are not infected with the plague because they have a natural, innate immunity to the swine fever. Large horned animals, on the other hand, do not suffer from swine fever, mango, equine infectious anemia, and so on. This means that in an organism that is not prone, there are no favorable conditions for the survival and development of these pathogenC. Natural innate

immunity is also called constitutional immunity (U.Bayd, 1969, PNBurgasov, SN Ruyansev, 1985 and others).

Natural innate absolute immunity can be absolute and relative. In absolute immunity, a certain type of animal will not develop the disease at any dose of harmful material under any circumstanceC. Since horses have absolute immunity to the plague of large horned animals, they will not get sick with it under any circumstanceC.

In relative type-specific immunity, the immunity that results from a change in environmental conditions or a high dose of the pathogen may be disrupted.

For example, a pigeon is resistant to anthrax under natural conditions, but if it is pre-poisoned with alcohol, it becomes infected with anthrax.

Non-specific resistance factors of the organism.

The human and animal organism has a number of natural protective anatomical and physiological factors - features that prevent the entry of a pathogenic microbe, kill it or quickly expel it from the body. They serve as a barrier that protects the skin, mucous membranes, lymph nodes, liver, spleen, placenta, blood vessels, intestinal and gastric juice (*HCL*), lysozyme, bile, phagocytosis and humoral factors.

Skin and mucous membranes are a natural barrier that prevents **germs** from entering the body. The skin and mucous membranes secrete lysozyme, resulting in a significant reduction in microbes on its surface. When the skin is clean, its bactericidal effect is high. The mucous membrane of the eye is in contact with the external environment, the lysozyme substance in the tear fluid prevents the entry of microbes into the body through it. Often there are injuries in the oral cavity of animals.

Although it contains many microorganisms, the disease does not occur because saliva contains substances that prevent the growth of microbeC. For example, dogs lick their wounds.

If the microbe enters the body through the damaged skin, there are other barriers in its path - lymph nodeC. They catch and destroy the microbe. In this struggle, the lymph node changes: it becomes enlarged and painful. When the animal is dissected, there will be a lot of bleeding at the site of the lymph node incision.

The role of the liver in the fight against microbes is enormouC. In this fight there are a large number of liver cells, which are replaced by connective tissue and reduce the protective properties of the liver. The natural barrier also includes a single-chambered stomach. Uninig juice contains hydrochloric acid, which forms an acidic environment (TH-2,5) and kills many microbeC. The role of humoral factors in non-specific immunity is very large. Serum contains substances that can kill germC. Of these, complement is important, as it is abundant in the serum of guinea pigC. The complement decomposes when heated. If the whey is heated for 20–30 minutes at a temperature of 56 ^{0}C, it loses its propertieC. Serum protein is also a strong non-specific protective factor. They kill most microorganismC. Erythrin is isolated from erythrocytes, leukocytes are isolated from leukocyteC.

They increase the body's natural resistance. Antibodies, lysozyme, and other factors in the serum of healthy animals are also important. Uvuz milk also contains many preservatives.

PhagocytosiC. Phagacytosis plays an important role in the doctrine of immunity. Mechnikov II was the first to give a complete account of phagocytosis and its importance. Pus accumulates in the damaged area of the body. It contains a lot of microbes, but leukocytes catch them. Most leukocytes die in such a struggle. The white pus in the wound is these dead leukocyteC. Macrophages and other cells of the body also have the property of phagocytic activity. The process of phagocytosis consists of the following phases:

a) proximity of phagocytes to microbes and adhesion (positive chemotaxis); b) ingestion of the microbe or parts thereof; c) digestion. This changes the shape of the microbe, they become swollen and granular , and melt away. It was later found that the more active the phagocytosis, the more easily the disease progresses and vice versa. In immune animals, phagocytosis is better manifested than in non-immune animalC. Hence, it is possible to think about the immunological state of the organism depending on the level of phagocytic cell activity.

Specific immunity can be acquired naturally or artificially. Naturally acquired immunity is formed as a result of a person or animal experiencing a specific infection. In doing so, the body develops immunity against the microbe that caused the disease. Artificially acquired immunity is formed after the introduction of special biopreparations - vaccines (microbes or their toxins). Naturally acquired immunity lasts a long time. From some diseases sung is preserved for life. For example, once horses are infected with mango, humans with measles, rubella, and dogs are infected with the disease, they retain their immunity for the rest of their liveC. Acquired immunity is divided into active and passive immunity, respectively.

Active immunity occurs as a result of an infectious disease or vaccination, in which the body actively participateC. The more severely the body becomes ill, the longer the natural active immunity lastC. Therefore, artificial active immunity (which occurs after vaccination) does not last long. For example, the duration of immunity produced by the salmonellosis vaccine is 6 months, and that of the anthrax vaccine is one year. Active immunity occurs in 10-14 days.

Artificial passive immunity occurs as a result of the delivery of a ready-made immune substance - antibodies to the body. Antibodies are naturally present in the serum of animals that have been cured or vaccinated. Biofactory produces very large amounts of hyperimmune blood serum. To do this, specially prepared animals are first killed according to the scheme, then live virulent microbes or their toxins are multiplied from a small dose to a high dose. Repeated immunizations produce specific antibodies (immunoglobulins) against the same pathogen in the animal's serum. Hyperimmunization can last from a few weeks to several months.

Passive immunity occurs within a few hours after delivery of serum and lasts for a short time 7-15 days, with treatment 20 days.

By sending ready-made antibodies, we help the organism in the fight against pathogenic microbes, increase its protective power. It is therefore advisable to send the serum to sick animalC. The earlier treatment is started, the higher its effectiveness.

Natural passive immunity is passed from mother to child through the placenta or through breast milk. If a salmonellosis vaccine is given one month before birth, the newborn calf will be more resistant to the disease. This means that the antibodies in the mother are passed on to the calf.

Natural active immunity is divided into **sterile** and **nosteril** immunity. When sterile immunity occurs, the pathogen is completely eliminated from the body and the organism is not re-infected with it. Nosteril immunity occurs only when the pathogen is present in the body, if the microbe disappears from the body, then the immunity is also lost (in tuberculosis, brucellosis, mange, diseases).

Question 2. Immune responses of the body.

Antigens, (Greek *anti-against* , *genes*- type). When administered parenterally, substances that produce an immune substance against themselves are called antigenC. The term antigen was introduced in 1899 by the Hungarian scientist Ladislau Deutsch. Antigens are substances of high molecular weight. The larger the molecule, the higher its antigenicity. Antigens must be colloidal.

Antigens include microorganisms and their toxins, foreign proteins, enzymes, cellular elements of tissues, as well as plant and animal toxinC. Qualitative and substandard antigens are distinguished. Qualitative antigens are proteins that form antibodies in the body and bind specifically to them. High molecular weight nucleic acids and complex polysaccharides have similar propertieC. Poor quality antigens or **haptens** (the term hapten was coined in 1936 by K. Landsteiner) are complex carbohydrates, lipids and other substances that do not form antibodies but bind specifically to them. Although haptens cannot produce antibodies on their own, but when they are combined with any protein that has antigenic properties and sent to the body, immune substances against haptens are formed.

The proteins involved in **antigenicity to haptens** are called **lead or shlepper** . Although iodine, bromine, atoxyl, quinine, and other chemicals are not antigens, they do have antigenic properties when combined with a protein. These are called semi-haptenC. Antigens are present in the cytoplasm, the nucleus accumbens, in all parts of the cell.

Antigens of microbeC. The microbial cell contains various capsules, hives, and somatic antigens .

They differ in composition, properties and effectC. Capsular antigens are a complex of polysaccharides consisting of polypeptides (anthrax pathogens); Hivchin antigen thermolabile decomposes at -60-80 ^{0}C, somatic antigen thermostable -100 ^{0}C is also resistant to heating for 2 hourC. The presence of specific antigens in the capsule, cell wall, and hives was detected.

Currently, antigens are being obtained synthetically, which can produce immunity like vaccines.

Antibody. These special proteins are immunoglobulins, which are formed in the animal body under the influence of antigenC. Antibodies are bound to serum protein globulins, not to albuminC. The antibody is a thermocouple with a molecular weight of 150-900 kDa. In Prague (1964) by the International Commission of the Department of Immunology of the All-Union Health Society (WHO) immunoglobulins were divided into five classes: *IgG, IgM, IgA, IgE and IgD.* They differ in the amount, molecular weight and other characteristics of serum globulins.

The main feature of antibodies is their specificity. That is, it affects the antigen that produces them. As a result of the interaction of the antibody with the antigen, the antigen is inactivated.

Antibodies are divided into three depending on how they react to their antigen: antimicrobial, antimicrobial-antitoxins and anti-cellular agglutinins adhere to cells (microbes, erythrocytes), antitoxins neutralize larvae-toxins, preceptins coagulate the protein, lysines microbe, erythrocyte and so on. Antibodies appear in the body after 5-6 days and are stored for several monthC. First the antibodies begin to multiply, after 14-17 days the proliferation reaches a maximum and then their amount decreases again. Deep immunobiological changes occur under the influence of the antigen, and as a result, the organism remains resistant even after the antibody is destroyed. The rate of antibody replication depends on the site of antigen delivery. If it is delivered intravenously, resistance develops quickly. Slow absorption of the antigen leads to prolonged storage of the antibody in the body. Therefore, the antigen is sent by depositors such as bitter, hydroxy alumina. Monoclonal antibodies have now been obtained that can be used to generate passive immunity. It is a chemically pure substance and does not contain foreign protein, so it prevents proteinuria, anaphylaxis and other reactions .

Monoclonal antibodies . The normal immune system produces millions of different antibodieC. But a poor quality myeloma cell of the immune system synthesizes only the same (any immunoglobulin protein) antibodies for a long time. Myeloma cells cannot produce antibodies to a specific antigen used to generate immunity.

1975 G. Kyoler, C. Milstein. (Cambridge, UK) bind myelo ma ma cells to mouse spleen immunized with a specific specific antigen with V-lymphocyteC. The result is hybrid cells (Hybridomas) that produce large numbers of highly specific homogeneous antibodies (monoclonal antibodies) over a long period of time. He was awarded the Nobel Prize in Medicine in 1984.

Later (1980) hybridomas producing human immunoglobulin molecules were obtained by Carlo M. Croche (Philadelphia, USA). This made it possible to obtain B-cell hybrids that continuously produce human antibodies against a number of pathogenic viruseC. Their application in practice increases the effectiveness of immunotherapy.

Interactions of antigens and antibodieC. Antigens and antibodies, like molecules, interact without changing their shape or structure. Immune reactions are specific and take place in two phaseC. First, antigens and antibodies (and their determinants) located on the surface of the microbial cell interact. Antigen and antibodies are attracted by electrostatic (they have opposite charges) and intermolecular forceC. This phase is not visible, but is specific (special). The second phase takes place in the presence of an electrolyte (an isotonic solution of *NaCl*) or a complement.

First, the antigen and antibody adhere to the adhesion, the resulting immune complexes (antigen-antibody) sink to the bottom of the test tube. This can be clearly seen in reactions such as agglutination, precipitation, complement fixation, and so on.

The role of cells and organs of the lymphoid system in the formation of immunity. It is now believed that immunity occurs in the organs of the lymphoid system in the immunocomponent and other cells of the body. Lymphocytes are the main immunocyteC. They are divided into two groups: T-lymphocytes (in the thymus) and B-lymphocytes (in the bone marrow) T-lymphocytes support the body's immunological homeostasis, B-lymphocytes produce antibodies or immunoglobulins that bind to foreign antibodieC. The central and superficial organs of the lymphoid system are distinguished. Central organs include bone marrow, thymus (thyroid gland), Fabrisius bursa in birds (Peyer's plaque in mammals); surface organs - spleen, lymph nodes, blood.

Organs of the lymphoid system. Produces bone marrow, blood and lymphoid cellC. Cells formed in the bone marrow enter the bloodstream and spread throughout the body. After passing through the lymphoid organs, they divide into cells of the immune system (T- and B-lymphocytes). So the marrow is one of the main central organs of the immune system. The thymus is composed of lymphoid tissue. It is well developed in newborns and young animalC. Immunocompetent cells (thymocytes) are formed in the thymuC. The thymus is the organ that maintains the immunological state of the animal organism. It plays a major role in the formation of humoral and cellular immune reactions in mammals.

The fabrisius bursa is located on the dorsal side of the avian cloaca and plays a role in the formation of immunity along with the thymuC. In mammals, peyer's plaques may perform immunological functionC. They are located in the small intestinal wall, thyroid gland, appendix. During infection, they become strongly inflamed and sores appear. Their function decreases with age . When the bursa is removed, the formation of antibodies suddenly decreaseC. The humoral immunological reaction is associated with the Fabrisius bursa, while the cellular immunological reaction is associated with the thymuC. Peripheral lymphoid organs perform the function of the spleen, lymph nodes, blood.

Divorce. When cut, the red and white pulp of the organ is visible. The red pulp contains a large number of erythrocytes, lymphoid tissue in the stream. Lymphatic tissue of the spleen is involved in humoral immune reactionC.

In the spleen, antibodies are formed when antigens are sent into a blood vessel or into the abdominal cavity.

Blood is a liquid tissue composed of plasma and trace elements (erythrocytes, leukocytes and other cells).

The cells that produce immune reactions are called immunocyteC. They start from the marrow. This means that the bone marrow is not only a blood- forming organ, but also a source of lymphoid cellC.

Plasma cells have a basophilic cytoplasm and are round in shape. The main function of these cells is to produce antibodieC. These include macrophages, reticular cells, eosinophils.

Allergy is an increase in the body's sensitivity to these allergens (microbial protein, toxin, drugs, etc.). Allergic reactions can be rapid or slow. In the fast phase, the reaction occurs after a few minutes (15-30), and in the slow phase after a few hours (24-72). Rapid reactions include anaphylaxis, serum sickness, as well as atopy (measles, bronchial asthma), which are more common in humanC.

Anaphylaxis (Greek, " *"* against, *"filaksiya"* means of protection). Increased hypersensitivity of the body to foreign protein (serum, antibiotics) as a result of repeated parenteral administration is called anaphylaxiC. The substances that cause anaphylaxis are called anophyloctogenC.

There are three conditions for anaphylaxis to occur.

1. Sensitization - when the body receives a single dose of serum, it becomes sensitive to this protein.

2. After 10-14 days, the serum should be sent to the body again. If serum is administered daily before the incubation period of 10-14 days, there will be no anaphylaxis.

3. Anaphyloctogen (serum) must be obtained from animals of the same breed.

Disensitization can prevent anaphylactic shock by injecting small doses of serum into the sensitized organism . Cold allergic reactions are observed in animals with tuberculosis, brucellosis and other diseases and persist for 8-10 yearC. It is used for diagnostic purposeC. The allergen is injected subcutaneously, subcutaneously, or into the fall conjunctiva. In sick animals, swelling, pain, fever, pus flow from the inner corner of the eye at the site of allergen delivery. In this allergic reaction, T-lymphocytes are highly sensitive to a specific allergen to which they are sent. The allergen binds to sensitized T-cells at the site of delivery, resulting in the formation of a chemical (lymphokines) and tissue damage.

Idiosinkraziya protein or proteins in nature any harmless substances dusty rose or fell, the dose of toxic chemicals (arsenic, mercury, chemistry), animal and vegetable food products, and the body than others sezuvchanligining ortishidir.Idiosinkraziya rise in body temperature , characterized by conjunctivitis, inflammation of the nasal mucosa, sneezing, itchy skin, various rashes, vomiting, diarrhea.

Practical application of the doctrine of immunity (Immunodiagnostics)

The most commonly used immune reactions are agglutination, precipitation, and complement fixation reactionC. They are all highly specific and are used to diagnose infectious diseaseC. **The agglutination reaction** is one of the first immunological reactions to be widely used in the practice of microbiology. It is used to diagnose diseases such as brucellosis, pullorosis, leptospirosis, as well as to characterize unknown microbial cultures with serums that clearly agglutinate. that is, it reacts with the antigen. This is a specific reaction in which the electrolyte passes through two phases in the medium. First, the antibodies (agglutinins) are adsorbed on the surface of the antigen (microbial cell), then stick together to form granular granules, which fall to the bottom of the test tube and form a precipitate. The result remains a positive when the liquid remains clear. If there are no specific antibodies in the serum being tested, adhesion will not occur, the fluid will be cloudy - the result will be negative. Hence, in the agglutination reaction a) agglutinin-serum immune substance; b) agglutinogen-causing microbe (antigen); c) electrolyte conditions involve -0.85% table salt.

There are several ways to put an agglutination reaction: a test tube, on a glass slide, a drop of blood and a milk ring. It is all based on one principle. The course of the reaction is influenced by the amount of salt in the electrolyte, the concentration of serum, pH, temperature and other factors.

The precipitation reaction is a highly sensitive, very specific reaction. The immune substance that triggers the precipitation reaction is called the precipitate, and the precipitating antigen is called the precipitate.

Precipitating serums have specific properties that mainly affect their antigen. whey is very sensitive. Even if its antigen is diluted 100,000 times in serum, the precipitation reaction is obviouC. In the precipitation reaction, a white-gray precipitate forms in the form of a ring at the boundary between the two liquidC. The precipitogen is temostable and is resistant to temperatures of 100 ^{0}C and above. Precipitation reaction is widely used in veterinary, medical industry. This reaction is used to diagnose anthrax. (leather and fur products). Forensic medical examination determines the type of blood (human, animal, bird). It is used in the food industry to determine the types of fats using the precipitation reaction, to know if artificial honey is mixed with natural honey, and so on. Precipitation is used in the preparation of the precipitation reaction - a special whey (produced in a biofactory), a precipitate (antigen) and a saline solution. The reaction is injected in two ways: a) pouring the antigen over the serum b) placing the serum under the antigen . After a few minutes, a ring forms on the border between the two liquids and appears in the form of a ring. The precipitation reaction looks better if either put in gelatin. In such an environment, the antigen and the antibody move towards each other and meet, resulting in contact precipitation. It appears in the form of arched fuzzy lineC. In this way it is

possible to determine the antigenic content of complex proteins (microbes, serum, animal, tissue). There are various modifications of this reaction.

The complement binding reaction is a very sensitive and specific reaction, consisting of two systems: bacteriological and hemolytic systems in the bacteriological system, specific antigens and antibodies that combine to form a complex. Complement is adsorbed on it. If the antigen and antibody do not combine, the complement will not bind and will remain free. In this reaction, a hemolytic system is used to determine the complement status (free or bound). The hemolytic system consists of erythrocytes of sheep and a special hemolytic serum-hemolysin. The hemolytic system joins the bacteriological system, when the complement is free, the erythrocytes undergo hemolysis and the mixture turns red. This is a negative result. If the complement is bound to the bacteriological system, the erythrocytes will not hemolysis and will settle to the bottom of the test tube. This is a positive result. So, it is a complement that connects the two systemC. Complement is present in the blood of all animals but is abundant in guinea pig serum. Complement serum contains germolabime, which decomposes at a temperature of 56 ^{0}C and loses its activity.

Immunoprophylaxis and immunotherapy. The vaccine is a biological drug used to create artificial active immunity in the body. Vaccines vary in their nature and composition. Live attenuated vaccines, killed (inactivated), chemically associated blood vaccines, as well as anatoxinC. Live attenuated vaccines are obtained by growing microbial cultures in conditions unfavorable to them. Dry-live vaccines are prepared for long-term storage. Examples of live vaccines are anthrax (STI), brucellosis vaccine (strain 19), tuberculosis (BSJ), swine paratyphoid (TS-177), smallpox, rabies, and other infectious diseaseC. Inactivated (killed) vaccines are prepared by heating or chemically neutralizing microbes . Such vaccines are not dangerous, but are less effective than live vaccines (immunity is shorter). Nevertheless, they are still widely used. Examples include vaccines against measles, mumps, sheep and goat hemorrhagic septicemia, and diplococcal septicemia in young animalC.

Chemical vaccines consist of an antigenic complex of microbial cells attached to adjuvantC. As adjuvants, aluminum hydroxide urine, yeast, etc. are used, which enlarge the antigen particles and form a depot at the site of delivery to the body. The antigen is slowly absorbed and the duration of immunity is prolonged. An example of this is the vaccine against the effects of pigC.

Associated vaccines are prepared from a mixture of microbial cultures of various infectious agentC. The association should consist of microbial pathogens that do not lose each other's immunogenic propertieC. It is believed that this vaccine is effective and topical to develop immunity against several diseases at once.

Anatoxins are obtained by adding formalin to exotoxins (solids, etc.) and storing them in a thermostat at 38-40 ^{0}C for several dayC. Anatoxins produce antitoxic immunity. Usually such immunity is maintained for a long time.

Seroprophylaxis and serotherapy. serum is used to induce passive immunity in order to treat and prevent disease. The duration of passive immunity does not exceed 2-3 weekC. serum may contain antibodies against the microbial cell and its toxin. Antimicrobial serums are obtained from the blood of immune animalC. They are used in diseases of anthrax, Aujeszky's disease, salmonellosis, colibacillosis, pasteurellosis and otherC. Antitoxic serums are obtained by hyperimmunization of large horned animals or horses with toxin-producing microbes and their toxinC. The effectiveness of their use for the treatment of diseases in young cattle is good. Immune serums are used for more therapeutic purposes due to the presence of antibodieC. The earlier it is used, the higher the effectiveness of treatment.

Control questions:

1. What is immunity, tell the types of immunity, its essence explain.
2. Explain what antigens and antibodies are.
3. Explain the nonspecific and specific factors of immunity.
4. Allergy, anaphylaxis, idiosyncrasy, their essence and tell the importance.
5. Explain the application of the doctrine of immunity in practice.

Pathogenic cocci

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Problematic report.
Curriculum	1. Expression of pathogenic staphylococci and streptococci. 2. Diagnosis of pathogenic staphylococci and streptococci. 3. Biopreparations
The purpose of the training: to form a holistic view of the characteristics of pathogenic staphylococci and streptococci, their diagnosis and to deepen knowledge.	
Pedagogical tasks: - to explain the role of pathogenic staphylococci and streptococci in the system; - description of the properties of pathogenic staphylococci ; - Description of the characteristics of pathogenic streptococci, coverage; - Explain the diagnosis of pathogenic staphylococci and streptococci; - Description of applied biopreparations ;	*Learning Outcomes:* Students: - state the characteristics of pathogenic staphylococci; - state the characteristics of pathogenic streptococci; - can describe the methods used in the diagnosis of pathogenic staphylococci and streptococci; - Explain on what basis and how the final diagnosis is made in the laboratory; - say the biopreparations used.
Teaching methods and techniques	Problematic, thought attack,
Form of teaching	Frontal
Teaching aids	Lecture text, projector, visual materials, board, chalk
Learning conditions	Equipped auditorium

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Indicates the topic, purpose, and lecture plan. Introduces the results of the training. Announces that this session will take the form of a problem lecture.	1.1. They hear they write.
Phase 2. Basic (65 min.)	2.1. Conducts quick questions and answers on previous topics to determine the adequacy of students 'knowledge in problem-solving research activities. 2.2. What do you think is the role of pathogenic cocci in animal pathology? Offers to solve the problem together. 2.3. Suggests the use of "brainstorming" to increase student engagement (Appendix 14). Any opinion is supported. 2.4. Organizes the discussion of the problem. To do this, small problems to be solved are identified (Appendix 15). 1) the teacher acts as a consultant-arbitrator. 2) Asks additional questions. 3) interprets the answers, draws conclusions, organizes mutual evaluation. 4) selects the most acceptable ideas, comments, motivates the student. Writes a question on the board and asks for an answer in order to check the knowledge gained on the topic. Especially from students who did not participate in the "brainstorming" tries to ask for more	2.1. To the questions they answer. 2.2. Write down the problem they get 2.3. Own solutions offer, exhibitions examples answer using they give. They answer.
Phase 3. Final (10 minutes)	3.1. Summarizes the learning process, summarizes the results achieved. Evaluates the best ideas.	They listen, record tasks for independent work

Key words: *Pathogenic staphylococci, mastitis, endometritis, pneumonia, septicemia, enteritis, purulent inflammation, autovaccine, bacteriophage, streptococcal diseases, infectious mastitis, subclinical mastitis, mute, pneumococcal pneumonia.*

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Question 1. Expression of pathogenic staphylococci and streptococci.

Pathogenic cocci are a class of *Schysomicetes* (bacteria). Staphylococci *belong to the* family *Micrococcaceae , genus Staphylococcus* . Streptococci belong to the family *Streptococcus of the* family *Streptococcaceae* . **They were** first isolated in 1880 by L. Pasteur from human boils, and in 1884 Rosenbach studied and described it.

There are currently more than 20 species of staphylococci: *Staph.aureus, Staph. epidermidis, Staph. saprophyticus* , etc. *Staph aureus* is a pathogen.

The etiological significance of staphylococci in animal pathology is enormouC. They cause mastitis, endometritis in cows, pneumonia in young animals, septicemia, enteritis, purulent inflammation of wounds, abscesses, phlegmon, arthritiC. Causes staphylococcal disease in chickens; The development of botryomycosis leads to shingles - in horses, pigs sometimes after leaching in cattle.

Morphology. Stophylococci are spherical, inactive cocci with a diameter of 0.7-1.0 μm (saprophytes 2-4 μm), gram-positive, no spores, do not form spores, capsuleC. They are arranged in the form of balls of grapes.

Cultural features . Staphylococci grow well in GPB, GPA, selective medium-salt blood GPA (8-10% *Nacl*, 5% defibrinated blood added), pH 7.2-7.4 at 35-37 ◦C, aerobic and anaerobic conditions .

Biochemical properties: Staphylococci break down glucose, fructose, sucrose, maltose, mannitol into carbonic acid. Staphylococci produce urease, catalase, hydrogen sulfide, do not form indole. Melt the gelatin in the form of a funnel. DNA-aza forms the enzyme coagulase.

Resistance. Staphylococci are more resistant to adverse environmental conditionC. Disinfectant solutions of 1% formalin and 2% caustic soda kill them in an hour, and 1% chloramine in 2-5 minuteC. Staphylococci are very sensitive to crystalline violet, pioctanin, malachite blue, their 1: 300000 ratio has a bacteriostatic effect. Staphylococci are also resistant to some antibiotics.

Pathogenicity. The pathogenicity of pathogenic (hemolytic) staphylococci is manifested in purulent processeC. The verulence of isolated pure cultures is determined depending on the toxin-forming and plasmocoagulation propertieC. Pathogenic staphylococci produce different toxins and affect the body differently.

Histotoxin - has lethal and dermonecrotic effectC. Necrotoxin causes tissue necrosiC. Hematoxin - causes hemolysis of erythrocyteC.

Enterotoxin-gastroenteritis occurC. Leukosidine - lyses leukocyteC. In addition, staphylococci form coagulase, under the influence of which the blood plasma coagulates, dissolving fibrinolysin-fibrin.

PathogenesiC. Staphylococci show local purulent inflammation in the animal's body, sometimes with general blood damage.

Antigen structure. Staphylococci have protein antigens that are common to all types and variantC. In pathogens - polysaccharide A antigen, in saprophytes - polysaccharide B antigen, as well as a special polysaccharide C antigen. Staphylococcal enterotoxins are divided into serovars A, B, $C_{1,}$(C_2), D and E according to antigenic structure .

Immunity is antitoxinouC. The use of anti-staphylococcal antitoxin serum is highly effective.

DiagnosiC. Wound exudates, pus, mastitis-milk, endometritis-genital discharge, septicemia-blood are taken from sick animals for examination. Patmaterial is tested in the laboratory in three stageC. 1) smear prepared from microscopy-patmaterial, stained by Gram method, viewed under a microscope: 2) Study of cultural, biochemical properties of patmaterial in nutrient media; 3) biosinov is placed.

Biopreparations are used in chronic processes with staphylococci. Autovaccine is a suspension of agar microbial culture isolated from the diseased organism boiled at 70-75 ^{o}C for 1-1.5 hours **.** Local antiviral-2-3-week broth culture of staphylococci and staphylococcal bacteriophage are used.

Question 2. Diagnosis of pathogenic staphylococci and streptococci

Properties and diagnosis of pathogenic streptococci. There are currently 21 species of streptococci. The following pathogenic types of streptococci are common. *Str.agalactiae (Str.mastitidis), Str.equi, Str. pneumoniae, and from* saprophytes lactic acid streptococci- *Str. lactis, Str. crimoris, Str. Salivaris* et *al* .

There are 17 groups of streptococci on a specific polysaccharide antigen detected in the precipitation reaction.

Streptococci cause infectious mastitis in cows, mute horses, pneumococcal pneumonia in young animals, and septic disease-streptococcosis in pigs and poultry. Sometimes streptococci aggravate viral diseases.

The causative agent of infectious mastitis - *Str. agalactiae* .

Morphology. In acute mastitis, more short chains are seen in milk-based ointments, while in chronic mastitis, cocci consisting of long chains are seen. Gram-negative, immobile, does not form spores and capsules, diameter 0.5-1 μm.

Cultural featureC. *Str.agalactiae grow aerobically* , at 37-38 °C in normal nutrient media at pH 7.2-7.6 GPB, GPA less.They grow well in serum media.

Biochemical properties - low activity of pathogenic streptococci. It does not dilute GPJ, it forms acid in litmus milk and fermentes it, it breaks down carbohydrates to form acid.

Durability. Streptococci are stored in the environment for 2-3 months in a slightly resistant, dried pus exudate . When milk is heated to 85 °C, it kills in 30 minutes, 2% sodium hydroxide, 1% formalin in 10-15 minuteC. Freezing preserves it.

Pathogenicity .Mastitic streptococci produce several toxins .

The pathogenesis is characterized by the effect of streptococcal toxins and enzymes on the udder tissue and the whole organism **.** Streptococci multiply in the mucous membranes and cause catarrhal-purulent inflammation. It penetrates deep into the tissue and causes purulent processes.

Antigen structure was studied on the basis of agglutination and precipitation reactionC. There is a protein shell antigen, a capsule polysaccharide antigen.

Immunity - is characterized by antitoxin and antibacterial factors.

The dumb causative *agent* **is** *Str.equi* (Shyuts, 1888). Dumbness is an infectious disease of young ungulates, characterized by catarrhal-purulent inflammation of the upper respiratory tract, submandibular, pharyngeal lymph nodes (abscess, manifested by runny nose).

Morphology. In greases prepared from *pus, Str.equi* is placed in the form of a long chain of coke. When prepared from culture, it is short and even in the form of diplococci. Gram-positive, inactive, does not form spores, capsuleC. The diameter of the cocci is 0.4–1 μm

Cultural features . The pathogen grows in the Kitt-Tarossi environment, with the addition of serum or fibrin-free blood. It grows in the liquid medium on the wall, at the bottom, in the form of small granuleC. In bloody agar, a B-hemolysis zone is formed.

Biochemical properties - does not ferment milk and litmus milk, does not discolor methylene blue, does not break down lactose, sorbitol, mannitol.

Resistance to infection faeces 6 months, 1 month saqlanadi.70 °C for 1 hour, 85 °Cda 30 minutes, 1%, 2% caustic sodium formaldehyde to kill 10-25 minutes.

Pathogenicity and variability . A young ungulate with a mute disease. In the laboratory, cats and mice are prone to disease. Dumb streptococci are very

variable, they lose their virulence in the first generation, and atypical forms appear, which can be located in one, two or balls at a time.

PathogenesiC. Horses infected with malnutrition become carriers of streptococcuC. Their young are damaged by the mouth or nasal mucosa, the pathogen accumulates in the lymph nodes of the throat and develops catarrhal-purulent inflammation.

Immunity is maintained for a lifetime in cured animalC. Artificial immunity cannot be developed with the help of a vaccine.

Diagnosis is made by microscopy, bacteriology, biosinov methodC. **Biopreparations** have not been developed. Antibiotics are used for treatment.

Streptococci causing diplococcal infection.

Str.pneumoniae (diplom.septicum, diplom.lanceolatus). Diplococcus was discovered by L. Pasteur in 1871. The disease occurs in young animals in the form of lungs or intestineC. Animals become ill at 2 to 4 weeks of age.

Morphology . In greases made of patmaterial, the exciter is located in the form of a pair of cocci. In chronic processes, the microbe settles in the form of diplostrepto cocci. Gram-negative, capsular, immobile, does not form sporeC. Capsules are not formed in cultureC. It is placed in the form of short chains in greases prepared from the culture. The size of the cocci is 0.5–1.5 μm. Forms a capsule in the animal's body.

Cultural features . *Str. pneumoniae* grows under aerobic and anaerobic conditions at 37 °C. In serum GPB, uniform turbidity, less sedimentation is formed. in serum GPA form small dewy colonies, colonies with a zone of hemolysis in bloody agar.

Biochemical properties . *Str. Pneumoniae* breaks down carbohydrates - glucose, lactose, sucrose, salicin, inulin, maltose. It does not dissolve gelatin, does not form indole, does not ferment milk. Pathogenic pneumococci are soluble in bile fluid, bile salts.

In resistant soils, manure and cattle streptococci die in 3–4 weeks, are strongly affected by sunlight and construction. Disinfectant solutions kill them in 1-2 minutes.

Pathogenesis . Virulent diplococci secrete toxins when they enter the respiratory organs, digestive tract, uterine mucosa, or udder and adversely affect phagocytosiC. as the toxins increase the permeability of the blood vessels, the tissues swell and hemorrhages occur. Diplococci multiply in the blood and cause septicemia, causing the death of young animalC. **Antigen structure.** There are several types of pneumococci that can be detected in an agglutination reaction. Common protein group antigens and type-specific capsule lasa polysaccharides that differ in chemical structure and antigenic properties have been identified.

Immunity is mainly antitoxin in diplococcal infections, it acts against toxins in its capsule and cytoplasm, which are released by microbes into the external environment.

DiagnosiC. Their secretions and blood are taken from sick animalC. Fragments, blood and pus are taken from the affected part of the dead animal's body or lungs, spleen. In the laboratory it is examined by microscopy, bacteriology, biosinov methodC.

Biopreparations . Formal vaccine against diplococcus, serum is used. Three immunogenic strains isolated from calves, lambs, and piglets are used to prepare the vaccine or hyperimmune serum. For treatment, serum is administered intramuscularly to young animals at a dose of 0.5-1 ml / kg. Serum is effective when used in combination with antibiotics (penicillin, streptomycin).

Question 3. Biopreparations

Biopreparations are used in chronic processes with staphylococci. Autovaccine is a suspension of agar microbial culture isolated from the diseased organism boiled at 70-75 °C for 1-1.5 hours **.** Local antiviral-2-3-week broth culture of staphylococci and staphylococcal bacteriophage are used.

No biopreparations have been developed for infectious dumb disease in ungulateC. Antibiotics are used for treatment.

No biopreparations have been developed for infectious mastitis.

For the prevention of streptococcal diseases of young animals are used anti-diplococcal formolvaccine, serum.

Three immunogenic strains isolated from calves, lambs, and piglets are used to prepare the vaccine or hyperimmune serum. They are grown in nutrient media in reactors and neutralized with formalin. Whey is prepared by hyperimmunization of bulls with live diplococcal culture.

The vaccine against diplococcal septicemia in calves, lambs and piglets is prepared from a *strain* of *C. pneumoniae* isolated from them . The culture is grown on semi-liquid agar, a 0.4% solution of formalin is diluted, sterility, sterility (in guinea pigs), activity (in white mice) are checked.

Paratii, pasteurellosis and diplokokkovaya septisemiyaga part of assosiirlangan (polyvalent) vaccine against *Pasteurella multocida* and *Salmonella choleraesuis C. pneumoniya* in addition to the bacterial mass.

For treatment, serum is administered intramuscularly to young animals at a dose of 0.5-1 ml / kg. Serum is effective when used in combination with antibiotics (penicillin, streptomycin).

Formal vaccine against diplococcus, serum is used. Three immunogenic strains isolated from calves, lambs, and piglets are used to prepare the vaccine or hyperimmune serum. For treatment, serum is administered intramuscularly to young animals at a dose of 0.5-1 ml / kg. Serum is effective when used in combination with antibiotics (penicillin, streptomycin).

Pasteurellosis, the causative agent of jaundice

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. Expression of the causative agent of pasteurellosis and laboratory diagnosis. 2. Expression of the causative agent of Saramas disease and laboratory diagnosis. 3. Biopreparations.
The purpose of the training: to form and deepen students' knowledge about the characteristics of the causative agent of pasteurellosis and laboratory diagnosis, the biopreparations used in it.	
Pedagogical tasks: - Introduction to the history of the pathogen, its place in the system, the definition of the disease; -explain the morphology, cultural and biochemical properties of pasteurella; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - training to make a final diagnosis;	*Learning Outcomes:* Students: - Describe the history of the pathogen, its place in the system, the disease; - describe the morphology of pasteurella; - Explain the cultural and biochemical properties of pasteurella; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - Explain with examples what is the basis for the final diagnosis.
Teaching methods and techniques	Visual lecture, "reading together", insert, presentation, test, practical assignments, blitz-questionnaire
Form of teaching	Collective, group, frontal.
Teaching aids	Lecture text, projector, board, chalk, KT-O'TV,
Learning conditions	Audience equipped with KT-O'TV

Technological map of the lecture

Stages of work and time	Activity content	
	educator	learners
Phase 1. Training training introduction (10 minutes)	1.1. Informs that the lecture will take place visually. 1.2. Introduces the topic, its purpose, plan and learning outcomes, lesson plan plan. Handouts will be distributed to reinforce the lesson. 1.3. Conducts quick questions and answers in order to clarify and activate knowledge on the topic. (Stage 1 of the course process This survey is also needed to determine the effectiveness of the course. 1.4. Announces that the lesson will be in the style of an analytical lecture.	1.1 They Hear, write, distribution with materials get acquainted, they answer
Phase 2. Basic (55 min.)	2.1. The lecture will be given using visual materials displayed on the screen. 2.2. Questions on basic basic questions will be answered. 2.3. Summarizes the topic, draws conclusions. 2.4. Divide students into groups of no more than 10 in order to activate students, requiring a clear solution; problematic questions are asked that encourage thinking and observation.	2.1. By groups discuss questions is done and answered they give. 2.2.Hear, own actively participate with their thoughts and questions. 2.3. The answer to the question they give.
Phase 3. Final (15 minutes)	3.1. Conducts test questions and answers on the acquired knowledge and announces the results of the general control. 3.2. Provides a task for independent work.	Solve the test and take the assignment

Basic terms: *anthropozoonotic disease, cultural characteristics, selective environment, microaerophilic, incubation period, bacterial carrier, polymorphic, deposited vaccine, hemorrhagic inflammation, aerobic, facultative anaerobic, pathogen resistance.*

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Question 1. Expression and laboratory diagnosis of pasteurellosis pathogen.

Pasteurellosis is a disease common in most agricultural, wild animals and poultry, characterized by septicemia and hemorrhagic-inflammatory processeC. Sometimes in the form of semi-acute and chronic or secondary disease aggravates viral (swine fever) and bacterial infections.

The causative agent is *Pasteurella multocida, a member of the genus Pasteurella* . This generation, as well as *P. haemolytica*, *P.pneumotropika* and *P.ureae* C. Hemolytic pasteurellae cause pneumonia in large horned animals, sepsis in lambs , *and P. multocida* - pasteurellosiC. Pasterella was first identified in 1880 by L. Pasteur.

Morphology. In stamped greases made from gram-stained organs and blood, the stimulus is in the form of small, short, gram-negative, twisted rods measuring 0.3x1.5 μm. Leffler, Romanovsky - When dyed in the Gimza methods, their bipolarity (the ends of the bacterial cell are intensely dyed) is well manifested. Forms capsule, motionlesC.

Cultural and biochemical propertieC. Pasteurella is aerobic and facultative anaerobic, grows well in 24-28 hours at an optimal temperature of 37-38 ^{0}C, pH 7.2 -7.4. GPA grows well in GPBs, especially in bloody GPA, serum GPA or GPB. **Durability.** Pasteurella dies quickly when dried, exposed to high temperatures and sunlight. 5-10 minutes at 70-90 ^{0}C. At 58 ^{0}C for 20 minutes, it dies instantly when boiled. Disinfectants - phenol, cresol, chlorinated lime, formalin, etc. have a strong effect. Pasteurellas are sensitive to antibioticC.

Pathogenicity. The pathogenicity and virulence of the pathogen are variable. Sometimes cultures isolated from material obtained from a dead animal 6-9 hours later have a virulence 10 times stronger than those isolated from material obtained immediately after death (in white mice).

PathogenesiC. Pasteurellosis occurs spontaneously - as a result of carriage or passes through sick and diseased animalC. The incubation period can be up to 15 dayC. The development and course of the disease depends on the condition of the animal and the virulence of the pathogen.

Antigen structure. - *P. multocida* has two antigens : capsular (*K* -antigen) and somatic (*O* -antigen) *K* -antigen are divided into 4 serological types according to Carter: A, B, D and E. *K* -antigen to the smooth variant (*S*) are related, and the broad (*R*) and (*M*) do not occur in mucoid formC. *K* -antigen consists of protein and polysaccharides, *O* -antigen lipopolysaccharide protein complex.

K - and *O* - antigens play an important role in the formation of **immunity** . Nosteril immunity develops when the patient recovers or is vaccinated. Therefore, animals remain pasteurella carriers.

DiagnosiC. For bacteriological examination, the body of small animals or the liver, spleen, kidneys, lymph nodes, blood from the heart, bone marrow are sent to the laboratory.

Greases are prepared from patmaterial, stained by Gram, Romanovsky Gimza methods and viewed under a microscope. Nutrient media are planted on GPA, GPB, and the pure culture of the pathogen is isolated and the cultural properties are studied. Patmaterial suspension or culture is obtained from large horned animals, pigs, sheep, white mice, rabbits; and from chickens - pigeons, chickens, ducks are affected.

The duration of laboratory testing is 7-10 dayC.

Pathological material. Liver, spleen, kidneys, lymph nodes, heart, bone marrow are sent to the laboratory for examination. On hot summer days, when the distance is long, the patmaterial is preserved in a 30% aqueous solution of glycerin. The bone marrow is wrapped in gauze soaked in 5-10% formalin solution. The carcasses of small animals are sent.

1. Microscopy. Made of patmaterial, Gram-stained greases are gram-negative bacteria in the form of small, short rods (0.25 -0.5 x 2 μm) with twisted endC. In greases painted in the Leffler blue or Gimza method, the pasteurels appear bipolar (the ends of the bacteria are intensely stained). In greases prepared from the culture, coccygeal or short-stemmed bacteria, sometimes in the form of short chains, appear one by one. Some newly isolated virulent strains form capsuleC. The capsule looks good when dyed in special ways (Mixin). Inactive, does not form sporeC.

2. Bacteriology. *P. multocida* - grows under aerobic conditions, at 37-38 ^{0}C, at GPAs and GPBs with a pH of 7.2-7.4. But it grows better in bloody GPA, whey GPA or GPB. Seedlings planted from patmaterial are grown in a thermostat for 24-48 hours . If there is no growth, the seedlings are stored in a thermostat for 4 - 5 dayC.

GPA da- pasterellas in the form of small, smooth, embossed, clear, round, smooth (*S*- shaped) gray-white colonies, sometimes large, slimy (*M* -shape) or unevenly expanded, colonies (*R* -shape) growC. *P. multocida* does not have hemolytic propertieC.

In GPB, the medium is uniformly turbid and forms a slimy precipitate (Fig. 79). When seen, the sediment rises in the form of "cut hair" (*S*- shape), mucoid strains grow intensively and form a lot of slimy sediment *(M*- shape), the environment in *R* -shaped strains does not blur, a fine-grained precipitate is formed. In GPJ, first separate colonies grow, then like a tumorless white stem

P. multocida breaks down glucose, sucrose, sorbitol, and mannitol to form a non-carbonic acid. Lactose does not break down dulcite, does not ferment milk,

does not form indole. The presence of somatic and capsular antigens has been identified.

3. Biosinov. White mice and rabbits are affected by the material being examined from cattle, pigs, and sheep. The material is injected subcutaneously in a dose of 0.2 ml for white mice and 0.5 ml for rabbitC. Rabbits are first tested for pasteurellosis - for 3 days, 2 drops of 0.5% brilliant green aqueous solution are instilled into their nasal cavity. Leakage of purulent discharge from the nasal cavity indicates pasteurellosis carrier. It is impossible to put biosi-nov in them. Poultry are infected with the test material by sending 0.3 ml of suspension between the muscles of pigeons, chickens, duckC. As a result, the animals in the biosynthesis die in 18 to 36 hourC.

The result is positive:

If a culture of gram-negative, capsule-forming, immobile rod-shaped bacteria is isolated from the pathological material ; if they break down glucose, sucrose, sorbitol and mannitol, do not form indole, if their virulence is confirmed in biosynthesiC.

Question 2 - Expression of the causative agent of Saramas disease and laboratory diagnosis.

Swine fever - zooanthroponosis is an infectious disease characterized by the presence of septicemia and inflammatory erythema in the acute course, endocorditis and arthritis in the chronic course. Pigs from three months to one year of age , lambs older than three to four weeks are sick. The disease is rare in other specieC. People get sick too.

The causative *agent of* swine *fever* is *Erysipelothrix rhusiopathiae,* belonging to the genus *Erysipelothrix* (*erisipelotrix*). It was discovered by Pasteur in 1882.

Morphology. *E. rhusopathiae* is a polymorphic, short 0.2 -0.3 x 0.5 -1.5 μm short rod, single or chain-shaped. Inactive. Does not form spores or capsuleC. Grammusbat. In old cultures, as well as in ointments prepared from damaged valves of the heart in the form of long threads, in ointments prepared from the kidneys, liver, spleen, the bacteria are located one, two or in a ball. Greases stained with fluorescent serum give light (radiation) +++ in the characteristic contour characteristic of yellow bacteria, the result is positive.

Cultural features . *E.rhusiopathiae* microaerophilic (5-10% CO_2), aerobic. GPB, GPA, GPJ, semi-diluted agar, serum, carbohydrate media, elective medium in the environment of St. Ivan (GPA containing 0.1 crystalline violet and 1% sodium azide), at pH 7.2-7.6, 37 ^{0}C Grows in 18-24 hourC. Less blur occurs in the GPB. After 48-72 hours, the environment calms down and a precipitate forms, rising like a cloud when you stumble. In GPA, they form clear, dew-like (*S*-shaped) colonies, but the *R* -shape is also common - they form colonies with large, uneven surfaces and root-like growths at the edgeC. Such colonies are

isolated when the disease is chronic. After 6-10 days in GPJ horizontal tumors appear, gelatin does not dissolve.

Biochemical properties . The causative agent Saramas releases hydrogen sulfide H_2S , does not form catalase, breaks down glucose, lactose into a non-gaseous acid, does not break down sucrose, mannitol.

Durability. *Although E. rhusiopathiae* does not form spores, it is resistant to environmental influenceC. They fixed liquid ampoules of 17-38 years, in an environment marked by several months, 73 days, 108 days in soil, water, land bacterium 3 weeks yashaydi.Saramas 50 ^{0}C at 15 to 70 ^{0}C for 5 minutes, thick slices of meat dies after 2.5 hours of boiling. Conventional disinfectants give good resultC. They are sensitive to ultraviolet light.

Pathogenicity. Saramas bacteria are naturally pathogenic to pigs, lambs, calves, poultry, fish, squid, deer, and humanC. White mice and pigeons are prone to artificial damage.

PathogenesiC. The pathogen enters the body through the alimentary canal, through the damaged bloodstream. After a few days, it passes through the protective barrier, into the bloodstream, where it develops and spreads throughout the body. Septic processes occur. The result is a feverish reaction, impaired tissue metabolism, dystrophic and necrotic changes in the parenchymal organs and the cardiovascular system, resulting in thrombosis, edema and death.

Antigen structure. Saramas bacterium has two antigens: thermolabile group and thermostable type. Based on serological tests (PR, AR, GAR) , two serovars were identified. Serovar *A* and *B* .

Immunity. Sick and cured pigs develop strong immunity. **DiagnosiC.** Bacteriological diagnosis consists of bacterioscopy, isolation of pure culture and biosynthesiC. Spleen, liver, kidney, bone marrow, skin (in case of rash), heart (in endocarditis), unopened joints (in arthritis) are sent to the laboratory for examination. The material is freshly preserved in a saturated solution of 30-40% glycerin or NaCl. The bone marrow is cleaned of flesh and wrapped in gauze moistened with 2% phenol.

Greases are prepared from new patmaterial, stained by Gram method and viewed under a microscope. Nutrient media are planted in GPA, GPB larvae. Prepare a suspension with saline solution in advance and inject 0.1-0.2 ml under the skin of white mice weighing 16-18 g. Pigeons can also be used for this purpose. As a result, the animals in the biosynthesis die in 2-4 days.

Serological tests are mainly performed to detect chronic and latent forms of sera. For this purpose, test and drip AR methods are used. When the reaction is applied dropwise, one drop of blood (0.004-0.006 ml) or one drop of serum (0.002-0.003 ml) is dropped onto a non-greasy dry object glass and mixed. The alcohol is heated slightly over a flame and shaken. Positively, small or large granules appear in 1-2 minuteC. The result is displayed on a black background.

Serum reaction in a test tube 1:50; It is diluted in a ratio of 1: 100. Agglutinins appear on days 2-5 of the disease and remain in the blood of recovered

animals for 2-3 weeks; It should be borne in mind that diagnostic tests can be performed only after 2 months after vaccination of pigs, and if the serum is sent - after 1 month.

Pathological material . Fragments of the animal's body or parenchymatous organs (heart, liver with gallbladder, spleen, kidneys), bone marrow, are sent to the laboratory for examination . When a chronic form of the disease is suspected, blood is sent from the heart and endocardium, joint fluid in arthritiC. If necessary , the organ parts are preserved in a saturated solution of 30% glycerin or salt. Separating the bone marrow from the soft tissue, a 2 - 3% phenol solution is wrapped in a soaked gauze.

1. Microscopy. Stamped greases are prepared from patmaterial and painted by Gram method. The causative agent of Saramas is a rod - shaped bacterium that does not form spores, capsules , is immobile, gram-positive, single, double or ball- shaped . Dimensions 0.2-0.3 x 0.5-1.5 μm. In the data given in some literature, the length ranges from 2 to 2.5 micronC. The ointment prepared from the damaged heart valves is placed in the form of long threads (Fig. 83.84). Can also be dyed with fluorescent serumC. In luminescent microscopy, a yellow light emits a special radiation with an intensity of not less than three targets (+++).

2. Bacteriology . GPB, GPA, GPJ are transplanted from pathological material . Seedlings are grown in a thermostat at 37 ^{0}C for 18-24 hours, if there is no growth, they are left for another 24 hourC. *E.rhusopathiae* aerobic, microaerophilic (grows well in 5-10% CO_2).

In GPB - the environment is slightly blurred. After 48-72 hours it settles and a precipitate forms at the bottom of the test tube . It rises in the form of a thin cloud when it stumbles .

In GPA, the yellowish pathogen forms small, transparent, dewy colonies (*S* -shape). *R* - form a large, protruding from the surface is uneven edges colonies - the disease (chronic passed) . Sometimes intermediate colonies are also formed.

When planted vertically on the GPJ does not dilute it, after a few days it grows in the form of a «round wire brush».

Biochemical properties - the causative agent releases hydrogen sulfide, does not form catalase. Steaming glucose, lactose, galactose forms acid, gas, does not break down sucrose, mannitol, salicylic acid.

Serological differentiation. On the glass of the appliance is placed AR with yellow whey in a ratio of 1:50 in a drip method . A culture grown on a one -day GPA is used. If there is a yellowish pathogen, dense, fine, granular agglutinate will form.

3. Biosinov . Placed on pigeons and white mice. Pigeons are given a dose of 0.2 - 0.3 ml, under the skin of white mice weighing 16-18 g - a suspension of patmaterial in a dose of 0.1 - 0.2 ml or a suspension of culture for 1-2 days grown on GPA . As a result, infected pigeons die after 3 - 6 days, white mice after 2-4 dayC. Biosinov is observed for 7 dayC.

The diagnosis is considered to be :

1. If the fluorescent microscope detects the causative agent in patmaterial, greases prepared from mixed culture (even if pure culture is not isolated);

2. Separation of pathogenic culture from the material ;

3. If the animals in the biosynthesis die and a culture of the yellow pathogen is isolated from their organs (even if the primary pathogen is not isolated).

BiopreparationC. Concentrated hydroxyalumin formol vaccine against swine fever.

A deposited vaccine against swine fever (live culture was used).

The dry lyophilized live vaccine against swine fever was prepared from the culture of the .VR-2 vaccine strain .

Pigs erysipelas disease - preventive therapeutic serums: giperimmunlab pigs; sterility, innocuousness, and activity in white mice are controlled. 0.01; At doses of 0.02 and 0.03 ml, mice are considered active if they do not die.

Saramas's luminescent dry whey was developed for the direct im-monofluorescence method . Intended for serological comparison of the pathogen in greases prepared from culture and material.

Question 3. Biopreparations.

BiopreparationC. Currently, killed and live vaccines are used to prevent pasteurellosis in animalC. In recent years, emulsified vaccines have been introduced into veterinary practice against animal and poultry pasteurellosiC. Immunity lasts 6 to 12 monthC.

The Uzbek Veterinary Research Institute has developed a polyvalent radio vaccine against pasteurellosis, salmonellosis and colibacillosis of farm animals from local strainC. Immunity lasts 6 to 12 monthC.

Polyvalent hyperimmune blood serum has been developed against pasteurellosis, salmonellosis and colibacillosis of farm animals .

Formal vaccine with hydroxyalumin was developed against sheep pasteurellosiC. These biopreparations are widely used on farms and effective results are being achieved.

Immune serums are used on farms when a disease occurC. Therapeutic drugs are antibiotics and sulfanilamide drugs.

BiopreparationC. The first live vaccine against swine fever was created in 1883 by Pasteur and Tyulye by attenuating (weakening) the bacterium. Several types of vaccines have now been developed: the deposited vaccine, the live vaccine prepared from a weakened VR 2 strain, and the dry vaccine VR 2, a concentrated hydroxyaluminum formol vaccine made from a culture of reduced virulence. Pigs are vaccinated at 2 months of age, 15-20 days before the mother pigs escape. Immunity appears in 8-10 days and persists for 6-8 months.

Immune serums against scurvy are obtained by hyperimmunization with pig, horse, sheep stimulation chi culture. Sterility, sterility and activity are checked. To test for sterility, the serum is inoculated with GPB, GPA and meat-peptone liver broth under Vaseline oil. If the implants remain sterile for 10 days at a temperature

of 37 ^{0}C, the whey is considered valid. the serum is administered subcutaneously at a dose of 0.5 ml and 10 ml per guinea pig to check for innocence. These animals must survive for 10 dayC. To test for activity, serum is injected into the abdominal cavity of white mice in doses of 0.01, 0.02, 0.03 ml (three white mice each). After 1–1.5 h, vaccinated and controlled mice were injected subcutaneously at a dose of 0.001–0.002 ml of a virulent daily culture of erysipelas . Controlled mice die in 3–4 dayC. If all serum-fed mice survive or die when only 0.01 ml of serum is delivered, the serum is considered active.

Whey canned with phenol or quinazole can be used for up to 4 yearC. It is used for the prevention and treatment of disease. Immunity is maintained from 14 days to one month. The use of antibiotics in combination with serum gives good results.

Control questions:

1. State the characteristics of the causative agent of pasteurellosis.
2. What is the laboratory diagnosis of pasteurellosis?
3. How to put biocides in pasteurellosis ?
4. Biopreparations used in pasteurellosis.
5. State the characteristics of the causative agent of Saramas.
6. What materials are sent to the laboratory for testing and how are they tested?

Colibacillosis, the causative agent of salmonellosis

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics and laboratory diagnosis of the causative agent of colibacillosis. 2. General characteristics and laboratory diagnosis of the causative agent of salmonellosis. 3. Biopreparations used.
The purpose of the training: to get acquainted with the characteristics of the causative agent of colibacillosis , methods of laboratory diagnosis, final diagnosis, the biopreparations used.	
Pedagogical tasks: - Introduction to the history of the pathogen, its place in the system, the definition of the disease;	*Learning Outcomes:* Students: - Describe the history of the pathogen, its place in the system, the disease; - describe the morphology of pasteurella;

-explain the morphology, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - training to make a final diagnosis	- explain the cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - Explain with examples what is the basis for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, wet preparations, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. - What disease is colibacillosis? "Do people get sick, too?" - What is the name of the pathogen? - What are its features? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he puts forward the problems of laboratory diagnosis of the pathogen, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - What is the final diagnosis based on?	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get

	- What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the causative agent of colibacillosis illuminate its importance in laboratory diagnosis, explain the biopreparations used for diagnosis, prevention and treatment.	
Phase 3. Final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	They hear. They ask questions.

Key **words:** *Escherichia coli, E.coli, septic, enterotoxic, meat peptone agar, broth, endo media 08, 09, 0101 strains Foges - Proscauera reaction, culture suspension, parenchymatous organs, serological diagnostics, differential differential , microscopy.*

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Question 1. General characteristics and laboratory diagnosis of colibacillosis .

According to the latest classification (1984), the family *Enterobacteriaceae* includes 14 genera. They are similar in morphological, tinctorial and cultural properties, differing in enzymatic, i.e. biochemical propertieC. Of these , *Escherichia, Salmonella, Prote us, Yersinia* are more important in animal pathology . Enterobacteriaceae are very common in nature. These include pathogenic, conditionally pathogenic, and saprophytic specieC.

Colibacillosis is an acute, contagious disease of young animals, characterized by severe diarrhea, weakness, and death. It manifests itself in three forms - septic, enterotoxemic, enteritiC. Calves become ill in a few days, in the first days of life of piglets, after weaning - from the birth of lambs with signs of edema to 5 - 6 months of age.

The causative agent is *E. coli* (*Escherichia* coli) belonging to the genus *Escherichia* . In 1885, Escherich separated *E. coli from* human feces - a

constant in the colon of humans, animals and birds, fish, reptiles, amphibians and insectC. Occurs in soil, water, various objectC.

Morphology. *E. coli* polymorphic, small coccobacteria (0.2-0.5 μm), thick, large, twisted, gram-negative (pink - red) rod-shaped bacteria, 1 - 3 μm long, width 0.8 μm., does not form sporeC. Placed one by one. Only strains 08, 09, 0101 form capsuleC. There are active and inactive species .

Cultural features . Escherichia coli is aerobic or facultative anaerobic. The optimum temperature for growth is 37 - 38 °C, pH 7.2 - 7.5. Grows well in normal nutrient environmentC. In the GPB a uniform turbidity, a rapidly dispersing precipitate is formed. At 16 to 20 hours in GPA, moist, round, smooth-edged, smooth-surfaced, gray colonies form. In a bloody GPA, a hemolysis zone is formed around the colony . In the endo environment it forms reddish-dark glowing, pink colonieC. Dark blue or black colonies are formed in the Levina environment.

Biochemical properties . *E. coli* breaks down maltose, mannitol, lactose into acids and gaseC. Sucrose does not always break down. Forms indole, does not dissolve gelatin, does not form hydrogen sulfide, ferment milk, positive with methylrot, reacts negatively with Foges-Proscauera.

Resistance *E. coli* is resistant to high temperatureC. Dies in 15 minutes at 60 °C and instantly at 100 °C. Many disinfectants - formalin, phenol, caustic soda, lime - have a strong effect on them. Can be stored in water and soil for several monthC. Resistant to penicillin.

In 1925, A. Gracia found a substance called colicin in the culture of Escherichia coli - similar to the antibiotic substance. It stops the growth of homologous strains of Escherichia coli. Escherichia coli produces more than 24 types of colisin.

Pathogenicity . In domestic and laboratory animals, the disease can be caused artificially by sending them a large amount of freshly isolated culture.

Antigen structure . *E. coli* has *O* -, *K* - and *H* - antigenC.

Diagnosis . For laboratory examination, the body of a newly dead animal or bone marrow, a piece of liver with a gallbladder, spleen, kidney, heart, intestinal lymph nodes, a piece of small intestine tied on both sides (it is another piece) placed in a container). Sick animals are sent to the rectum with the feces.

Patmaterial presented in the laboratory is examined by microscopy, bacteriological, serological, biological methods.

In calves, lambs, piglets, chickens - 08, 09, 015, 078, 086, 0101, 041, 0115, 0117, 0119, 02,026, etc. serogroups are found.

Biopolymers - giperimmun, gamma globulin, serum poliva lent serum concentration of assosirlangan vaccines, koliprotektant, colitis silage.

Colibacillosis of calves is very common in all countries, including Uzbekistan, and causes great economic damage. Serogroups 08, 09, 015, 078, 086, 0101, 041, 0115, 0117, 0119, 0137, 02, 026, 020, 0127, 055, 035 are common in

calveC. Some of them (026, 055, 086, 0119, etc.) are causative agents of young children's colitis.

PathogenesiC. Calves are mainly affected by food. The nose can also be damaged through the throat or in the mother’s womb. There are two main forms of colibacillosis - enterotoxemic (more common) and septicemic. In the enterotoxic form, escherichiae multiply and develop in the small intestine, the spleen. There, too many exoenterotoxins accumulate in the bacterial biomass, releasing endotoxins from dead bacteria and triggering a local inflammatory procesC. In addition, endotoxins pass into the lymphatic system and the calf dies shortly from toxemia. In septicemia, Escherichia coli first passes from the intestinal wall to the lymph nodes, then into the general lymph flow, leading to enteritis and sepsiC. The intestinal form of colibacillosis is called Escherichia coli, which produces more thermolabile and thermostable exotoxinC.

According to many authors, age-related anatomical and physiological features are important in the pathogenesis of colibacillosis: low acidity of gastric juice, increased permeability of intestinal epithelium, decreased resistance of lymph nodes and liver , low or no gamma globulin in the blood. Severe course of colibacillosis during mass childbirth is characterized by an increase in virulence of the pathogen from calf to calf. Delayed delivery of cow's milk also leads to the development of the disease.

Immunity. In unhealthy farms, calves are given gamma globulin on the first day. Calves older than 10-14 days have a natural immunity to colibacillosis.

Diagnosis is based on the results of microscopic, bacteriological, serological, biological tests in the laboratory. The sensitivity of the isolated culture to antibiotics is determined at all times.

BiopreparationC. Newborn calves are given hyperimmune serum or gamma globulin (subcutaneously, intramuscularly, intravenously, orally) to prevent disease.

Vaccination of pregnant cows is also very effective. In doing so, the calf receives special antibodies with uvuz. Colostral immunity is maintained for 2-3 weeks as well as serum immunity. In our country , a coli-salmonellosis vaccine has been developed that kills many strains of *E.* coli and cultures of several salmonella strains with formalin. Calf cows are vaccinated twice between 10-14 dayC. VIEV coliprotectant (Escherichia coli killed by heating) has been suggested to be given to calves several times with cow's milk during the first feeding.

Polyvalent coli-gertner-phage has also been successfully administered to calves by enteral, subcutaneous, and intramuscular injection. Its effectiveness is further enhanced when used with antibiotics or sulfanilamide, nitrofuran drugs.

In Uzbekistan, VITI has developed an associated radiovaccine against calf colibacillosis and salmonellosis, hyperimmune serum. They O'zbyokistonda calves, the persistence of *E. coli* and *salmonella* strains used, with great succesC.

Lambs are infected with **colibacillosis** in Uzbekistan from the first days and first months of life to 5-6 monthC. The disease takes an acute, septic form. They

mainly contain 08, 09, 015, 020, 026, 035, 078, 0101, 0119, 0137, 041 serogroups of Escherichia.

Diagnosed as calf colibacillosis.

Biopreparations . Associated radioactivity vaccine against lambs colibacillosis and salmonellosis, pasteurellosis, salmonellosis, polyvalent radiovaccine against colibacillosis, hyperimmune serum have been developed.

Colibacillosis in piglets varies depending on the time and nature of the disease - **colibacillosis in** newborn pigs (up to 3-4 weeks) and edema (colienterotoxemia) at 2-3 months of age separated from the mother. Pathogenic serogroups of Escherichia coli 08, 0138, 0139, 0141, 026, 018, 045, 055, 0127, 0142 are mainly found in piglets.

In young pigs, the disease is acute, with symptoms of toxemia and sepsis, and in acute - with toxemia and diffuse diarrhea. The tumor is more common in well-fed piglets, is very acute (dies after 18-24 hours) and passes with symptoms of diarrhea in a semi-acute form. Due to the sudden increase in vascular permeability, tumors appear and the animal dies from toxicosiC. Intoxication and allergic reactivity of the organism play an important role in pathogenesiC. Tumor disease is caused by hemolytic strains of the intestinal rod that protect the K-antigen 88, 82, or 91 . Hemolytic strains of Escherichia coli produce extracellular hemolysin with high activity.

The clinical sign of the disease depends on the serotypes that produce entero- or neurotoxin. In the neurotoxin-producing serotype, signs of central nervous system dysfunction appear, and the disease manifests itself in the form of tumorC.

Diagnosis is made in the laboratory according to generally accepted methodC. Additional isolated cultures are examined for hemolytic activity. If necessary, dermonecrotic (in rabbits) and plasmocoagulation properties, as well as virulence in white mice (0.5 ml of daily broth culture is injected into the abdominal cavity) are checked.

From biopreparations special polyvalent serum (5-15 ml) or gamma-globulin (5-10 ml) is used). Vaccination of pregnant mother pigs with a vaccine prepared from local strains 3-4 weeks before birth, vaccination of 5-week-old pigs or a week before and after their separation gives good resultC. Antibiotics, nitrofuran and sulfonamides are also used for treatment.

Poultry colibacillosis occurs in 3–14-day-old chickC. The disease is acute (with signs of toxicosis), semi-acute and chronic (colientitis - severe diarrhea). In chickens, serotypes of escherichia 035, 041, 086, 0101, 0103, 0117, 0137, 0408 were isolated. Pathogenic Escherichia coli enters through the eggshell, from which the chicks are carriers, causing colibacillosis (through feces, contaminated food and water).

For prevention, mercury-quartz irradiation before incubation of eggs gives good results, especially with dispersed formaldehyde. It is recommended to give antibiotics and nitrofuran 3 times a day for 6-10 days.

Pathological metarial . The carcass or bone marrow of a newly dead animal, a piece of liver with a gallbladder, the spleen, kidneys, heart, intestinal lymph nodes, a piece of small intestine tied on both sides (it is placed in a separate vessel from the others). The material should be sent to the laboratory within 4 hourC. If the distance is long, it can be preserved in 30% glycerin, 10% table salt. The feces are taken from the rectum of a sick animal.

1. Microscopy . Greases are prepared from patmaterial and painted by Gram method. The causative agent is a twisted, gram-negative (pink - red) rod-shaped bacterium; does not form spores; length 1 - 3 μm, width - 0.8 μm (Fig. 96). Placed one by one. Only strains 08, 09, 0101 form capsuleC. There are active and inactive species (Fig. 98).

2. Bacteriology. Patmaterial is planted in GPA, GPB, Endo environmentC. Test tubes are inoculated with Pasteur pipettes, Petri dishes with a spatula, or stamped from organC. Seeds are grown in a thermostat at 37–38 °C for one day. *E. coli* aerobic and facultative anaerobic. If there is a characteristic colony in the endo environment, it is planted GPB, GPA, blood agar.

GPB is a homogeneous turbidity, rapidly dissolving sediment is formed. At 16–20 h, the GPA forms moist, rounded edges with smooth, smooth, gray colonies (Fig. 97). In a bloody GPA, a hemolysis zone is formed around the colony (Fig. 101).

Biochemical properties - In the endo environment (Fig. 99) there are three types: reddish-dark glow, raspberry-pink glow and the formation of pink colonies (due to the decomposition of lactose). Forms indole, does not form hydrogen sulfide (H_2S), fermentes milk, positive with methylrot, reacts negatively with Foges - Proscauera. Gissa breaks down glucose, lactose into acid and gas in a colored row (Fig. 100). In the Simmons environment, *E. coli* does not grow because it does not assimilate ammonium citrate salts.

The isolated culture is serologically typified in serum with a typospecific agglutination coli - serum. In terms of antigen , somatic *"O"*, shell *"K"* , hivchin " *H"* antigens are distinguished. Only diagnostic serums for " *0"* antigen were developed in the biofactory . Similarly, the serogroup and serotypes of *E.coli* are detected in AR in the droplet method on the instrument window. AR is set according to the instruction. First with 4 polyvalent whey, then with monovalent whey. Each polyvalent serum contains 8-10 monovalent sera.

Strains of *E. coli* 026, 0111, 078, 055, 041, 020, 09, 0119, K99, 41, A 25, 086, 015, 08 and others are found in Uzbekistan.

Some strains of *E. coli* produce a substance of antibiotic nature - colicinC. Colicins prevent the growth of individual intestinal rod strains, but do not affect other types of bacteria.

3. Biosinov. A daily suspension of *E. coli* culture at a concentration of 500 ml / ml was injected into the abdomen of three white mice . Followed for 5 dayC. Even if one of the white mice dies during this time, the result is positive. In the

Schwarzmann phenomenon of culture with toxic properties, a foci of necrosis appear when sent between the skins of rabbits **.**

Question 2. General characteristics and laboratory diagnosis of the causative agent of salmonellosis.

Salmonella is pathogenic to humans and animals and causes salmonellosiC. The name is named after the American scientist Salmon.

Salmonellosis is an acute infectious disease that manifests itself in the septic form of all types of young animalC. The causative agent belongs to the genus *Salmonella* . Calves are infected at the age of 3 - 4 weeks to 4 months, the causative *agents* are *C. enteritidis* and *C. typhimurium* . The disease is accompanied by fever and severe diarrhea (adults are carriers of salmonella, the disease passes without clinical signs). Pigs are infected at the age of 4 months, the causative *agent is S.choleraesuis, S.typhimurium* . Sheep become ill at all ages, salmonellosis is observed in *ewes* , and the causative *agent* is *S.abortus ovis* . Weddings are often damaged in the mother's womb, resulting in miscarriageC. In them, the disease is *caused by C. abortus eqvui* . Poultry salmonellosis is manifested by mass morbidity and mortality in the first days and weeks of life of chickenC. Chicken embryos and adult birds are also affected. The causative agent is *S.pullorum (S.gallinarum).* Toxic infection occurs in humans when eating products (meat, eggs, milk) contaminated with salmonellosis.

Morphology . Salmonella are gram-negative, rod-shaped, twisted, 2 to 4 microns in size. Does not form spores and capsules, located in one, sometimes two. With the exception of *S.pullorum* , all are motile (peritrixes).

Cultural features . Salmonella are aerobic or facultative aerobes and grow well in normal nutrient media at 37 °C and pH 7.2 to 7.6. In the differential diagnostic - Endo, Levin, Ploskirev environments salmonella form colorless or gray - blue colonies, bismuth - sulfite agar black colonies.

Biochemical propertieC. Salmonella decomposes glucose, mannitol, maltose to form acids and gases , does not **decompose lactose, sucrose,** does not dissolve gelatin, does not form indole, most form hydrogen sulfide. Positive with methylrot, negative with Foges - Proscauera.

Durability . Salmonella die at 60 °C in 1 hour and at 100 °C at that moment. In salted, smoked products can be stored for several months in boiled meat (need to boil for 2 - 2.5 hours). It dies in a matter of minutes under the influence of direct sunlight. It is stored in the external environment, in the soil for 20 to 120 days, and in animal carcasses for up to 100 dayC. Disinfectants kill them. Sensitive to antibiotics, nitrofuran, sulfanilamide.

Pathogenicity. Under natural conditions, salmonella infects calves, lambs, pigletC. White mice are more prone than laboratory animals.

PathogenesiC. Through the digestive tract, aerogenous, in the mother's womb, transvorial (birds) can be damaged.

When the disease is acute and semi-acute, salmonella first develops in the intestine, then passes through the intestinal villi to the intestinal lymph nodes, and

the bacteria develop intensively and the first inflammatory processes develop. Bacteria then enter the general lymph and bloodstream, causing bacteremia, followed by parenchymal diffusion (the development of salmonella located in the lymph nodes, lungs, and sometimes in the bone marrow). In pregnant animals (sheep, bees, etc.) salmonella are mainly located in the uterus and cause inflammatory processes in it and in the placenta, sepsis in the fetus, miscarriage.

Salmonella is secreted in large quantities in the intestinal mass, birth canal (in the period of abortion and beyond), nasal mucosa (in pneumonia). During this period, antibodies increase and the RES-reticuloendothelial system suddenly becomes active.

As a result of Salmonella multiplication, a lot of biomass accumulates and endotoxin is released by the breakdown of bacteria. Endotoxin causes a number of inflammatory, dystrophic, necrobiotic and granulomatous changes in the tissue of the organs, bleeding. After clinical recovery, the animals remain carriers of salmonella for weeks, months .

In poultry salmonellosis appear sepsis, catarrhal enteritis, dystrophic changes in the liver and ovaries, hemorrhage.

Antigen structure. Salmonella (except *C. gallinarum*) has two main antigen complexes: *O* -antigen (somatic) thermostable; *The H* -antigen (hivchin) is a thermocouple protein in nature.

Knowledge of the antigenic structure of Salmorellas is important in the isolation of strains for vaccine preparation.

Immunity . Animals that recover from the disease develop adequate immunity based on humoral and cellular protective factors . *O* -antigen is the leading antigen in immunogenesis . The H-antigen is insignificant. The immune response is characterized by the formation of immunoglobulins *IgM* and *IgG* .

BiopreparationC. In farms with salmonellosis, calves are vaccinated from 10 days of age, piglets from 2-3 weeks of age, and lambs from 2 days of age . Concentrated, polyvalent, associated vaccines are used for this purpose . The amount of vaccine and the order of vaccination will be indicated on its label. Calves, cows, pigs and sheep are vaccinated twice 1.5–2 months before birth.

Diagnosis is based on clinical, epizootiological and pathological data, the results of laboratory testC.

Laboratory diagnosis of salmonellosis pathogens.

With the body or bone marrow of a newly dead animal, a piece of liver, a gallbladder, a kidney, a heart, for laboratory examination; blood, nasal discharge, feces from a sick animal ; aborted fetal placenta, excretions or fetal stomach and parenchymatous organs are sent.

In the laboratory it is examined by microscopy, bacteriology, serology, biosynthesis, if necessary.

The duration of laboratory testing is 5-6 days.

The causative *agents of* calf salmonellosis are *S.enteritidis* and *S.typhimurium.* It is also dangerous for people. It causes severe toxic infections in humans when a patient consumes animal meat or contaminated milk.

In the laboratory, ointments are prepared from Patmaterial and stained by the Gram method. GPA, GAB and differential diagnostic media are implanted in either endo, levin, bismuth sulfite agar . An agglutination reaction is poured into the subject glass when a culture with a characteristic character for Salmonella is isolated . Polivalentli *denotes the* serum, and then monoreseptorli *N* - serum.

Bacteriological examination. Blood from sick animals is tested by hemoculture. For this it is better to take blood during bacteremia (when the fever rises) and when salmonellosis is semi-acute. 5-10 ml of blood taken from the jugular vein is inoculated into 5-6 test tubes or 2-3 vials of GPB and 10-20% bile fluid or semi-liquid agar. It is then planted in the dense nutrient media described above. In the endo environment, salmonellae form colorless colonies (do not break down lactose), unlike Escherichia coli, while black colonies grow on bismusulfite agar (except group C). Salmonella-specific, non-lactose- and sucrose-degrading, indole-forming cultures are tested in a droplet agglutination reaction.

The serological method is **used to** diagnose sick animals and detect **carcinogenesis** (latent period). For this purpose, an agglutination reaction is performed with blood serum (in chickens, a blood-agglutination reaction is performed).

Fluorescent antibody method (express diagnostic method). Greases prepared from patmaterial are fixed in methyl or ethyl alcohol and treated with fluorescent salmonellosis serum. Characteristic light-emitting radiation (green - yellow) appears.

Phagotyping. More group and type phages are used for diagnostic purposeC. In two test tubes, a daily culture of salmonella is inoculated into the liquid nutrient medium, one to which 3-4 drops of phage are added, and the other is left for control. After 12-24 hours, the bacteria in the phage solution are lysed and the liquid becomes clear. In a dense nutrient medium, a thiox is planted on the surface of the bacteria and a drop of phage is instilled. On the second day, there will be no growth where there is a phage drop.

Biosinov is poured if necessary. To do this, 0.2-0.3 ml of culture suspension (50-100 million microbial bodies per 1 ml) is injected under the skin of white mice with a mass of 18 g. In a positive result, the mice die in 3–10 days.

The duration of laboratory testing is 5-6 days.

The causative *agents of* calf salmonellosis are *S.enteritidis* and *S.typhimurium.* It is also dangerous for people. It causes severe toxic infections in humans when a patient consumes animal meat or contaminated milk.

The main sources of the pathogen are sick animals, convalescents, carriers of clinically healthy bacteria. In the general disease of calves, milk left for several

hours during the summer can be an important source of infection. This is because salmonella, which is rapidly absorbed into milk during this time, develops intensively and causes disease even in vaccinated calveC. Once the calves have recovered, they develop strong immunity and do not become ill again. Diagnosis is made on the basis of clinical and epizootiological data (age of the animal, signs of disease, farm health, etc.), pathological examination, as well as the results of bacteriological and serological testC. Dead and live vaccines, hyperimmune serums are used to prevent the disease. The use of hyperimmune serums against polyvalent calf and other animal salmonellosis, bivalent calf salmonellosis and colibacillosis gives good resultC. For treatment is used in combination with broad-spectrum antibiotics, sulfanilamide and nitrofuran drugs.

Question 3. Biopreparations used.

Biopolymers - giperimmun, gamma globulin serum, polyvalent serum concentration of assosirlangan vaccines, koliprotektant, colitis silage.

Newborn calves are given hyperimmune serum or gamma globulin (subcutaneously, intramuscularly, intravenously, orally) to prevent disease.

Vaccination of pregnant cows is also very effective. In doing so, the calf receives special antibodies with uvuz. Colostral immunity is maintained for 2-3 weeks as well as serum immunity. In our country , a coli-salmonellosis vaccine has been developed that kills many strains of *E.* coli and cultures of several salmonella strains with formalin. Calf cows are vaccinated twice between 10-14 dayC. VIEV coliprotectant (Escherichia coli killed by heating) has been suggested to be given to calves several times with cow's milk during the first feeding.

Polyvalent coli-gertner-phage has also been successfully administered to calves by enteral, subcutaneous, and intramuscular injection. Its effectiveness is further enhanced when used with antibiotics or sulfanilamide, nitrofuran drugs.

In Uzbekistan, VITI has developed an associated radiovaccine against calf colibacillosis and salmonellosis, hyperimmune serum. They are made from local strains of *E. coli* and salmonella , which are common in calves in Uzbekistan, and are used with great succesC.

Formalthiomersal vaccine with polyvalent hydroxide oxidant against colibacillosis in piglets, calves and lambs.

A polyvalent vaccine against salmonellosis and colibacillosis in fur-bearing animals.

VIEV coliprotectants.

Polyvalent serum against colibacillosis of farm animals.

Agglutinating O - coli whey.

Anti-adhesive coli: serums - K 88, K 99, 987 R, A20, F41.

Concentrated hydroxide oxide vaccine against colibacillosis of lambs, pigs and calves from local strains at the Uzbek Veterinary Research Institute .

Associated hydroxide oxidative vaccine against colibacillosis and salmonellosis in calves, lambs and piglets .

Polyvalent radiovaccine against pasteurellosis, salmonellosis and colibacillosis of farm animalC. Immunity lasts 6 to 12 monthC.

Polyvalent hyperimmune blood serum has been developed against pasteurellosis, salmonellosis and colibacillosis of farm animals .

Concentrated formula vaccine against calf salmonellosis.

Pigs vaccine against salmonelloziga - 50% *S.chole raesuis, S.typhimurium* 25% 25% *C . made from Dublin* strainC.

The dry live vaccine against swine salmonellosis *was prepared from* the TS-177 strain of *C. chole-raesuis* .

Vaccine against calf salmonellosis was prepared from strain C. *dublin* №6.

Polyvalent formolthiomersal vaccine against sheep salmonellosis.

Dry live vaccine against salmonellosis in waterfowl.

Polyvalent antitoxin serum against salmonellosis of calves, piglets, lambs and poultry. *S* . Obtained from the blood of animals immunized with antigen, consisting of strains of *Dublin, S.typhimurium, C. abortus ovis C. choleraesuis* .

Calves are bacteriophages against salmonellosis and colibacillosis and bacteriophages against poultry pullorosiC. It is prepared from phages isolated from animals that have been infected with salmonellosis and colibacillosis.

The Uzbek Veterinary Research Institute has developed an associated hydroxide oxidalumin vaccine and immune serum against colibacillosis and salmonellosis in calves, lambs and piglets from local strains.

Salmonellosis antigen for serological testing - a homogeneous suspension (volume 10^{9}/ ml) consisting of inactivated salmonella , for test-potassium AR.

Pulorous erythrocyte antigen.

Color antigen for testing for poultry pullorosiC. Homogeneous suspension of salmonella stained with formalin and stained with crystal violet. In the blood droplet agglutination reaction, birds are used to test for salmonellosis during their lifetime.

Fluorescent salmonellosis O-sera.

A set of salmonellosis O-complex and monoreceptor O- and H-agglutination serumC. It is used for express testing of 33 groups of salmonella isolated from animals, animal products and environmental objects in the product window by AR method.

Control questions:

1. State the characteristics of the causative agent of colibacillosis.
2. What are the methods of laboratory testing for colibacillosis ?
3. Biopreparations used in colibacillosis.
4. Name biopreparations against colibacillosis in Uzbekistan.

say biopreparations.

The causative agent of anthrax.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics of the causative agent of anthrax. 2. Laboratory diagnosis of anthrax. 3. Biopreparations used.
The purpose of the training: to get an idea of the characteristics of the causative agent of anthrax , methods of laboratory diagnosis, the final diagnosis, the biopreparations used.	
Pedagogical tasks: - Introduction to the history of the pathogen, its place in the system, the definition of the disease; - Explain the morphology, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - Provides insight into the final diagnosis.	*Learning Outcomes:* Students: - Describe the history of the pathogen, its place in the system, the disease; - describe the morphology of the causative agent of anthrax; - explain the cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, dry and wet preparations, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. - What kind of anthrax? "Do people get sick, too?" - What is the name of the pathogen? - What are its features? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he puts forward the problems of laboratory diagnosis of the anthrax pathogen, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - how the pathogen is identified; - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". 2.4. The characteristics of the causative agent of anthrax highlight its importance in laboratory diagnosis, explaining the biopreparations used for diagnosis, prevention and treatment .	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get
Phase 3. Final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	They hear. They ask questions.

Basic terms: *carbuncle, B. anthracis, spore, capsule, ascolysis, antagonists, coral test, pathogen propertieC. Blood agar growth, biosinov, toxin formation, characteristic symptoms, biopreoarat.*

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Question 1. General characteristics of the causative agent of anthrax.

The international name for anthrax is *Anthrax* . The causative agent is *Bac.anthra cis* . *It* belongs to the family of *Eubacteriales* , the family *Bacillaceae* , and the genus *Bacillus* . Anthrax is an acute infectious disease characterized by severe intoxication of the body, fever, septicemia, the appearance of carbuncles, and damage to the intestines, more often the lungC. Anthrax affects all types of agriculture, as well as many wild animals as well as humans.

The disease was studied and scientifically substantiated by R. Cox (1876), L. Pasteur (1877), LS Senkovsky (1883).

Morphology. The anthrax pathogen is a large, motionless, gram-negative rod. Length 6-8 micronC. Eni 1.0-1.5 μm. In greases, one, more in the form of a chain. The ends of the sticks facing each other seem to be cut straight. The pathogen forms a capsule in the body, spores in the external environment. Bacteria also form capsules in nutrient media with added blood and serum. The spores are mainly located in the center of the rod and are oval in shape.

Cultural featureC. The anthrax pathogen is aerobic. Grows at a temperature of 12-45 ^{0}C. The optimum temperature for growth is 35-37 ^{0}C. Grows well in normal nutrient environmentC. Forms a white cottony precipitate in the fleshy peptone broth, leaving the medium clear. Flesh forms grayish white colonies on peptone agar. Colonies are like a lion’s path. Grows in the form of inverted spruce in 2–5 days in fleshy gelatin.

Pathogenicity. Of the laboratory animals, white mice, guinea pigs, and rabbits are susceptible to the disease. In Biosinov, white mice die in 1-2 days, guinea pigs, rabbits in 2-3 days.

PathogenesiC. The anthrax pathogen enters the damaged mucous membranes of the animal's body , passes through the body's local defense mechanisms and enters the lymphatic system. Here the microbe multiplies rapidly and passes through the lymph flow to the lymph nodes, from there into the blood, and is captured by phagocytes and various organs, elements of the lymphoid macrophage system . Anthrax rods accumulate intensively , especially in the spleen , and then re-enter the bloodstream, developing septicemia and intoxication in the body . All this is accompanied by a decrease in oxygen in the blood, a violation of the acid-base ratio, a decrease and even loss of blood coagulation properties . As the anthrax microbe multiplies in the body, it forms a capsule , resists phagocytes, accumulates

and multiplies in the cells of the macroorganism , and secretes toxinC. The anthrax pathogen again breaks down cell proteins by releasing proteases (exoenzymes). Deep changes in the body that occur as a result of exposure to the life products of anthrax bacilli lead to the death of sick animals . The incubation period of the disease lasts from a few hours to 14 days, usually 2-3 dayC. There are septicemia and carbuncleosis forms of anthrax. In addition, depending on the location of pathological processes, there are forms of skin, intestines, lungs and tonsils (angionosis). Such local pathological processes develop on the basis of septicemia, but these symptoms may appear simultaneously or separately.

Depending on the passage, it can pass at lightning speed, acute, semi-acute, chronic and abortive .

Lightning shape. Occurs in sheep, goats, horses and cattle. It is manifested by a rise in fever, rapid pulse and respiration, bruising of the visible, mucous membranes . The animal suddenly collapses and dieC. The illness lasts from a few minutes to a few hours.

Antigen structure . In the anthrax microbial wall there is a polysaccharide antigen (hapten) capsule - a polypeptide. The polysaccharide (somatic) antigen is heat-resistant, it is stored for a long time in the patmaterial (skin).

Durability . The vegetative forms of the microbe die instantly when boiled at 55 ^{0}C for 40 minutes and at 60 ^{0}C for 15 minuteC. It can live up to 3 days in an unbroken body. Pathogen spores are very resistant and die within 10 minutes in hot steam at 120 ^{0}C, 3 hours in dry heat, and 30-60 minutes when boiled. Disinfectants - 10% sodium hydroxide, 5% phenol, etc. decompose spores in 2-24 hourC. Basillas are resistant to adverse environmental conditions and can live for several 10 years to 100 years.

There are many antagonistic microbes of the anthrax pathogen, among which the putrefactive microbes are important. The anthrax microbe is sensitive to penicillin, streptomycin, terromycin, tetrocycline and other antibioticC. Under the influence of penicillin, the stimulus changes from a rod-shaped to a coral shape.

DiagnosiC. Based on epizootiological and clinical indications, as well as the results of bacteriological examinationC. Injury of animals of all species and ages , seasonality, stationary, randomness of the disease , acute and semi-acute course, presence of fever and carbuncles, severe general condition, short-term death, data on the appearance of the corpse , swelling, non- hardening of the body , the appearance of mixed secretions of blood from the natural pores are grounds for suspicion of anthrax. These complex symptoms may also be grounds for suspicion of anthrax in compulsorily slaughtered animalC. Laboratory tests confirm the diagnosiC. Anthrax should be differentiated from pasteurellosis, erythema, malignant tumors, bradycardia, enterotoxemia and piroplasmidosis as a result of epizootiological, clinical and laboratory tests.

Immunity. After recovering from anthrax, animals develop strong immunity.

Question 2. Laboratory diagnosis of anthrax.

For laboratory testing, a cut is made along the base of the ear, blood taken from the incision site of the ear, and from dead pigs — throat lymph nodes and swollen connective tissue fragments are sent. Dissection of the body is prohibited when anthrax is suspected. If anthrax is suspected when the disease is causing the death of a septic animal, the rupture is stopped and a portion of the spleen is sent for examination.

Bacteriological diagnosis of pathological materials: primary microscopy; planting in nutrient media; study of cultural and biochemical properties of isolated pure culture (microbe); including damage to laboratory animals . If the ear is bleeding, an additional precipitation reaction is also given. If the material is degenerate and is not suitable for bacteriological examination, it is limited to placing a precipitation reaction only.

Microscopic examinationC. Ointments made from blood in the ear or other laboratory materials are examined microscopically. Prepared ointments are painted with Gram, capsules - Rebiger, Mixin, Alt, Gimza or Leffler blue.

Gram-based greases *contain the* causative *agent of* anthrax - *Bac.anthracis* - in the form of straight Grammusbat rods, the rods are arranged in short chains or in pairC. The facing sides of the sticks are slightly cut, as if they were cut flat, and the left side is slightly moonlit. In some cases (often in ointments made from pathological materials obtained in pigs) the shape of the anthrax microbe can change: the rods are short, thick, bent or granular, the middle or both edges are swollen.

When greases made of new patmaterial are painted in special ways, the anthill rods are wrapped in a capsule. In greases made from worn patmaterial , the microbes are enlarged several times, the edges are rounded, the morphological appearance is distorted, the capsules are incomplete, torn , and very bad, low staining .

An immediate response examination was given on the approximate result of the microscopic examinations, in which it was noted that other examinations were ongoing.

Bacteriological examinationC. Meat peptone broth (GPB) and meat peptone agar (GPA) in test tubes or Petri dishes made from blood or other patmaterial taken from the ear are grown in a thermostat at 36 - 37 ° C. Seedlings are seen after 18 - 24 hours, if the microbial culture has not grown, it is grown in a thermostat for another two dayC.

Identification of anthrax pathogen (identification) . The anthrax pathogen differs in growth, microbial morphology, and the presence of a capsule (in ointments prepared from patmaterial, infected dead mice). In suspected cases, the motility and hemolytic properties of the pathogen are determined, luminescent microscopy, phagocytosis, "coral" test are performed, and laboratory animals are infected.

The causative agent of anthrax does not have the property of hemolytic activity , i.e. hemolysis does not occur in bloody food.

Biological examination. A suspension with saline solution is prepared from the patmaterial and 0.1-0.2 ml is administered subcutaneously to two white

mice under the skin of the tail base, and 0.5-1 ml is administered subcutaneously to guinea pigs . The infected animals die in 1–3 days, sometimes later. Animals with biosinov are observed for 10 dayC. O ' animals that you want to break up, heart blood, spleen, liver, material sent to the place of mass ointments prepared, planted environmentC.

Serological testing is a **precipitation reaction.** The new material should stand in the thermostat for 18-20 hours before setting the reaction . The old material is extracted without putting it in a thermostat. Extraction is performed in two ways: hot and cold. It should be noted that the extract obtained by the hot method has less precipitogens than that obtained by the cold method . Positive result: 1-2 minutes after the reaction, a thinner, whiter ring appears at the border of the components after 15 minutes of treatment.

Evaluation of inspection resultC. If any of the following indications are present, the diagnosis of anthrax is considered to be clear. 1. When a culture characteristic of an anthrax pathogen is isolated from the pathogen material and one of the two infected laboratory animals with the pathogen material or culture isolated from it dies, if not hyech, and the culture is separated from its organC. 2. If the culture does not grow in the nutrient medium in which the material is planted, but even one of the laboratory animals infected with the material dies, and a culture specific to the anthrax is isolated from its parenchymal organs . 3. Positive results are obtained by immunofluorescence method and capsule basil is found in greases made of patmaterial. 4. If a positive result is obtained by examination of obsolete mold materials with a precipitation reaction .

Terms of inspection:

microscopic examination - on the date of delivery of the material,
bacteriological examination -3 days,
biological-10 days.

Question 3. Biopreparations used.

BiopreparationC. Active protection of animals from anthrax through vaccination is an important tool in disease prevention. Live spore anthrax vaccines are used for this purpose. The first vaccines were developed in 1881 by L. Pasteur and in 1883 by LS Senkovsky. The vaccine is reactogenic in nature, so there is a need to develop a new vaccine because it leaves complications after vaccination. In 1940, NN Ginsburg developed the STI vaccine. In 1951-1952, SG Kolesov and Yu.F. Borisovich developed the reactogen GNKI vaccine. Live spore STI and GNKI vaccines prepared from capsule-free mutants of anthracnose bacilli have high immunogenic properties, and immunity in vaccinated animals is maintained for 1-2 yearC. Hyperimmune serum and globulin are used against anthrax to generate passive immunity and treat anthrax.

BiopreparationC. STI live vaccine is made from a standard strain. Agar consists of spores of the cultured culture (95 - 100%). In the form of a suspension in sterile 30% glycerin solution, 1 ml (2.5-3.5) contains 10^7 live sporeC.

The GNKI vaccine is a dry, live vaccine made from the GNKI standard strain. 1 ml contains 5x10 ^{7} live sporeC. Anthrax vaccine prepared from strain 55.

A live, liquid vaccine associated with anthrax and smallpox in large horned animals.

Therapeutic - prophylactic serumC. Horses are hyperimmunized with a culture of inactivated anthrax pathogen.

Precipitating serum of anthrax. Used when checking material by PR method. Horses are hyperimmunized.

Anthrax standard antigen for precipitation reaction. Used to control the activity of precipitating serum. *An* extract obtained from the inactivated bacteria of B.anthracis is visible.

Luminescent anthrax serum. Precipitating anthrax is made from whey.

Diagnostic bacteriophages of anthrax. Broth culture filtrate of the pathogen contaminated with bacteriophage . Bacteriophage titer 10.

Control questions:

1. State the characteristics of the anthrax pathogen.
2. Describe the methods of diagnosis in the laboratory.
3. What is the final diagnosis of anthrax?
4. Biopreparations used in anthrax.

Tuberculosis pathogenC.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics of the causative agent of tuberculosis. 2. Laboratory diagnosis of tuberculosis. 3. Biopreparations used.
The purpose of the training: to get an idea of the characteristics of the causative agent of tuberculosis , methods of laboratory diagnosis, the final diagnosis, the biopreparations used.	
Pedagogical tasks: - Introduction to the history of the pathogen, its place in the system, the definition of the disease; - Explain the migration, morphology, cultural and biochemical characteristics of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - Provides insight into the final diagnosis.	*Learning Outcomes:* Students: - Describe the history of the pathogen, its place in the system, the disease; - describe the morphology of mycobacteria; - Explain the cultural and biochemical properties of mycobacteria; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, preparations, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. - What disease is tuberculosis? "Do people get sick, too?" - What is the name of the pathogen? - What are its features? - What do you mean by the migration of the pathogen? - What is its epizootic and epidemiological significance? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he puts forward the problems of laboratory diagnosis of the tuberculosis pathogen, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the causative agent of tuberculosis highlight its importance in laboratory diagnosis, explaining the biopreparations used for diagnosis, prevention and treatment. Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers.	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get
Phase 3. Final	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and	They hear. They ask

(15 minutes)	encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	questions.

Basic terms: *types of mycobacteria , characteristic tubercles, elective media, Gon, Alikayev methods, typology of mycobacteria, allergic diagnosis, methods of serological testing, final diagnosiC.*

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1. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013
2. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 268 p
3. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. Chast 3. Chastnaya microbiology. M.2007 g.

Q1. General characteristics of the causative agent of tuberculosis.

Microorganisms that grow in the medium to form long filaments **are** called **mycobacteria** . At the ends of these threads a sausage-like swelling appears, sometimes the threads branching. When viewed under a microscope, the culture resembles mycelium of a fungus, and this sign brings them closer to actinomyceteC.

Mycobacteria are widespread in nature, their pathogenic and saprophytic species occur. Saprophytes live in soil, water bodies, dung, milk, grasC. Pathogens - mainly tuberculosis mycobacteria cause disease in humans and animals . Mycobacteria are also the causative agent of leprosy in humans and the causative agent of paratuberculosis in large horned animals .

The causative agents of tuberculosis *belong* to the family *Actinomycetales* , family *Mycobacteriaceae*, genus *Micobactyerium* . All mycobacteria can in some cases migrate to humans or other species of animals and cause disease.

Tuberculosis causative agents in- opened in 1882, and *Micobactyerium tubyerculosis* called. Mycobacteria were then divided into five types :

1. *M.tuberculosis* is the causative *agent* of human tuberculosiC. (also found in monkeys and pets);

2 . *M. bovis* - the causative *agent* of bovine tuberculosis (also found in humans);

3. *M.avium* - the causative *agent* of avian tuberculosis (also found in pigs and cattle);

4. *M.murium* - the causative *agent* of mouse tuberculosis;

5. *M.poykilothermorum* - the causative *agent* of colds tuberculosis;

Tuberculosis is a chronic infectious disease of humans, mammals and poultry , characterized by the formation of specific nodules (tubercles) in the affected organs and tissues .

Morphology and tinctorial featureC. The microbe is usually a thin, straight or slightly curved rod with twisted ends, 0.8 to 5.5 μm long and 0.2 to 0.6 μm wide. Their dimensions are not constant. It varies depending on the type of bacteria, nutrient environment, growth conditions, and so on. Compared to *M.tuberculosis , M. bovis is* shorter and thicker, and *mycobacteria* are *longer in* animal tissues than those *grown in the* nutrient medium. The bacterial cytoplasm has granules of various shapes and sizeC. They are placed in greases individually or in groupC. Mycobacterial rods are immobile, do not form spores and capsuleC. Resistant to acid, alkali and alcohol. Grammusbat.

Fontes 1910 y. identified a filterable form of tuberculosis mycobacteria. *L*-shaped mycobacteria were represented in 1945 by *Alexcander-Jackson* . They appear in the form of fine grains or spherical bodies of various sizes on phase-contrast microscopy. Mycobacteria are stained by the Sil Nielsen method:

1. Pour the carbolic TB fuchsia paint over the filter paper on the fire-fixed grease. Heat until steam is formed, after 2-3 minutes the grease cools and the paper is removed and washed with water;

2. Decolorize with 3 -10% sulfuric acid for 3-5 seconds.

3. Wash with water. 4. Dilute with 96 ◦alcohol for an additional 3 to 5 seconds.

5. Wash again with water. 6. 3-5 minutes Leffler stained with methylene blue or 1: 1000 malachite blue. 7. The drug is washed in water and air dried.

Microscopy - TB rods are red.

Due to the hydrophobicity of the shell, a modified Gramm-Mux method is used to stain mycobacteria by the Gram method. The greases are heated with carbolic methylviolet until steam is formed. Drain the paint and pour Lugol's solution on top. It is then decolorized, respectively, with a mixture of 5% nitric acid, 3% hydrochloric acid, acetone and alcohol. Finally, it is additionally stained with saffron or diluted fuchsin. Blue mycobacteria appear on a red background under a microscope.

The immunofluorescent method is currently used.

Cultural featureC. The causative agent of tuberculosis is severely aerobic. Optimal growth temperature: *M.tuberculosis* - 37 - 38 ◦C, *M.bovis* - 38 - 39 ◦C, *M.avium* - 39 - 41 ◦C. Ambient pH 6.8 - 7.4. Microbes do not grow in normal nutrient media. To grow it, special glycerin, elective-protein and protein-free (synthetic) nutrient media are used. Glycerin meat - peptone broth (GGPB) and agar (GGPA), glycerin potato medium, Petranyani from elective protein media, Gelberg, Levenstein - Iyensen media, synthetic food media - Sonton, Model media are used.

When grown in glycerin broth for a long time (6 - 8 weeks) accumulates toxins - **tuberculin** . This substance does not affect a healthy organism, but only has a toxic effect on animals infected with tuberculosis . Therefore, it is used in the diagnosis of tuberculosiC.

Glycerin meat grows in peptone broth after 10 - 30 days, forming a membrane: *M.tuberculosis* - a thick, ascending *membrane of the* test tube , *M. bovis* - *reticular* , tumor *membrane* , *M. avium* 7 - 10 Day on Day 21, thin, thin, leakage, wrinkled curtain.

in dense nutrient media, microcolonies that are barely visible at first appear and then grow. On the surface of the nutrient medium appear one or two colonies, small or large, glossy or opaque, smooth or broad, which can merge and form a single leaky layer with the surface.

Durability. Tuberculosis rods are more resistant to physical and chemical influenceC. In cultures, they usually die after 8–10 monthC. Bacteria live 7-10 months in dried sputum, 2-6 months in decomposed organs, 7-10 months in manure, 2 months in water, more than 2 years in soil; milk 85 °dies in 30 minutes when boiled, 3-5 minutes when boiled. Under the influence of disinfectants - 5% phenol, 20% fresh slaked lime, 3-5% lysol, 3% formaldehyde, etc., the tubercle bacillus dies in 12-24 hourC. Manure is biothermally disinfected.

Antigen structure . The activity of tuberculosis bacterial antigens is low. The protective properties of the antigen are related to mycolic acid compounds.

Immunity in tuberculosis is nosteril, cellular (*T* - lymphocytes). For it to appear and survive, the animal must have live TB rods in its body. Live mycobacteria of *BSJ* vaccine strains remain in the animal's body for a long time after vaccination and maintain immune strength.

Diagnosis consists of bacteriological, serological, allergic testC. Bacterial diagnosis is very important. The final diagnosis is made on the basis of positive results of pathoanatomical or bacteriological examination at the farm. Determining the type of mycobacteria is necessary to find the source of infection.

Question 2. Laboratory diagnosis of tuberculosis.

Bacteriological examinations include microscopy, culture, and biological methodC. Liver, spleen, lung fragments, and lymph nodes are taken from an slaughtered or dead animal for laboratory testing. Milk, sputum, tracheal mucus pus and urine, feces are taken from live animals .

The test material may not contain many mycobacteria of tuberculosiC. Special methods are used to increase the amount of stimulus in the sampleC. Greases are prepared from patmaterial and stained by the Sil-Nielsen method and viewed under a microscope.

To isolate mycobacterial cultures, they are treated with one of the Gon or Alikayev, Levenstein-Sumioshi methods before planting.

Gon method . The material is thoroughly crushed in a sterile mortar and mixed with 10-12% sulfuric acid in a ratio of 1: 4 and centrifuged at 3000 rpm for 10-15 minuteC. Exposure to acid should not exceed 20 to 30 minuteC. Greases are prepared from the sediment and planted in nutrient media. For biosinov, the precipitate should be washed 1 to 2 times with sterile saline.

Alikayev method. Used when working with low-contamination, new material. To do this, the patmaterial is cut into 0.5 cm^3 pieces and placed in a sterile mortar and placed on a solution of 10 - 8 - 6% sulfuric acid for 10 - 20 minuteC. The concentration of the acid, the exposure time, depends on the degree of contamination of the material. The acid is then drained and replaced with a sterile saline solution, and after 8 minutes it is also drained and the material is thoroughly crushed with a saline solution in a mortar. Greases are prepared from the prepared suspension, 5 - 6 test tubes are inoculated into nutrient media, biosynthesis is applied. The duration of the cultural examination is two monthC.

Biosinov - in a dose of 1.0 ml. The follow-up period is three monthC. A positive result is tuberculosis-specific tubercles in the liver, spleen and other organs when the dead animal is bitten. Guinea pigs should be tested for tuberculin allergy before biosynthesiC. Those with a positive result are considered unfit for biosynthesiC. The duration of the biological test is 3 months.

Distinguish (typify) types of mycobacteria of tuberculosis . Mycobacteria differ in the nature and rate of growth, morphology, pathogenicity and other characteristics of the nutrient medium. . For Biosinov, three guinea pigs, three rabbits and, if necessary, three chickens are vaccinated in the above doses and methodC. Based on the following data, the type of culture being tested is determined.

1. *M.bovis* culture *causes* generalized tuberculosis process in guinea pigs and rabbitC. 2. *M.tuberceulosis* - causes a generalized tuberculosis process in guinea pigs, and a local process in the lungs in rabbitC. 3. *M.avium* - *causes a* septic process in rabbits, resulting in the death of the rabbit. Sometimes it can also be a local procesC. In guinea pigs, only the local process, the abscess appears where more culture is sent. In chickens, a generalized process occurC.

PR, AR, DPR, CBR, GAR, hemolysis reactions were studied in **serological diagnosis** . PR and AR did not work in animalC. Only in chickens blood drip AR method gave reliable results.

The complement binding reaction is used as an adjunct method to separate animals that react to tuberculin for controlled slaughter. A complex compound antigen or complex antigen is used

Allergic diagnosis . In 1890, R. Cox proposed tuberculin for therapeutic purposeC. Then they started using it as a diagnostic drug. Currently, subtuberculin and dehydrated tuberculin - PPD (protein purified derivative) are used. They are produced in biofactorieC. For diagnostic purposes, tuberculin is administered subcutaneously, subcutaneously, or instilled into the conjunctiva.

In cattle, sheep, goats, chickens, tuberculin is injected into the skin. It is sent to the neck of cattle, to the chest area of calves, to the underside of the tail of goats, to the inside of the thighs of sheep, to the base of the outer surface of the ears of pigC. The chickens are sent to the earringC. The dose is 0.2 ml for animals and 0.1 ml for poultry.

It is counted after 72 hours in cattle, 48 hours in goats, sheep, pigs, 30 - 36 hours in poultry. In cattle, the thickness of the skin layer is positive if the skin is 3 mm or more thicker than normal skin.

Question 3. Biopreparations used.

Biopreparations . In a number of Western European countries, calves up to 15 days old are vaccinated with the BSJ vaccine. In Czechoslovakia, a vaccine made from a culture of mycobacteria isolated from mice is used.

The BSG vaccine is a dried live culture of the *M. Bovis* vaccine strain . Purified, dry PPD tuberculin, for mammalC. Alttuberculin, for mammalC. PPD tuberculin for poultry.

Control questions:

1. State the characteristics of the causative agent of tuberculosis
2. What methods are used to diagnose tuberculosis in the laboratory?
3. How do the types of mycobacteria differ
4. What is the final diagnosis of tuberculosis?

Brucellosis pathogens.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics of brucellosis pathogens. 2. Laboratory diagnosis of brucellosiC. 3. Biopreparations used.
The purpose of the training: to get an idea of the characteristics of brucellosis pathogens , methods of laboratory diagnosis, final diagnosis, the biopreparations used.	
Pedagogical tasks: - Introduction to the history of the pathogen, its place in the system, the definition of the disease; - illuminates the migration of the pathogen; - Explain the morphological, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - Provides insight into the final diagnosis.	*Learning Outcomes:* Students: - Describe the history of the pathogen, its place in the system, the disease; - describe the morphology of brucellae; - explain the cultural and biochemical properties of brucella; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, preparations, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	Educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. - What disease is brucellosis? "Do people get sick, too?" - What types of brussels are there? - What features do you know? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he raises the problem of laboratory diagnosis of the brucellosis pathogen, suggesting the following questions to consider. - What are the methods of diagnosis in the laboratory? -What serological testing methods are used? - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the causative agent of brucellosis highlight its importance in laboratory diagnosis, explains the biopreparations used for diagnosis, prevention and treatment. Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers.	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get
Phase 3. Final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	They hear. They ask questions.

Basic terms: *brucella species, brucella migration, abortion, source of disease, tinctorial, cultural features, culture, strain, vaccine, bacteriological diagnosis.*

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1. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013
2. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 268 p
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Question 1. General characteristics of brucellosis pathogens.

Brucellosis pathogenic agent for the first time in 1886 the British microbiologist David Bruce, abattoirs dead man's worth and *Micrcoccus melitensis* called. In 1897, Bing and Stribolt separated from cattle and called it *Bact.abortus bovis* , and in 1914, D.Traum separated it from a fetus abandoned by pigs - *Bact.abortus suis* . American scientists A.Ivens 1918 in-depth study of these pathogens identified in terms of features, closer together and D.Bryus in honor of all generations into the *Brucella* nomladi.Hozirgi time, there are six types of brucella disease support In y and goats - *Brucella melitensis* , in cattle - *Brucella abortus, in* pigs - *Brucella suis* , in dogs - *Brucella canis, in* rams - *Brucella ovis, in* mice - *Brucella neotomae* . In rams, this disease is called infectious epididymitiC.

Brucellosis is an infectious, chronic disease. All kinds of domestic and wild animals, people also get sick. It is a sick animal to humans, passing through its productC. At the onset of brucellosis enzooticity in animals is manifested by gross miscarriage, resulting in rapid separation of the placenta, endometritis, infertility. In most cases it passes without clinical signs.

The migration of Brussels sprouts from one species to another is of great epizootiological and epidemiological significance. For example *Br. melitensis is* found in cattle and pigs , so such animals remain a source of brucellosis in humans (Ye.V. Kozlovskii, 1954-1956 and others). In addition, *Br.suis* cattle and sheep, goats, *Br abortion*, sheep, goats and pigs migration is clear.

Humans can be infected with all types of brucella germs, but sheep and goat brucellae are extremely contagious to humans and the disease is severe.

Morphology. Brucellae are polymorphic-round, oval, coccygeal bacteria or rods measuring 0.5x0.7-0.6x1.5 micronC. Do not form spores, do not move. Microscope brusellalar one or two groups seems to be the

case. Some scientists have observed capsular forms in virulent strains of brucella .

Tinctorial propertieC. Paints well with aniline dyes . Gram-negative. One of the special methods of painting is Stamp, Kozlovsky, Shulyak-shin. Brucellae are red, other bacteria and tissue cells are stained green.

Cultural features . The following nutrient media are used to grow brucellosis: meat peptone liver broth - GPJB and agar, liver - glucose glycerin broth - JGGB and agar, potato agar, erythritol, whey dextrose agar.

The causative *agent of* infectious epididymitis of rams, Br.ovis, grows in an atmosphere *containing* dense or semi-diluted liver serum or liver aminopeptide, whey dextrin agar, containing 10 - 15% carbon dioxide.

Half of the patmateral crops imported from cattle are grown in an atmosphere containing 10-15% carbon dioxide, and the other half are grown in normal atmospheric conditions.

The required amount of carbon dioxide in the desiccator can be obtained in the following way: 1. Using a gas cylinder or a kipp apparatuC.

2. Using sodium bicarbonate and sulfuric acid or hydrochloric acid.

3.By burning cotton soaked in alcohol .

To do this, the test tubes should occupy half of the desiccator. Seedlings are grown in a thermostat at 3 7 - 38 °C for 30 dayC. To isolate brucellosis from pathological materials contaminated with foreign microflora, antibiotics are added to the nutrient medium that kill the foreign microflora and do not inhibit the growth of brucella.

Forms a thin, shiny, clear layer in a dense nutrient medium. Later it darkens and turns blue. Virulent epizootic strains form *C* colonieC. They are small, colorless, round, convex, smooth-surfaced, clear, bluish colonieC. It gets darker later. Blurring the broth uniformly, a ring is formed. The ring is located above the level of the broth. As the culture ages, sediment forms in the test tube. When we tap the test tube, the elongated sediment rises in the form of braided hair. *R* - strains, on the other hand, do not uniformly turbidify the broth and then subside, forming a lumpy precipitate. To distinguish *S* and *R* -shaped colonies, White and Wilson (1951) proposed a special staining method. **Biochemical propertieC.** Brucellae do not have proteolytic enzymes, they do not dilute gelatin, do not ferment milk. The saccharolytic property is weak. Only some of their strains break down dextrose, galactose, xylose, levuleza, rabinose. *Br.abortus* and *Br. suis* s *release* hydrogen sulfide. *Br.melitensis, on the* other *hand,* is formed only in the *presence* of sulfur. The catalase activity of brucellae was determined.

Durability . Brucellae are resistant to external influenceC. Lives in moist soil, 3 - 4 months in water, 160 days at low temperatures in cattle, 1.5 - 5 months in sheep wool, 2.5 hours in direct sunlight. Lives 8 days in milk, 45 days in cheese and cheese, 60 days in fat, 20 days in meat stored in the cold. Milk dies in 30 minutes when heated to 70 °C, and in 1-2 minutes when boiled. The milk is

pasteurized at 70 ◦C for 30 minutes or at 85-90 ◦C for 20 secondC. For disinfection 2% sodium hydroxide, 20% fresh slaked lime, 2% formaldehyde, 4% creolin, etc. are used.

Pathogenicity . Brucellae are facultative, living and multiplying only within the cell, especially within the cells of the reticuloendothelial system of the affected animal organism.

Pathogenesis . The entrance gates of brucellosis infection are the mucous membranes of the oral cavity and respiratory tract, conjunctiva, skin.

Antigenicity . *Br.abortus, melitensis, suis* A common thermostable antigen and two serologically differentiated A and M antigens were identified for the *C* form of the three main brucellae . In addition, a highly toxic somatic Buaven complex for animals - antigen (endotoxin) was isolated from them. When immunized with this antigen - agglutinin, preceptin, complement binders and oposonins are formed. When the antigen is injected into the skin, a specific local reaction occurs in sick animals.

Immunity occurs in infected and cured animalC. It can be infectious - nosteril and post-infection sterile. It depends on how long the pathogen is stored in the body.

Diagnosis Timely detection of animals infected with brucellosis is very important in the eradication of such a dangerous disease. Diagnosis of brucellosis consists of laboratory examination of the material (bacteriological and serological) and allergic examination of animals on farmC. Scheduled serological and allergy tests are the main methods of identifying sick and suspected animals.

Q2. Laboratory diagnosis of brucellosis.

Live animals are sent to the laboratory for examination of the discarded fetus or its bilaterally enriched stomach, placenta, placenta, milk, abscess and hygrom fluid, altered parts of the sperm from rams, glands.

Parenchymatous organs and lymph nodes are sent from dead animals.

Blood is also sent from aborted animals for brucellosis for serological testing.

Bacteriological diagnosis:

1. Microscopy of greases made of patmaterial. Greases are painted in Gram and one of the special methodC. In the Gram method, the brucellae are red, the other cells are blue, in the Kozlovsky method, the brucellae are red and the other cells are green.

2. Separation of pure brucella cultures in nutrient medium. Mentioned above. Meat - peptone liver broth, if erythritol. To separate the brucella culture from the pathological material contaminated with foreign microflora, 1: 100,000–1: 250,000 gensianviolet, 1: 500,000 malachite blue, or 1: 100,000 crystallviolet is added to the nutrient medium . Seedlings are grown for a month. Reviewed weekly. The characteristics of the isolated culture are studied.

3. **Biosinov** is taken from the heart of guinea pigs weighing 350-400 grams and tested for brucellosis by serum RA. Biosinov can be put in them only if a negative result is obtained in a ratio of 1: 5. A suspension is prepared from the given patmaterial in a ratio of 1:10 and injected subcutaneously on the inside of the number of guinea pigs in a dose of 1 ml. The hygroma is transmitted to guinea pigs by subcutaneous doses of 0.2-0.3 ml. On the 15th, 25th, and 40th days after infection, 1 to 2 ml of blood is taken from guinea pigs and the serum is tested for brucellosis in a 1:10 to 1:80 ratio by the RA method.

If pure cultures of brucella are isolated in guinea pigs in Biosinov or a positive result is obtained in serum RA 1:10 and above, the test results are positive, even if no culture is isolated from the given patmaterial.

Duration of bacteriological examination - 1 month Biological examination period - 2 months

Methods of serological testing

1. Agglutination reaction in test tubes - AR
2. CBR is a complement binding reaction
3. UKBR is a long-term complement binding reaction in the cold
4. RBN - pink bengal sample - placing AR on plates with rose bengal antigen.
5. HR is a ring reaction, ie a ring reaction is used to test milk

AR is put in a ratio of 4 in a volume of 1 ml. Sheep, goats, owls, dogs in blood serum- 1:25; 1:50; 1: 100; 1: 200.Gives agglutination at titers of 1:50 and higher with a positive result.

1:50 in cattle, horses, and camels ; 1: 100; 1: 200; A positive result of 1: 400 is titers of 1: 100 and higher.

1:20 in fur animals and guinea pigs; 1:20; 1:40; A positive result of 1:80 gives titers of 1:10 and higher.

In general inspections, only the first two ratios are allowed.

The CBR method was first used by Hols in 1909.

The ring reaction in milk was proposed in 1937 by Fleischhauer to detect brucellosis in lactating cowC. Its essence is that in the presence of specific agglutinins in milk, it binds to the stained brucellosis antigen and forms agglutinate. It soaks into the milk fat and rises to the top, forming a painted ring. It should be noted that the milk of cows vaccinated with sht №19 gives a positive result.

Allergic method . In animals with brucellosis, an allergic reaction occurs when brucellosis allergens are injected into the skin. Cattle and pigs *Br.abortus* agglutinogens strains of non-allergenic brusellizat VIEV. The appearance of a tumor that is well manifested at the site of allergen delivery is considered a positive result of the allergic sample.

Question 3. Biopreparations used.

BiopreparationC. Active immunization against brucellosis was initiated in 1906 by Bang. Sht №19 1923 Separated virulently from cow's milk by Buk. By replanting potato agar for 10 years, the virulence of strain 19 was reduced.

After the use of the SHT №19 vaccine, it became difficult to differentiate animals infected with brucellosis because the animals remained seropositive for a long time. This has prompted our scientists to conduct research to create more sophisticated live vaccines against brucellosiC. As a result, vaccines made from sht82 have been proposed and widely used.

Control questions:

1. State the characteristics of the causative agent of brucellosis.
2. What methods are tested for brucellosis in the laboratory?
3. What is the final diagnosis of brucellosis?
4. Serological diagnosis of brucellosiC.

Pathogenic anaerobes.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics of pathogenic anaerobes. 2. Pathogens of measles, mumps and botulism . 4. Biopreparations used.
The purpose of the training: to get an idea of the general characteristics, systematics of pathogenic anaerobes, the characteristics of the causative agent of rabies , methods of laboratory diagnosis, the final diagnosis, the biopreparations used.	
Pedagogical tasks: - Introduction and coverage of the history of the pathogen, its place in the system, the definition of the disease; - Explain the morphology, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - Provides insight into the final diagnosis.	*Learning Outcomes:* Students: - describe the general characteristics of pathogenic anaerobes; - Describe the history of the pathogen, its place in the system, the disease; - describe the morphology of the causative agent of measles; - Explain the cultural and biochemical properties of pathogens of measles, mumps and botulism; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, dry preparations, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. "What kind of disease is black?" "Do people get sick, too?" - What is the name of the pathogen? - What are its features? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he puts forward the problems of laboratory diagnosis of the pathogen, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the causative agent of measles, its importance in laboratory diagnosis, explain the biopreparations used for diagnosis, prevention and treatment. Organizes a discussion using the technique of "mental attack".	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get
Phase 3. The final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	They hear. They ask questions.

Basic terms: *clostridia, exotoxin, enzymes, spores, anaerobic conditions, culture, strain, gas formation, nutrient media, vaccine, hyperimmune serum, biosinov.*

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Question 1. General characteristics of pathogenic anaerobes.

Pathogenic anaerobeC. The group of pathogenic anaerobes is one of the microorganisms that cause severe infectious or intoxication processes in animals and humanC. Pathogenic anaerobes are clostridia, but they also include sporeless fusobacteria (the causative agent of necrobacteriosis).

Clostridia are a group of many soil anaerobic bacteria that include 93 specieC. But eight of them are real pathogenic microorganismC. They have a number of common featureC. In young cultures and tissue preparations are gram-positive, in the old - gram-negative. Most of them are perityrich. Forms an oval or cylindrical endospore located centrally, subterminally, terminally. When spores are formed, the cells increase in cross-sectional size, swell, and take on a spiral shape. Grows in special nutrient environments, anaerobic conditionC. Characteristic features of this group of microbes are the absence of the enzyme catalase, which forms proteases that break down proteins, and some species have saccharolytic activity. Contains different hemolytic, necrotic, lethal and other components, actively synthesizes exotoxin.

Different types of clostridia have the same antigen - hivchin, somatic, endotoxin antigens.

The ecological features of different representatives of the Clostridium generation are characterized by saprophytes, resistance to adverse environmental conditions due to the formation of spores, their prevalence (geographical cosmopolitanism) on almost all continentC.

The gastrointestinal tract of animals is a typical place for their development and reproduction.

Pathogenic clostridia schizomycetes *belong to the* class *Schizomycetes* , to the group of true bacteria - *Eubacteriales,* to the family of *bacilli* - *Bacillaceae* , clostridium - *Clostridium* . Important pathogenic anaerobes - *Cl. Chauvoei, Cl. Perfringens, Cl.oedematiens, Cl.Septicum, Cl.histoyiticum, Cl.sordelii, Cl.Tetani, Cl.Botulinum* .

The first causes blackheads, the remaining five - gas edema, bradzot, lamb anaerobic dysentery, infectious enterotoxemia, and the other two cause constipation and botulism. The causative agent of necrobacteriosis is also a pathogenic anaerobic, but clostridia do not resemble larvae. The class Schizomycetes, along with true bacteria, belongs to the family *Fusobacterium* , a family of bacterioids (*Bacterioidaceae)* .

The causative agent of blackheadC. *Clostridium chauvoei* . Black (Emkar) is an acute infectious disease of horned animals, characterized by the appearance of a rapidly growing gaseous tumor in the muscular parts of the body, which produces a wheezing sound, accompanied by a rise in fever. Large horned animals get sick from 3 months to 4 years old. The causative agent of black spot was first found by Fezer in 1865 in the teriosteal tissue of a cow that died.

Morphology and tinctorial featureC. The causative agent is *Clostridium chauvoei in the* form of rods, the ends are twisted, 4-8 μm long, 0.6-0.9 μm wide, mobile-peritrix. Forms spores located centrally or subterminally in both culture and patmaterial. Depending on the location of the spores, the pathogen takes the form of a sprig, noxious or lemon. Young cultures are gram-positive, older cultures are gram-negative.

Cultural featureC. The pathogen is strictly anaerobic, grows at a temperature of 36-38 ^{0}C. Special media are used for growth - blood, serum, liver, brain, muscle fragmentC. More meatpeptone liver broth, Kitt-Tarossi nutrient medium, glucose-blooded Seyssler agar, whey-glucose agar are grown. Optimal pH is 7.2-7.6, temperature can rise even at 36-38 ^{0}C, 14 ^{0}C. In the Kitt-Tarossi environment , turbidity occurs 12–24 h before and after 2–3 days, after the spores have reached the bottom of the test tube (sediment), the broth becomes clear. Gas bubbles are formed. It smells of sour oil. Glucose-blood agar colonies form a zone of hemolysis, the center rises and is button-shaped. When the brain grows in the environment, it forms gas, does not darken, and only after a few days a subtle redness appears in the middle of the medium. In the middle of the whey grows in the form of lentil or round, finely growing colonieC.

Biochemical propertieC. *Cl. shauvoei* synthesizes protease slowly dissolving gelatin, does not dissolve whey and egg protein, coagulates milk in 3-6 days, the precipitate is in the form of a soft porous masC. Does not form indole, most strains produce less hydrogen sulfide, does not convert nitrates to nitrites, does not discolor methylene blue. It breaks down glucose, sucrose, maltose, lactose, galactose, levulose to form acid and gas.

Durability. The spores of the microbe are more resistant to the vegetative form. In rotten corpses, spores are stored for 3 months, blood and tissue debris in mixed feces for 6 months, and at the bottom of reservoirs in unhealthy areas for more than 10 yearC. In the soil the spores retain their viability for 20-25 yearC. Under favorable conditions , it can develop into a vegetative form in the soil. Boil for -2 hours, 40 minutes at 110 ^{0}C, stored 18 years when dried. Sulema solution (1:

500) kills spores after 10 minutes, 3% formalin solution after 15 minutes, 6% sodium hydroxide for 6-7 days, 12% lysine for 24 hourC.

Pathogenicity . Under natural conditions, cattle and sheep get sick. Goats, buffaloes and deer get sick lesC. Cattle are more prone between the ages of 3 months and 4 yearC. Due to the immune-generating subinfection in animals older than 4 years, calves up to 3 months of age become resistant to the disease due to collostral immunity. Horses and donkeys are not prone to blackness, and sometimes pigs get the disease. Camels do not get sick under natural conditions, artificial disease can be called. Dogs and cats are not prone to the disease. There are reports of fish being infected with blackbirds (FIKagan, 1976). People are not prone to blackheadC. Guinea pigs are more prone than laboratory animals .

PathogenesiC. The pathogen enters the body more in the summer with food, when the animals are driven to pasture. Spores enter the body when damaged mucous membranes, insect bites through the skin surface. The microbe multiplies from the gastrointestinal tract to the subcutaneous tissue and muscles, especially hematomas, crushed or torn tissue, necrotic parts, tumorC. In it, carbon dioxide, hydrogen and other gases are formed, making a crackling sound. Sometimes the disease can pass in a septic form without the formation of carbuncleC.

Antigen structure . Suu part of the causative antigenes termostabil somatic *O* antigen and thermolabile xivchinli *unmarked* antigene allocated.

Immunity. Large horned animals and sheep do not have natural immunity, but their susceptibility to the disease decreases with age. Affected animals develop active immunity. Immunity in black is antitoxic and antimicrobial.

Question 2. Laboratory diagnosis of the causative agent of measles.

Damaged muscle fragments, the exudate of the crepitous tumor, are sent to the laboratory for examination . In this case, the skin is separated with boiled tools, then the tools are replaced again. the affected area is cut deeper, 3 x 3 x 3 cm from the middle of the muscle. a piece of damaged tissue is cut to size . If the body is torn, blood is taken from the liver, spleen, and heart. Material to be sent to the laboratory is taken no later than 4 hours after the death of the animal . On hot days, the material is preserved in an aqueous solution of sterile 30% glycerin .

Checking for smears includes microscopic examination of smears made from patmaterial, inoculation into nutrient media, and damage to laboratory animals.

Microscopic examination. Greases are prepared on the windows of degreased objects from muscle fragments and other patmaterials and painted by Gram or Muromsev method.

Bacteriological examinationC. 1. Kitt-Tarossi nutrient medium from patmaterial, meat peptone broth (GPB) and meat peptone agar (GPA) are grown. The Kitt-Tarossi nutrient medium is regenerated before use — i.e. heated in a boiling water bath for 15–30 min, then suddenly cooled to 45–50 ° C. If the

material is old, a suspension is prepared from it in a saline solution in a ratio of 1: 4, heated at 80 ° C for 15-20 minutes, then inoculated into nutrient media.

Test tubes sown in the seedlings are placed in a thermostat at 37–38 ° C for 24–48 hours . Cups should stand 24-48 hours in aerobic conditions.

2. *Cl. When shauvoei grows in the* Kitt-Tarossi nutrient medium, uniformly distributed turbidity occurC. When we look at the grease prepared from the culture under a microscope, we can see grammatically, sporadically and sporadically located rods, one by one or in pairs .

3. To separate the pure culture of the pathogen from the broth, 3-4 pieces of glucose in a Petri dish - blood Seyssler agar are inoculated. But before sowing Seyssler Previous thermostat to dry for 5-6 hours . Seedlings should stand in a thermostat at 37-38 ° C for 24-48 hours under anaerobic conditionC.

4. In seismic agar, the colonies grow as the edges are trimmed, like a glossy button or a grape leaf. A small hemolysis zone appears around the colony. If mixed cultures are grown in the first plantings , the colonies with more characteristic features are replanted in the Kitt-Tarossi nutrient medium and grown in a thermostat for 24-36 hours , again with its characteristic growth. morphology and tinctorial properties are studied.

Biological examination. M CAD, slices of liver, spleen, broken sterile until the same mass in a mortar adding a little (1:10) GPB thoroughly crushed. The abdomen of two guinea pigs weighing 350-450 g in a dose of 0.5-1 ml of the prepared mass is infused subcutaneously. It is monitored and controlled for 8 dayC. Patmaterialda *Cl. In the* case of *shauvoei* , infected laboratory animals die within 24-96 hourC. On the skin of dead guinea pigs appear serous-necrotic discharge, diffuse or punctate hemorrhage . The skin is difficult to separate from the damaged muscle. The muscles of the chest, abdomen, and sometimes the hind legs are dark red. A few gas bubbles collect in the buttocks and underarms . The intestines are not swollen, there is no visible change in the organs of the abdominal cavity. The gallbladder is filled with bile fluid .

The diagnosis is made in the following cases :

- if a colony of this disease is isolated from the patmaterial, and if there is no hyech, one infected guinea pig dies with characteristic, typical pathoanatomical signs, and the pathogen culture is isolated from its organs ;
- even if the pathogen culture is not isolated from the given patmaterial , even if one of the two infected guinea pigs dies with characteristic pathoanatomical signs and the pathogen culture is isolated from its organs .

Inspection period - up to 8 days.

Question 3. Biopreparations used.

BiopreparationC. A concentrated hydroxyaluminum vaccine is used to create active immunity. In large horned animals and sheep, the vaccine is

administered intramuscularly in a single dose of 2 ml. Immunity lasts 6 monthC. Calves vaccinated up to 6 months of age are re-vaccinated.

Anti-hyperimmune serums are used for prophylactic and therapeutic purposes.

Due to the acute nature of the disease, it is not always curable. But sometimes antibiotics such as streptomycin, dibiomycin, penicillin are used.

The causative agent (*Clostridium tetani*). It is an infectious wound disease of animals and humans, characterized by strong excitation under the influence of microbial toxins, reflex contraction of skeletal muscleC. The causative agent was found in 1883 by a Russian scientist, ND Monastirsky, in the separation of a sick man at the site of injury. A. Nikolayer sent soil to rabbits and guinea pigs in 1884, called them scurvy, and found the causative agent, and in 1889 his pure culture was isolated by Sh. Kitazato. As a result of injuries to animals and humans, the wounds are damaged by the fall of the pathogen from the soil. The microbe releases a strong poison.

Morphology and tinctorial featureC. The peritrix is a large, slender, mobile (peritrix) rod, 4–8 μm long and 0.4–0.6 μm wide. in greases prepared from damaged tissues, the bacteria are separated, in groups of 2-3, and from cultures, especially in liquid media, in the form of long, bent threadC. The microbe does not form a capsule. Forms round sporeC. Spores are 2-3 times wider than the cell and are located at the tip of the rod, in the form of a drumstick. Spores appear after 2-3 days in cultures, as well as in the body. Spore rods are motionlesC. The microbe is gram-negative, but in older cultures a group of bacteria is gram-negative.

Cultural featureC. The pathogen is strictly anaerobic, very sensitive to oxygen. The optimum temperature for them is 35-37 C, pH 7.4-7.6.

In the Kitt-Tarossi environment, the pathogen grows slowly, usually after 24-36 hours, uniformly turbid, with the appearance of one or two gas bubbleC. In 5-7 days a soft precipitate forms a gas, the environment becomes clear when the microbial cells sink to the bottom of the test tube. From the culture comes the smell of burnt horns in 3–5 days of growth. Glucose-blooded Seyssler agar forms thin white-gray, tufted, centrally ascending colonieC. Sometimes it looks like a small, round, dewdrop. The colonies form a hemolysis zone. After 1–2 days of deep planting on vertical agar forms lentil-dense, sometimes disc (*R* - shape) or dense parsimonious (*S* - shape) colonies in the center. If the material is planted in a condensed liquid of the slope agar, under anaerobic conditions it grows upwards in the form of a thread. This method can be used to isolate a pure culture of the microbe. Grows spruce-shaped when planted vertically on or on gelatin . The brain nutrient medium darkens after a long time.

Biochemical propertieC. Unlike other pathogenic clostridia, the causative agent is characterized by low biochemical activity.

Durability. Vegetative forms of the pathogen die in 60 minutes at 60-70 ^{0}C, spores in 80 ^{0}C - 6 hours, in boiling water in 40-50 minuteC. Lives up to 11 years when dried. Under the influence of Sulema solution (1: 100) or 5% phenol solution, the spores die after 10-12 hourC. It is neutralized in 10-15 minutes under the influence of conventional disinfectants .

Pathogenicity. All types of farm animals are prone to hardening. Of these, horses are more sensitive. Dogs, cats, and wild mammals are also affected. The literature also mentions chicken, goose, and turkey. People are prone to the toxin of the causative agent. From laboratory animals, white mice, guinea pigs and rabbits are very susceptible to the disease.

The toxin was isolated and expressed in 1890 by Bering and Kitazato. The clinical signs and pathogenesis of the coating depend on this toxin.

The two components of the compound exotoxin are tetanospasm and tetanolysin. The first affects the nervous system and leads to a tonic contraction of the transverse smooth muscle, the second causes nonspecific hemolysis of erythrocyteC. Tetanospasm is a major toxic factor of the microbe that damages the motor neurons of the central nervous system. This toxin occurs in organisms and cultureC. The purified, crystalline form of tetanospasm is a thermolabile protease composed of 13 aimino acids, most of which are asparagine. Tetanolysin is of little importance in the pathogenesis of tetanolysiC. Tetanolysin is hemolysin that decomposes in the presence of oxygen.

PathogenesiC. The causative agent is a necroparasite, which multiplies in dead tissue. In wounds, the spores rapidly undergo vegetative form under anaerobic conditions, the bacteria develop intensively and the toxin is excreted. Toxins spread along the axis of the motor nerveC. Exotoxin action damages the nerve centers, back and brain, causing the main symptoms of constipation.

Antigen structure. The active strains of Clostridium have somatic- *O* and hivchinli- *H* antigenC. Only the *O* -antigen is inactive. Thermolabile *H* -antigen represents a special type of microbe.

Laboratory diagnosis . Wound secretions, tissue fragments from the deepest layers of the affected area are sent to the laboratory for examination. Blood, liver and spleen fragments are also taken from dead animals (5-10 ml).

Laboratory tests are performed in two directions: isolation of the toxin, isolation of the pathogen culture to determine its harmfulness.

Grease is prepared from the patmaterial, inoculated into nutrient media, biosynthesized in white mice, and observed for 10 dayC. A positive result is a sign of the disease in 2-3 days.

If a solid toxin is isolated from the material being tested, no test is performed to isolate the culture .

The diagnosis is considered to be made in the following cases :

- if the toxin of the solid is isolated in the test material (even if the culture is not isolated);

- patmaterialdan lean , specific to the pathogenic characteristic propertieC. if a toxin-producing culture is isolated. The inspection period is 1 to 5 dayC.

Immunity. Immunity develops in animals infected with cataractC. Concentrated, bitter anatoxin is used for active immunization. It is injected once under the skin of large animals 1 ml, young and small animals 0.5 ml. Immunity is formed after 30 days and lasts more than a year, and in horses 5-6 yearC. Anti-aging serum is used only when necessary.

Botulism is a toxic infection that affects all animalC. It occurs as a result of eating foods that contain botulinum toxin and is characterized by severe damage to the central nervous system, paralysis of the larynx, tongue and lower jaw. A person with botulism also gets sick. Botulism was introduced in the mid-18th century, and its name (sausage- bot. *Botulus*) was derived from the observation of the first clinical signs of the disease in people who ate sausageC. Van Ermengem first isolated the causative agent of botulism in 1896 from the spleen and colon of a man who had died of botulism. Subsequent studies have shown that in nature - *Cl. botulinum* in the presence of the 7 types of aniqlandi- *A, B, C, D, E, F, Y* . They differ in the antigenic structure of the mutual exotoxin.

Morphology and tinctorial featureC. *Cl. In botulinum*- stained preparations, the ends are twisted, 4-9 μm long and 0.6-0.8 μm wide in the form of rodC. Bacteria are located separately or in pairs, sometimes in the form of short chainC. Microbial motility- peritrix. Spores are oval in shape and are located in the center of the cell or near the edgeC. It is reminiscent of the shape of a tennis racket. It does not form a capsule. Vegetative cells are well stained with aniline dyeC. In young cultures and tissue preparations are gram-positive, in older cultures - gram-negative.

Cultural features . The causative agents of botulism are serious anaerobeC. To grow them, special nutrient media are used - glucose-blood Seyssler agar, glucose liver agar, glucose gelatin, glucose vertical agar, Kitt-Tarossi medium, etc. The optimum temperature for bacterial growth and toxin formation is $35^{\circ}C$ for types *A, B, C* and *D* , -28-30 ^{0}C for types *Y* and *F* , and types *A* and *C* also develop at 10-55 ^{0}C. pH 7.4-7.7. The causative agent of botulism has the property of forming a strong poison in cultures with high humidity in nutrient media, in neutral or weakly alkaline environmentC. Kitt-Tarossi obscures the environment, then a precipitate forms, the liquid becomes clear, and the smell of fermented oil comes from the culture. Seissers form clear colonies on the agar - dewy, a few millimeters small, with smooth or trimmed edges, shiny surface, surrounded by a zone of hemolysiC. will be bulging. Several different types of colonies occur in a single strain. If erect, the colonies look like lentils or a dense piece of cotton in the center .

Biochemical propertieC. *Cl. botulinum* breaks down glucose, levulose, maltose, glycerin, dextrin, salicin, adonite, inositol, and forms acid and gaC.

Durability. The vegetative cells of the pathogen are resistant to various factors of the external environment. Dies in 30 minutes at 80 ^{0}C, 2-5 minutes when boiled. Pathogen spores are very resistant. They die when boiled for 5-6 hourC. Therefore, to neutralize botulism spores, it is necessary to autoclave it at 120 ^{0}C for 30 minuteC. Spores are resistant to low temperatures and do not die at -190 ^{0}C. Store at -16 ^{0}C for one year. Therefore, frozen substrates with large amounts of spores can be toxic. They decompose after 15-20 minutes when boiled in liquids , and after 2 hours in dense matter . Bacterial spores are killed in 5% phenol per day, 10% hydrochloric acid per hour at room temperature, 40% formalin twice diluted in 24 hourC.

Pathogenicity. Under anaerobic conditions in the animal organism, plant and animal products, as well as in special nutrient media *Cl. botulinum* produces a potent exotoxin that belongs to the group of neurotoxins . This toxin is stronger than all known natural poisons, and its 10 mg crystalline form can poison the entire population of the globe (C. Martinov, 1969). The toxin contains five factors - neurotoxin, hemolysin, hemolysin-hemagglutinin, lipase and protease. Dogs, cats, wolves, coyotes, and other predators are resistant to the disease.White mice, guinea pigs, and rabbits from laboratory animals are susceptible to all toxins of botulinum toxin.

PathogenesiC. Botulism is a toxic infection. The toxin enters the body through food. In this case, the central nervous system is severely damaged. The toxin passes from the blood to the organs and damages the nerve elementC. The lumbar motor centers affect the neurons and the elongated brain, causing signs of paralysis.

Antigen structure. Bacterial serological types of exotoxins have special immunological properties, which are detected in the neutralization reaction.

Immunity is antitoxin in botulism . There is no natural immunity to botulism in susceptible fungi . Immunity does not develop in sick people or animalC. By sending a special anatoxin, it is possible to create a strong antitoxic immunity to botulism through artificial vaccination.

DiagnosiC. It is based on characteristic clinical signs or the results of anamnesis and laboratory tests.

BiopreparationC. Anatoxins are used specifically to prevent botulism. Of the animals, only mink are vaccinated. For prevention, mink is vaccinated against botulism with a formal kvass anatoxin vaccine. The vaccine is administered intramuscularly, 1 ml. amount will be sent. Immunity is formed after 2-3 weeks and lasts up to a year.

Laboratory diagnosis of botulism

Samples from suspected foods (silage, grain, compound feed, meat and fish waste), as well as the mass in the stomach of dead animals, liver fragments and blood of sick calves are sent to the laboratory for testing .

Pathological material is obtained no later than 2 hours after the death of the animal .

Preparation of material for examination. 1. The given pathological material is simultaneously examined for botulism toxins and pathogens; the blood is tested only for botulism toxins .

2. The food sample, stomach mass, liver pieces are crushed well with sterile sand in a sterile mortar in an amount of 25-30 g and mixed by pouring an equal amount or twice the volume of saline . The resulting homogeneous mass is allowed to be extracted at room temperature for 2 hours . Two-thirds are used to separate the toxin, and one-third - to separate the pathogen .

3. The blood of a sick animal is examined without dilution. Botulism toxin is rapidly degraded in the blood, so it should be tested on site (farm) .

Separation of botulism toxin. 1. Patmaterial and food samples are filtered through cotton or at a speed of 3000 rpm for 30 min. centrifuged, then divided into halves, part of which is heated for 20–30 minutes in a boiling water bath.

2. With each filtrate of the test material (boiled and unboiled) two white mice weighing 16-18 g are injected intravenously or intravenously in a dose of 0.5-0.8 ml . Under the skin of guinea pigs (mass 300–350 g) the material is administered in a dose of 3–5 ml (one boiled filtrate, the other - unboiled).

If the material contains botulism toxin, laboratory animals infected with unboiled filtrate , on days 2-5 with clinical signs characteristic of botulism (loss of balance, rapid breathing, relaxation of skeletal muscles, collapse of the abdominal wall as a "bee's waist") o ' ladi. Animals sent with boiled filtrate will survive.

3. As soon as blood is taken from sick animals, two white mice or guinea pigs are injected into the abdominal cavity in the dose indicated in point 2. Animals are observed for 5 days and the presence of the toxin is determined depending on the appearance of clinical signs.

4. If a toxin is isolated from the test material, a neutralization reaction is performed with serum of specific botulism toxin typeC. **Preparation of material for examination.** 1. The given pathological material is simultaneously examined for botulism toxins and pathogens; the blood is tested only for botulism toxins .

2. The food sample, stomach mass, liver pieces are crushed well with sterile sand in a sterile mortar in an amount of 25-30 g and mixed by pouring an equal amount or twice the volume of saline . The resulting homogeneous mass is allowed to be extracted at room temperature for 2 hours . Two-thirds are used to separate the toxin, and one-third - to separate the pathogen .

3. The blood of a sick animal is examined without dilution. Botulism toxin is rapidly degraded in the blood, so it should be tested on site (farm) .

Separation of botulism toxin.

1. Patmaterial and feed samples are filtered through cotton or at a speed of 3000 rpm for 30 min. centrifuged, then divided into two parts and heated for 20–30 minutes in a boiling water bath.

2. With each filtrate of the test material (boiled and unboiled) two white mice weighing 16-18 g are injected intravenously or intravenously in a dose of 0.5-0.8 ml . Under the skin of guinea pigs (mass 300–350 g) the material is administered in a dose of 3–5 ml (one boiled filtrate, the other - unboiled).

If the material contains botulism toxin, laboratory animals infected with unboiled filtrate , on days 2-5 with clinical signs of botulism (loss of balance, rapid breathing, skeletal muscle relaxation, collapse of the abdominal wall as a "bee's waist") o ' ladi. Animals sent with boiled filtrate will survive.

3. As soon as blood is taken from sick animals, two white mice or guinea pigs are injected into the abdominal cavity in the dose indicated in point 2. Animals are observed for 5 days and the presence of the toxin is determined depending on the appearance of clinical signs.

4. If a toxin is isolated from the test material, a neutralization reaction is performed with serum of specific botulism toxin types.

To do this, special types of botulism serum are used , which are produced for practical use in health care facilities .

5. The material under test may contain two (or more) types of toxins , so the neutralization reaction is put in the following scheme: a). *A.* Serums of types *B, C, D, E* are taken in a volume of 0.2 ml in one test tube and 1.0 ml of test material is added to it. The mixture should stand at room temperature for 45 minutes or at 35-37 ° C for 30 minutes . Then 0.8 ml is injected into the abdominal cavity of white mice weighing 16-18 g . Simultaneously, an equal volume of saline is mixed with the test material and administered to the other two animals in the same dose (for control). If there is botulism toxin, white mice injected with a mixture of specific serums with the material being tested will survive, while those under control will show characteristic clinical signs of botulism within 2–4 days . If there is no need to determine the types of toxin , the results obtained can be the basis for a diagnosis .

b). To determine the types of botulism toxins, a neutralization reaction is performed in the following scheme: The test material is poured into 2.6 ml to six test tubes, 5 of which contain 0.6 ml of different types of serum: the first - type *A* , the second - type *B.* To the third - type *C* , to the fourth - type *D* , to the fifth - type *E* , and to the sixth - the same amount of saline. The mixed solutions should be kept at the temperature indicated in 5 a). Each mixture (serum test material) is then injected into two white mouse veins or the abdominal cavity at a dose of 0.8–1.0 ml with separate syringes . The result of the neutralization reaction is taken into account for 4 days .

Animals sent with a mixture of the tested material with a similar serum survive, and the rest - die, showing clinical signs of botulism .

If botulism toxin is detected in the material being examined, an examination is performed to isolate the culture.

Isolation of the pathogen. 1. Patmaterial and food samples prepared as shown in paragraph 2 have a pH of 7.2-7.4, under Vaseline oil. Inoculated in liquid nutrient media (Kitt-Tarossi, Hottinger broth) with the addition of 0.5% sterile glucose . Nutrient media are regenerated before planting and glucose addition. The Kitt-Tarossi medium is heated in a boiling water bath for 15–30 min and rapidly cooled to 45–50 ° C. It is better to sow 3 to 2 parts in vials of 100–250 ml filled with nutrient medium. Vaseline oil thickness should not be less than 0.5 cm.

For each sample, the material should be planted in at least two vialC. One of them is heated at 80 ° C for 1 hour. Simultaneously planted in normal nutrient media (GPB and GPA) to control anaerobic contamination.

2. The seedlings are placed in a thermostat at a temperature of 30-35 ° C. The growth of the botulism microbe is characterized by the gradual (2-3 days) turbidity of the environment and the formation of a gas that smells of fermented oil.

When we microscopically examine the culture obtained, gram-positive spores appear at the edges of the sporeC. The sticks look like tennis rackets.

3. *Cl.* Toxins are detected in the culture fluid in 5–7 days, if the growths characteristic of *botulinum* and similar rods in the ointments prepared from the culture .

4. To isolate a pure culture of the botulism pathogen, the primary cultures are heated at 80 ° C for 1 h and transplanted separately into the bloody Seyssler agar in Petri disheC. The cups are placed in an anaerostat, creating the necessary conditions for anaerobiosis (air outflow should not exceed 5 mm Hg). It should be noted that the causative agent of botulism is a serious anaerobic. After 2–4 days of cultivation, seedlings are seen and the grown colonies are isolated. *Cl. Botulinum* colonies have round, rooted tumors, are colorless or gray, are a zone of intensive hemolysis.

The diagnosis is considered to be made in the following cases:

- botulism toxin is detected in the test material (even if the culture is not isolated);

- A culture specific for the causative agent of botulism is isolated from the material and its toxins are detected biologically.

Control questions:

1. Give an idea of pathogenic anaerobes.
2. Describe the characteristics of the black causative agent.
3. Describe the characteristics of pathogens of botulism and botulism.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics of leptospirosis pathogens . 2. Laboratory diagnosis of leptospirosis pathogens. 3. Biopreparations.
The purpose of the training: to get an idea of the general characteristics, systematics of leptospirosis pathogens, the characteristics of the causative agent of leprosy , methods of laboratory diagnosis, the final diagnosis, the biopreparations used.	
Pedagogical tasks: introduction and coverage of the history of the pathogen, its place in the system, the definition of the disease; - Explain the morphology, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - Provides insight into the final diagnosis.	*Learning Outcomes:* Students: illuminate the general characteristics of leptospira; - Describe the history of the pathogen, its place in the system, the disease; - describe the morphology of the causative agent of leptospirosis; - Explain the cultural and biochemical properties of the pathogen leptospirosis; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, sick animal, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners

Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. - What disease is leptospirosis? "Do people get sick, too?" - What is the name of the pathogen? - What are its features? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. Compares diagnostic methods. 2.3. After explaining the basic concepts, he puts forward the problems of conservative and operative treatment, inviting us to consider the following questions. . After explaining the basic concepts, he puts forward the problems of laboratory diagnosis of the causative agent of salmonellosis, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the leptospirosis pathogen highlight its importance in laboratory diagnosis, explaining the biopreparations used for diagnosis, prevention, and treatment. Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers.	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get
Phase 3. Final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	They hear. They ask questions.

Basic terms: *spirochete, leptospira, spiral, twist, endotoxin, enzymes, hematuria, culture, strain, nutrient media, vaccine, hyperimmune serum, biosinov.*

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Question 1. General characteristics of leptospirosis pathogens . PATHOGENIC SPIROXETALS

Spirochetes - *Spirochaetales* family, 0.12–10.0 μm in diameter, 5–500 μm in length, screw-like, twisted microorganismC. Their body consists of a protoplasmic cylinder. Wrapped in a multilayered shell over the cylinder, it has fibrils (one or more), resembling a hive of bacteria. Spirochetes multiply by division, gram-negative, do not form spores, chemoorganogeterotrophs, aerobes and facultative anaerobeC. Pathogenic species of spirochetes belong to the genus *Treponema* , *Borellia* and *Leptospira* .

Pathogenic spirochetes are demanding to growing conditions and grow in special nutrient media with the addition of specific growth factors.

The causative agent of leptospirosis

Leptospira cause zoonotic diseaseC. Leptospirosis affects many species of animals, as well as humanC. In animals, the disease is manifested by short-term fever, hematuria, anemia, jaundice, hemoglobinuria, hemorrhagic diathesis, necrosis of mucous membranes and skin, atony of the digestive organs, sometimes abortion, stillbirth or stillbirth ladi.Natural hearth disease. VITerekix in large horned cattle (1938-1939); in silver-black foxes, dogs, goats S.Ya. Lyuboshenko (1938-1939); in pigs and sheep VITerskix (1940), in horses S.Ya. Lyuboshenko and LSNovikov (1946) proved for the first time that the cause of the disease was leptospira.

According to the current classification , the *genus* Leptospira (*lepto*- nosic, *spira*- spiral) is divided into two groups: pathogenic for animals and humans (*L. interrogans*) and saprophytic (*L. biflexa*). Pathogenic leptospira consist of 25 serological groups and include more than 180 serological variants , of which the following serogroups are found in farm animals - Pomona, Grippotyphosa, Tarassovi, Icterohaemorrhagiae, Hebdomadis, Canicola, Kazakhstan.

Morphology and tinctorial featureC. Leptospira move through two long, thin threads located on the body axis and a cytoplasmic spiral twisted into them like a screw. There are 12-18 primary twists that stick together. The first twists of the spiral are very small and stick tightly together. Depending on the shape and

size of the twists, leptospira can be in the form of the letters **C, S, X** , sometimes the number **8** . The ends of the leptospira are bent in the form of loopC. But loopless forms are also common. Some have rounded, thickened tipC. The cell length is 7–15 μm, (30 μm and longer) occurs 0.1–0.25 μm wide. The body consists of a bullet strip, a cytoplasmic cylinder, transverse rings, and a multilayered shell. It has microfibrils on it. The nucleoid is eccentrically located. Does not form spores and sporeC. Active mobility is one of the diagnostic signs of microorganisms of the *genus Leptospira* . It does not dye well with ordinary aniline dyeC. Of the special methods, the Romanovsky Gimza method is dyed pink-blue after 48 hourC. Gram-negative. Cells quickly lose their virulence properties when grown under laboratory conditionC.

Mainly a live drug is prepared from the material and examined microscopically in a dark area.

Cultural featureC. Leptospira are facultative aerobes, chemogeteroorganotrophs, the optimal growth temperature is -28-30 ^{0}C, pH 7.2-7.4. Leptospira do not grow in normal nutrient media. Grows in special nutrient environments containing 5-10% rabbit or ram serum: Ulengut, Eorski, Fervolt-Voloff, Korthaf, Terskix, Lyuboshenko environmentC. In dense nutrient media, leptospira form S-, O-, and R-shaped colonies that resemble a dull, clear, or semi-transparent homogeneous disc, and in liquid nutrient media, turbidity occurs after 7–20 dayC. The presence of leptospira in the medium is determined by microscopy. Propagated by transverse division. In this case, the cell center becomes thinner and splits in two. Division results from the active movement of two daughter cellC. Most cultures die after 7 to 20 days, sometimes less than 3 to 5 days, and after 1 to 2 months or more.

Biochemical propertieC. It does not play a role in the diagnosis of leptospira and is not used in differentiation.

Durability. Leptospira are sensitive to building, heating, low pH, disinfectantC. Can be stored for up to 30 days in water bodies, up to 280 days in moist and alkaline soils, 1-2 days in nutrient media. It is stored for 49 hours in the urine of carnivores and 4 hours in the urine of carnivoreC. Lives 8 to 24 hours in fresh milk, 24 to 48 hours in boiled, pasteurized milk. In veal, lamb, pork, rabbit - kept at 10 ^{0}C (pH 6.2) for 10 dayC. Dies in 25-30 minutes when heated to 56 ^{0}C. Leptospira die instantly when dried, boiled, and exposed to a normal concentration of disinfectant. Leptospira are stored for 2.5 years when frozen in food at -30, -70 ^{0}C and their virulence is maintained for 238 dayC. Leptospira are very sensitive to salt solution - its 2.8% solution kills them in 3-5 days.

Pathogenicity. The pathogenicity of leptospira is very wide. In natural foci, where farm animals and humans are not involved, ants, rodents, rats, insects, and ungulates are infected. The area where the natural hearth-pathogen lives and enters the body in various wayC. In the foci, leptospira are found in certain species of rodents, infecting up to 60% of the population. All types of farm animals, pets and people get sick.

Laboratory animals are arranged as follows: golden eagles, guinea pigs, rabbit cubs (milk-sucking juveniles).

The virulence of the infectious strain is a factor in the severity of the disease.

The virulence of newly isolated leptospira strains is highly variable between serotypeC. When grown in nutrient media, they lose their virulence relatively quickly. Infecting susceptible animals can increase its virulence and keep for a long time.

Hemolysin is found in leptospira cultures, whose activity is well demonstrated against ruminants, especially sheep erythrocyteC. Gemlizin decomposes at 56 ^{0}C in 10 minutes, and when dried - stored for 4 monthC. At pH 7.4–8.0, it exhibits more activity at 37 $^{\circ}$C. When hemolysin is delivered to the body , it does not produce antibodies, but when immune serum is added, it is neutralized, i.e., like hapten.

Toxicity. Many enzymes: hemolysin, lecithinase, fibrisillin and others are pathogenic. As a result of the death of leptospira, endotoxin is released from it and accumulates — hemorrhagic, hemolytic, and neurotoxic effectC. Toxicity - can cause death of the animal. Endotoxins formed by the breakdown of leptospira in the body play an important role in the pathogenesis of infection.

PathogenesiC. The pathogen often enters the body through damaged mucous membranes and skin. After 12 hours, they can be found in the liver, where leptospira accumulate until fever developC. During the onset of fever, leptospira appear in the blood, and their amount increases not only in the liver, but also in the kidneys, adrenal glands, and in rare cases in the heart muscle, lungs and lymph nodeC. With the appearance of jaundice, the temperature drops, and leptospira gradually disappear from the blood, liver, lungs, but their amount in the kidneys, urine increaseC. This corresponds to the phase of accumulation of antibodies in the blood of a sick animal. In leptospirosis, intoxication results in damage to the nervous system, resulting in disruption of the normal functioning of various organC.

Short-term fever hematuria, sometimes (10%) jaundice, occurs after an incubation period of 3–16 dayC. Abortion can also be observed. Under the influence of toxins, dystrophy occurs in the liver. In the kidneys-foci of necrosis, hemorrhage. In the renal glomeruli and tubules, leptospira are excluded from the action of antibodieC. Therefore, they actively develop there and are excreted in the urine.

Antigen structure . Although the morphology of all pathogenic and saprophytic leptospira is the same, they differ in antigenic structure. Immunochemical analysis of drugs prepared from ultrasound-dissected leptospira cultures proved that they contain specific antigens specific to the type and generation.

The antigenic function of an ultrasound antigen depends on its protein fraction. It was also found that there are precipitogens in the cells of leptospira of various serotypes.

To date, more emphasis has been placed on agglutinogens in practice. Leptospirosis pathogens are distinguished by the exact agglutination reaction. This reaction is the basis of serological diagnostic methods, as well as the classification of leptospira.

There is only one common somatic antigen of leptospira, which determines their species affiliation. Differentiation of serovars and serogroups is performed taking into account the diversity of polysaccharide antigens in MAR (microagglutination reaction) and immunoadsorption analysis.

Immunity. In sick animals, strong, persistent immunity (to homologous serovars) is formed due to antibodieC. In the serum of sick animals on days 3 - 5 of the disease agglutinins were detected at titers of 1: 500 - 1: 1000 and higher, which persists for several yearC. Reinfection with heterogeneous serovars may occur. Convalescent serums have preventive propertieC. Persistent leptospira carriage has been identified in animals, so it is possible to talk about infectious immunity. Streptomycin does not affect post-vaccination immunity. Hence, there may be strong (sterile and nosteril) immunity in this infection.

Question 2. Laboratory diagnosis of leptospirosis pathogens.

DiagnosiC. Laboratory diagnosis: 1) microscopic examination in the right dark area; 2) separation of hemorrhoids; 3) biosynthesis; 4) serological testC. 5-10 ml of blood (3-5 days), urine, discarded fetus from a sick animal is sent to the laboratory for testing. The carcasses of dead small animals, the heart from large animals, fragments from parenchymal organs, kidneys, bladder are connected, spinal fluid is sent. Urine is taken in the morning before feeding.

Patmaterial should be tested in the laboratory no later than 6 hours (10-12 hours if stored in the refrigerator).

For microscopic examinations, drugs are prepared by the crushed drop method and seen in a darkened condenser.

Diagnosis is made by bacteriological and serological methods.

1. Microscopy. Leptospira react poorly to dye. They are tested in the crushed drop method, in a darkened condenser. Leptospira are a slender, mobile filamentous organism in a spiral shape, straight or *C*- shaped . Length 5-20 microns, diameter 0.1-0.2 microns, the ends are bent in the form of loopC. Leptospira move through fibrilC. Grammanfiy is pinkish-purple when dyed 48 hours in the Romanovsky Gimza method. Luminescent microscopy uses a special fluorescent globulin of leptospirosis.

If leptospira are detected on microscopic examination, this may be limited to the diagnosiC.

2. **Bacteriology.** Patmaterial (urine is centrifuged for 30 minutes at a speed of 10-15 thousand revolutions, sediment and liquid on it, blood plasma, suspension from the organs is prepared and examined) is cultured in special Lyubashenko, Ulengut nutrient media. 5-6 drops of 3-5 drops of each sample are inoculated into a semi-liquid or liquid nutrient medium. Leptospira are facultative aerobic, grown at 28-30 °C for three monthC. As leptospira grow, the appearance of the

environment does not change. Therefore, in order to determine the growth of leptospira in the seedlings, after 3, 5, 7, 10 days, and then every 5 days, preparations are prepared in the form of crushed drops from the seedlings in each solution. Leptospira grow more in 5-20 days, sometimes 1-2 months, rarely 2-3 months later. To keep the leptospira culture for a long time, they should be replanted every 10-15 days.

Leptospira are not always isolated from patmaterial in nutrient media.

It is more efficient to **put biosinov** . With its help, leptospira can even be separated from the soil. Biosinov is laid in 20–30-day-old golden rabbits, 10–20-day-old young rabbits, 3–5-week-old young guinea pigC. Patmateri hand suspension is administered subcutaneously or intra-abdominally in a dose of 0.5-1 ml for rabbits, 2-3 ml for rabbits, 1-2 ml for guinea pigC. At 3-5 days of fever, blood is taken from the ear or heart, examined microscopically, and cultured in nutrient media. If the infected animals do not die, they can be killed and examined on the 14th or 16th day. Their serum is tested in a microagglutination reaction with 13 serogroup leptospira. A positive result at a ratio of 1:10 and above indicates the presence of leptospira in the test material.

The heart, liver, and kidneys of dead laboratory animals are transplanted into nutrient media.

Guinea pigs die only when *infested* with *L.icterohaemorrhagiae* .

The pathogenicity of the isolated 5-7-day culture is determined by injecting it into the abdominal cavity in a dose of 1 ml. Leptospira are highly virulent if they die in 5-12 days.

Serological testing is based on the identification of specific antibodies in animal blood serum by microagglutination (MAR) and macroagglutination reaction (AR), FAU. Serological diagnosis of leptospirosis includes general and individual (individual) examinationC. The diagnostic field of immunological examinations includes animals with different immune status: infected, sick, diseased, immune, immunized as a result of immunosuppressive subinfection, healthy, so the results are difficult to interpret.

Blood serum from sick animals is taken twice a day, 5-7 days, 7-10 dayC. Freshly obtained, dried on filter paper, canned (with phenol or boric acid) whey is used for the reaction. Live leptospira cultures are used as antigenC. In addition, indirect hemagglutination reaction, CBD, fluorescent smear antibody methods are used.

MAR. Whey is diluted in a ratio of 1:50, 1: 250, 1: 1250. The reaction is placed on slotted plateC. From each diluted whey, 6 separate rows of 0.1 ml are infused into 3 cavities (depending on the number of antigens). Pour 0.1 ml of each of the 6 leptospira cultures into 3 cavities over the whey and mix until the whey is diluted 1: 100, 1: 500, 1: 2500. Gently shake the plate and place in a thermostat at 30 ^{0}C for 1 hour. Simultaneous control: 0.1 ml of culture +0.1 ml of saline.

The result is determined by preparing the drug in the form of crushed drops and examining it under a microscope. Agglutination in all diluted whey is positive if assessed at 4,3,2 pluC. In addition to the control reaction.

The macroagglutination reaction - AR - is **applied dropwise to the instrument glass** . 0.04 ml of each diluted whey or whey itself + one drop of antigen is mixed with a glass rod or shaken. The reaction is accounted for for 10 min. Agglutination is positive for 4, 3, 2 plus, negative for one plus.

Question 3. Biopreparations.

Special prevention and treatment of leptospirosis in farm animals was first developed by S.Ya. Lyuboshenko (1941) and applied in veterinary practice. For active immunization, two different variants of the polyvalent phenol vaccine against leptospirosis in farm and game animals and the depolarized polyvalent VGNKI vaccine are used. In the first variant, leptospira have groups of pomona, tarassovi, ichthegemorrhagia, and canikola. Dogs and pigs are vaccinated with it. The second variant has 4 main serovars of pomona, tarassovi, influenza, and gebdo madiC. Large and small cattle are vaccinated with it. Immunity appears after 14–20 days and persists for 6 months in young animals and up to 1 year in adults.

Polyvalent serum against leptospirosis is used for passive immunization. It is obtained by hyperimmunization of cattle with a mixture of leptospira cultures (vaccine strains). If the serum titer is 1: 25000 and above at MAR, it is considered active. Serum is administered subcutaneously in doses of 5 to 60 ml. Passive immunity lasts 15 dayC. Streptomycin is used in combination with hyperimmune serum to treat sick animals.

Control questions:

1. State the characteristics of the causative agent of leptospirosis.
2. What materials are sent to the laboratory for testing for leptospirosis.
3. What methods are used to test for leptospirosis in the laboratory?

Pathogenic mites and mycoplasmas.

Lecture teaching technology

Time: 2 hours	*Number of students: 100 people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics of pathogenic mycelium and mycoplasmaC. 2. Laboratory diagnosis of pathogenic mycelium and mycoplasmaC. 3. Biopreparations used.
The purpose of the training: to get an idea of the general characteristics, systematics, pathogen characteristics, methods of laboratory diagnosis, final diagnosis, biopreparations of pathogenic mites and mycoplasmas .	
Pedagogical tasks: introduction and coverage of the history of the pathogen, its place in the system, the definition of the disease; - Explain the morphology, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - Provides insight into the final diagnosis.	*Learning Outcomes:* Students: illuminate the characteristics of pathogenic mycelium and mycoplasmas ; - The history of the discovery of pathogens, their place in the system, describe the disease; - describe the morphology of mycelium and mycoplasmas ; - explain the cultural and biochemical properties of mycetes and mycoplasmas; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, sick animal, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. - What pathogens are included in deuteromycetes? "Do people get sick, too?" - What diseases do mycoplasmas cause? - What is the name of the pathogen? - What are its features? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he raises the problem of laboratory diagnosis of the pathogen, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the pathogen, highlighting its importance in laboratory diagnosis, are used for diagnosis, prevention and treatment.	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get
Phase 3. Final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future	They hear. They ask questions.

	professional activity.	

Basic terms: *pathogenic microscopic fungi, deuteromycetes, immature fungi, trichophyton, microsporon, acharyons, spores, Soburo, Chapeka agar, Susloagar, fluorescence method, species differentiation.*

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1. General characteristics of pathogenic mycelium and mycoplasmas.

Mycoses are a special group of diseases caused by pathogenic microscopic fungi, which include dermatomycosis, fungal mycosis, candidiasis eye pathogens.

Dermatomycoses include mycoses that infect the skin and its tissueC. The pathogen parasitizes tissues that have keratin. The pathogens deuteromycetes enter immature fungi (class *Deuteromycetes*) and are grouped into three generations - trichophyton, microsporon and aharion.

All types of farm animals, fur and wild animals, rodents are affected. People get sick too.

Trichophytia -surunkali an infectious disease, the surface of the skin and fleece sharply limited, kepaksimon qozg'oqlangan covered with a layer of gray seal in the form of lesions or skin and follicle is characterized by inflammation.

They enter the body by contact with each other. In 1845, one of the pathogens was discovered by the Swedish scientist M. Malmsten and named *Trichophyton* . A number of species of trichophyton are now known. Calves and lambs *Tr.faviforme* (ext. *Tr.verrucosum*), horses *Tr.equinum* , rodents *Tr. gupseum* , birds *Tr.gallinae* and so on.

Morphology of fungi. Trichophyton is found in preparations made from patmaterial treated with 10% alkali, on damaged hair. Straight, articulated mycelial gifs are arranged in a row along the length of the hair. The spores are single-celled round or oval, arranged in a chain in the hair or inside it, and form a coating of sporeC. Spores and mycelium infect the hair in three different ways: endotrix-spores are located inside the hair in the form of chains along its length; ectotrix-spores are located on the hair in the form of a coating around it; neoendotrix - spores are located inside the hair fiber in the form of chains and on top in the form of a coating. Spores are located only in straight rows along the length of the hair.

Cultural featureC. Fungi of the genus Trichophyton grow slowly in nutrient media. To grow it, saburo agar is planted. The pathogen-aerobic, when grown at 26-28 ^{0}C, forms smooth, skin-like, layer-by-layer, sometimes unsimon-layered colonies in 10–20 dayC. From the colonies emerge a strong, deep

branching into the nutrient medium. The pathogen has four different microconidia: endo-, or arthrospores (3–7 μm); chlamydospores (7-10 microns), as well as macroconidia (15-20 microns in length, 3-5 microns in width, large, worm-shaped spores consisting of 5-8 chambers) are located as a single or ball at the ends of the mycelium.

Durability. The resistance of Trichophyton species to environmental influences varieC. According to GS Ryabovoy, fungi can be stored for up to 10 years in shady, dark, unventilated barnC. Virulence in patmaterial is stored in the soil for 1.5 years and 2 monthC. Ultraviolet light kills fungi in both culture and patmaterial in 30 minuteC. Kills in 7-9 minutes in water heated to 80-90 ^{0}C, 7-10 minutes in boiling, 2 hours in dry heat (60-62 ^{0}C) . 5-8% alkaline solutions kill in 20-30 minutes, 2-3% phenol in 20-30 minutes, 2% formalin in 2-3 minutes.

Pathogenicity. The fungi of the genus Trichophyton are pathogenic to cattle, horses, sheep, pigs, donkeys, camels, cats, guinea pigs, rabbits, white mice, rats, dogs, fur and wild animals under natural and artificial conditionC. More cattle and horses, less dogs and cats are prone.

The disease is highly contagious, mainly affecting young animals.

PathogenesiC. The pathogenesis of animal dermatomycoses is based on the parasitism of fungi in the body, infecting the skin and its productC. The role of macroorganisms is also important. When favorable conditions are created in the body, fungi develop and multiply in the hair follicleC. Inflammation occurs at the site of entry and development. As a result of swelling of the cells of the hair follicles, the hair becomes thinner and breaks where it leaves the follicle . from the affected foci, the fungal elements pass into the blood and lymph through the dilated blood vessels and return to the skin through the bloodstream and lymphatic vesselC. And new infected sources are emerging.

Antigen structure . Spores and mycelium of trichophyton have polysaccharide and protein antigens.

Immunity. Infected animals develop long-lasting, strong immunity so that the animals are not re-infected. Sick and diseased animals will have agglutinin, precipitin, and complement-binding antibodies in their serum. The maximum titer of antibodies is maintained for 2-3 months at the time of disease development. An allergic reaction has been observed in 70–80% of animals during the period when clinical signs of the disease are present.

Diagnosis . For laboratory examination, the damaged epidermis and wool fiber fragments are removed from the border with healthy tissue. In the laboratory it is examined by microscopy, if the result is doubtful, the patmaterial is inoculated into the culture medium, pure culture is isolated, luminescent analysis and biosinov are performed.

The shavings are treated with 10% alkali (*KOH* or *NaOH*) for 15-30 minuteC. The drug is prepared by the crushed drop method and viewed under a microscope. The damaged hair appears as endospores arranged in a row, inside and outside.

To separate the pure culture from the patmaterial, Saburo, suslo-agar, one of the Chapeka nutrient media is used. Alkaline treated material should be washed with saline by centrifugation before sowing, 100-200 TB / ml of penicillin and streptomycin are added to the material as it is dirty.

Biosinov - the skin of a guinea pig or rabbit is scratched and patmaterial is applied to it.

BiopreparationC. A team of authors such as AX Sarkisov, SV Petrovich, LI Nikifirov, LM Yablochnik, 1974 developed the LTF-130 vaccine for the treatment and prevention of cattle trichophytia, the SP experimental vaccine for the treatment and prevention of equine trichophytia. The LTF-130 vaccine is administered intramuscularly in two doses for treatment, and 2 times at intervals of 10-14 days for prevention.

Microsporia pathogens . Microsporia (microsporosis, temiratki) is an infectious disease of the skin and its derivatives, characterized by extreme infectivity, manifested clinically in 3 different forms: superficial, deep or follicular, atypical. Dogs, cats, pigs, horses, etc. as well as people get sick, especially young children.

The main pathogens that cause disease in animals are: 1) *Microsporum equinum* - in horses; 2) *M.lonosum* - in cats, dogs, fur and wild animals, guinea pigs, monkeys; 3) *M.lonosum Bodin - causes disease in* cats, dogs, horses, calves, guinea pigs, rats, mice.

Morphology . Fungi of the genus Microsporum occur in the form of mycelium, branched in the patmaterial, divided into jointC. It breaks down and forms round single-celled sporeC. The fungal spores form a coating around the damaged hair. Spores are arranged in an irregular, mosaic shape. The size of the spore is 3-6 μm.

Cultural features . The fungus grows at 26-28 ^{0}C , on glucose Saburo agar . *M.equinum forms skin* -like, layered, densely packed, gray-white mycelial-covered colonieC. Mature colonies are yellow or brown. Mycelium is divided into joints, microconidia are noxious, macroconidia are multicellular (15-20x12-17 μm).

M. lanosum suslo - agar with a round concentric circular gray *discharge,* forming ovoid colonies in the center. Mycelium is divided into joints, branched in young cultureC. Macroconidia are multi-chambered, tapered at both ends, 40-80 μm long.

M.gypseum forms flat, *ovoid* colonies in suslo-agar, mycelium is rocket-like, macroconidia are multicellular, 8-12x30-50 microns.

The enzymatic properties of dermatomycetes are completely different and mostly not constant, so they are not used in the differentiation of fungal species.

Durability. Microspores live 3-4 years or more when patmaterial (hair, skin scraps) is stored in paper bags at room temperature. Dry heat kills the fungus at 110 ^{0}C for 30 minutes, at 80 ^{0}C for 2 hours, boiling-2-3 minutes.

5% sulfur-carbolic solution is used for disinfection. Gowns, towels, bandages and other special clothing are boiled in 2% soap solution for 15 minutes or soaked in 5% chlorine (3 hours), 5% lysol (20 minutes).

Dermotophytes live 2-7 years in damaged wool, 8 months in manure, 142 days in soil.

Pathogenicity . *In* horses with *M.equi* fungus, the disease can be caused by guinea pigs from laboratory animals: To do this, a fungal culture or patmaterial is applied to the animal by scratching its skin.

Antigenic properties are poorly understood. Trichophytia and microsporia can be distinguished by the fluorescent antibody method. Their difference in antigenic structure is of great importance in the development of prophylactic specific biopreparations.

Diagnosis . When microsporia is suspected, scraps taken from the affected foci are examined microscopically to confirm the clinical diagnosiC. if necessary, a pure culture of the pathogen is isolated. In addition, trichophytosis should be distinguished from microsporia. For this, luminescent analysis is used. In the case of microsporia pathogens, characteristic green radiation (light) appears under the influence of ultraviolet light. The trichophytia pathogen is not irradiated.

Biopreparations . No specific treatment for microsporia has been developed. Drugs used in trichophytia are used for local treatment. Highly fungicidal drugs have been proposed: yuglon, phenothiazine, amkazol, iodine - vasogen, yam, etc. There are no specific disease-preventing agentC.

Favus (parsha) pathogen . Favus is an infectious disease characterized by damage to the skin, feathers, hair and nailC. Internal organs can also be damaged. Mostly birds, less mammals get sick. In birds, Favus is characterized by the appearance of a grayish-white layer-scutula near the crown, earrings and beak. The furnaces merge and the crown and earrings are completely covered with scutula. In the generalized form, the head, body, as well as the nasopharynx, gills, small intestine are affected. In cats, dogs, rabbits, favus appears in the form of scutula. The skin around the nail and scalp are damaged.

The main pathogens of *Favus belong* to *immature* fungi, family *Moniliaceae,* genus *Acharion* . *Ach.gallinae in* birds, *Ach.schoenleini* in humans *causes the* disease. In sporadic cases, dogs, cats, monkeys, and rarely calves become ill.

Morphology . Fungi of the genus Axorion have mycelium branched in patmaterial, consisting of felt-like gifC. The mycelium is thin, divided into jointC. It may consist of broad, right-angled cells consisting of two contourC. Spores are round or polygonal in shape, they are arranged in a chain or group. Diameter 4-8 μm. In addition to spores, damaged hair also has air bubbles.

Cultural features . The causative glucose is grown on Saburo agar. From 4–5 days the colony begins to grow in the form of small gray bumps, on the 10th day it reaches 10–20 mm in diameter. At first smooth, leathery, yellowish-white, then the colonies become waxy, strongly wrinkled.

Old cultures are tall, dry, powdery, grayish white. On microscopic examination, the mycelium is first thin (1.5–2 μm), then thick (5 μm), clearly divided into joints (4–20 μm), sometimes scaly. The colonies are pink, pinkish-red, raspberry in color.

Pathogenicity . white mice are infected with fungal culture or pat material. It can also cause damage to chicken crownC. Artificial disease can be caused in guinea pigs and rabbits.

Diagnosis . The patmaterial is examined microscopically to make a definitive diagnosis.

Biopreparations . No special means for the prevention and treatment of the disease have been developed in FavuC.

The causative agents of fungal **mycoses** are fungi belonging to the genus *Aspergillus, penicillium, Mucor* , etc.

Aspergillosis is an infectious disease of domestic and wild animals, sometimes affecting y.s.h., m.s.h., horses, pigs, beeC. Man is also prone to this disease. Respiratory organs are mainly characterized by granulomatous lesions of the lungC. The causative agents are immature higher fungi of the class Deuteromyces, belonging to the genus *Aspergillus* .

The causative agent of **mucormycosis is the** *MM racemosus* , which belongs to the genus Mucor . Mucormycosis is a chronic disease characterized by the development of granulomatous processes in the lymph nodes, lungs, other organs and tissues.

Patmaterial . Pus, necrotic tissue, exudate, granulomatous tissue.

Microscopy . Mycelium, spores not divided into joints, appear in the ointment.

The causative agent of candidiasis is a yeast fungus of the genus *Candida albicans* . It is a facultative parasite that lives permanently in the mucous membranes of animals and causes candidiasis (molochnisa). The digestive tract is characterized by damage to the mucous layer, various organs and tissueC. Mostly birds are affected. Fewer calves, lambs, etc. young cattle get sick.

2. Laboratory diagnosis of pathogenic mycelium and mycoplasmas.

Pathogenic mycoplasmas

Mycoplasmas are small, no cell walls, free-living prokaryoteC. In them, the function of the cell wall membrane is performed by the cytoplasmic membrane (G.Ya. Kagan, 1979).

Mycoplasmas are characterized by the following complex features: 1) cells with a polymorphism of 100-450 nm, consisting of branched, chain, spherical small elements; 2) has an outer three-layered cytoplasmic membrane, accumulated many biosynthetic and regulatory functions; 3) the genome consists of a single-molecule DNA that forms a ring chromosome, characterized by a lack of guanine and cytosine in the nucleotide composition; 4) located between *E.coli* and T-phages in terms of genetic information volume ; 5) propagated in many ways - budding, branching and chain-shaped segmentation, simple division (integral

method); 6) need sterin (except axoleplasms) and protein for growth; 7) forms colonies with a central rise in dense environments; 8) bacteria are resistant to penicillin and other antibiotics that affect the synthesis of cell wall peptidoglycans; 9) undergoes various lyses of hemadsorption, hemagglutination and erythrocytes; 10) antigens clearly differ from each other.

The etiological significance of mycoplasmas in animal pathology was first identified in 1893 by Nokar and Rular in cattle peripneumonia. They developed a method of growing in a Marten broth in which blood serum was added by separating a filtering agent from the pleural exudate of a sick animal. Russian scientists MGTartakovsky and Ye.P. The Dzhunkovskys studied its biology by creating effective methods for growing mycoplasmaC. Edward and Freundt (1956) proposed the first classification and nomenclature of mycoplasmaC. Scientists such as VDTimakov and GY Kagan also made significant contributions to the development of mycoplasmatology.

Classification of mycoplasmaC. All mycoplasmas are grouped into a single class of soft skins - *Mollicutes* (Latin *mollia* - soft, flexible, *cutes* - skin). *The* class *Mollicutes* enters *prokaryotes* and contains a single row of *Mycoplasm tales* . It consists of two families — Mycoplasmataceae (*Mycoplasmataceae*) and Axoleplasma (*Acholeplasmataceae*), *Thermoplasma,* and *Anaeroplasma* .

The mycoplasma family is divided into two generations - mycoplasma and ureap lasma. There are 50 species of all representatives of the mycoplasma genus, which do not hydrolyze urea and need exogenous cholesterol for growth. There are 8 serotypes of the ureaplasma genuC. Microorganisms of the axoleplasma family do not need cholesterol to grow. Includes 5 types.

Morphology and tinctorial featureC. Mycoplasmas are polymorphic microorganismC. This feature of them is characterized by the absence of a regidative cell wall. in ointments prepared from the affected organ and cultures appear in the form of spherical, spherical, filamentous, ovoid rods, or ringC. Which shape is more common depends on the composition of the medium, the method of cultivation, the phase of growth, the method of hardening and dyeing. Their size is 300-400-1000-1400 nm. Mycoplasmas are well stained by gram-negative, Romanovsky Gimza methodC.

Cultural features . Mycoplasmas grow in a nutrient medium composed of complete protein, cholesterol, steroids, nucleic acids, carbohydrates, vitamins and mineral saltC. Pathogen species grow well in nutrient media with the addition of horse or pig serum. It also grows in 3-7 day old chicken embryos and cell cultureC.

Biochemical propertieC. Mycoplasmas have a complex enzymatic system. Metabolism is divided into three types according to the nature-enzymatically active stering-dependent, enzymatically active stinger-dependent, and non-enzymatically active. The first (true mycoplasmas) need stingin for growth and break down glucose, maltose, mannose, fructose, starch, glycogen to

form acid. The latter (axoleplasms) also break down the above carbohydrates to form acid. Some strains break down sucrose and galactose. The third does not break down carbohydrateC. Mycoplasmas do not form indole, some strains secrete hydrogen sulfite and ammonia.

Pathogenicity. Some species of mycoplasmas secrete exotoxinC. Mycoplasmas play an important role in the infectious pathology of animals - they can damage individual organs, organ systems and cause special diseaseC. These include peripneumonia of large horned animals, pleuropneumonia of sheep and goats, infectious agalactia of sheep, enzootic pneumonia of pigs, respiratory mycoplasmatosis of birds, etc. These microorganisms are also etiologically important in mycoplasmic mastitis, arthritis, conjunctivitis, polyserositis, urogenital mycoplasmosis.

The structure of the **antigen** is complex, and mycoplasmas are distinguished by interspecific and interspecific agglutination, passive hemagglutination, complement binding reaction, DPR. In mycoplasmas, the antigenic function is performed by lipid, polysaccharide and protein components.

Large horned animal peripneumonia (pleuropneumonia) is characterized by croupous inflammation of the lungs, the development of pleurisy, the appearance of anemic necrosis in the lung tissue, an increase in persistent fever. The causative agent *is M. mycoides* .

Morphology and tinctorial featureC. Mycoplasma occurs in cocci, diplo cocci, ring, thread, star, disc, or spherical formC. Sizes vary from 125-250 nm. Polymorphism is especially well developed in broth cultureC. The pathogen passes through a bacterial filter. Mycoplasmas are well stained by the methods of Roma novsky Gimza.

Cultural features . Grows in pH 7.8-8.0 liquid and dense special nutrient media (Marten broth and agar with 8% whey). *M. mycoides* - aerobic, optimal growth temperature 37 ^{0}C. In a liquid medium after 2–3 days there is a slight turbidity. serum agar- grows in the form of a mucous coating. It also grows in the chicken fetus.

Biochemical properties . It does not dissolve gelatin, does not form indole, breaks down glucose, mannitol, starch, glycogen. The culture filtrate lyses horse erythrocytes.

Biosinov is placed in suspicious caseC. For this purpose, the calves are damaged under the skin. Laboratory animals are not prone to disease. As a result, the calves get sick in 2–7 dayC. Body temperature 40-41 ^{0}C, phlegmon appears in the affected area, passes into the regional lymph nodes, and general intoxication of the organism developC. After 17 days, the calf dies.

Serological diagnosticC. CBR is used for general inspectionC. The reaction is set in the generally accepted way. Broth culture or lymph of the pathogen is used as the antigen.

Durability. The pathogen is less resistant to external influenceC. When dried, it dies after 5 hours under the influence of sunlight. The usual concentration of caustic soda, formalin, chlorine, or fresh slaked lime has a good effect.

Immunity. Long-term immunity develops in animals that recover from illnesC. Vaccinated animals also develop immunity for up to 2 yearC.

DiagnosiC. Based on the results of laboratory testC. Bronchial mucus from sick animals, mammary gland secretions, urine, pleural exudate from the dead,

The causative agent of infectious agalactia in sheep and goats is *Mycoplasma agalactiae.* The disease is characterized by damage to the mammary glands, loss of milk secretion, damage to the eyes (keratitis, conjunctivitis), jointC. When the disease is acute, the animals die after 5–8 dayC.

Patmaterial. Milk or udder secretion (in agalactia), synovial fluid of the affected joint, infected eye secretions, liver - part of the udder, synovial fluid, abscess material are taken from sick animalC. The material is sent in a frozen thermos or in a frozen state through a specialist mist. Fresh frozen material should not be stored for more than 10 days.

Microscopy. A thin grease is prepared from the material being tested and dried for 24 hourC. The grease is soaked in distilled water for 10 minutes to remove salt and dissolved proteins, dried on paper, hardened with ethyl alcohol for 10-15 minutes, stained for 48 hours by the Romanovsky Gimza method, washed and dried. Like other mycoplasmas, *Mycoplasma agalactiae* is polymorphic, measuring 250–400 nm.

Cultural features . Aerob. It grows in marten agar and broth with the addition of 15-20% horse or cattle blood serum., Ambient pH 7.4-8.0, optimal temperature 37 ^{0}C. also grows in Hottinger and Edward environments with the addition of whey and 1-2% glucose. Grows slowly in liquid nutrient media, slightly turbid for 5-6 dayC. Grows in dense nutrient media in the form of small colonies (seen in a magnifying glass). A colony of young cultures migrates easily from the surface of a dense nutrient medium, while older cultures migrate difficult. Mycoplasmas can also be grown in cell cultures - sheep embryo kidney cells, chicken fibroblasts.

For biosinov , sheep and goats are **infected by injecting** 5-10 ml of material under the skin or into a cistern. The incubation period is 2–14 dayC. Based on the diagnostic guidelines (1984), 2.5-3.0 kg of rabbits can also be used for biosynthesiC. They are damaged by a patmaterial suspension (1:10) with the addition of 100 TB / ml penicillin, 1-2 drops of 10% thallium vinegar solution. This mixture is left at room temperature for 1 hour, then damaged by sending it to the anterior chamber of the rabbit eye. To do this, first the eye is anesthetized with navocaine, then with a fine needle carefully draw 0.05-0.1 ml of liquid in the syringe, without draining the needle, the syringe is replaced by a ready-made suspension torpedo and 0.1-0, 2 ml is sent. In positive cases, keratitis develops after 5-12 dayC. Milk from sick animals or synovial fluid can also be used for biosinov.

Biopreparations used. A team of authors such as AX Sarkisov, SV Petrovich, LI Nikifirov, LM Yablochnik, 1974 developed the LTF-130 vaccine for the treatment and prevention of cattle trichophytia, the SP experimental vaccine for the treatment and prevention of equine trichophytia. The LTF-130 vaccine is administered intramuscularly in two doses for treatment, and 2 times at intervals of 10-14 days for prevention. For active prevention:

The TF-130 and LTF-130 dry vaccines for cattle were prepared from an attenuated strain of *Trichophyton verrucosum (faviforme)* .

The *SP* – 1 vaccine for horses is made from the *Trichophyton equinum* strain.

Trichovis dry vaccine for sheep was prepared from the strain *Trichophyton verrucosum* (autotrophicum).

The MENTAVAK vaccine for fur-bearing animals and rabbits is made from a culture of *Trichophyton mentagrophytes* .

Camelvac-TC vaccine for camels is made from an attenuated strain of the fungus *Trichophyton* sarcasm.

MIKOLAM vaccine for carnivorous animals, nutria and rabbits.

The Polivak-TM inactivated vaccine against canine dermatomycoses consists of 8 species of fungi of the genus *Trichophyton* and *Microsporum* .

VAKDERM vaccine against dermatomycoses: designed to combat microsporia and trichophytosis in dogs, cats, fur animals and rabbitC. *Microsporum canis, Microsporum gipseum* and *Trichophyton.*

Prepared from highly immunogenic strains of *mentagrophytes* .

In vaccinated animals, immunity is maintained for life.

Biopreparations . No specific treatment for microsporia has been developed. Drugs used in trichophytia are used for local treatment. Highly fungicidal drugs have been proposed: yuglon, phenothiazine, amkazol, iodine - vasogen, yam, etc. There are no specific disease-preventing agentC.

Biopreparations . No special means for the prevention and treatment of the disease have been developed in Favus.

Control questions:

1. State the characteristics of the causative agent of trichophytia and the laboratory diagnosis.
2. State the characteristics of the pathogen and the laboratory diagnosis.
3. Explain how trichophytia, microsporia pathogens are distinguished.
4. Obtaining patm material for examination for dermatomycoses.
5. Candidiasis, aspergillosis pathogens, their cultivation.

Bacterial and mycological diseases of fish pathogens

Lecture teaching technology

Time: 2 hours	*Number of students: ___ people*
Form of training	Information, visual presentation
Curriculum	1. Pathogens of bacterial diseases of fish 2. Pathogens of mycological diseases of fish
The purpose of the training: *to get an idea of the general characteristics, systematics, pathogen characteristics, methods of laboratory diagnosis, final diagnosis, applied biopreparations of bacterial and mycological diseases of fish .*	
Pedagogical tasks: introduction and coverage of the history of the pathogen, its place in the system, the definition of the disease; - Explain the morphology, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic methods; - Provides insight into the final diagnosis.	*Learning Outcomes:* Students: Explain the characteristics of the disease; - The history of the discovery of pathogens, their place in the system, describe the disease; - describe the morphology of the pathogen; - explain the cultural and biochemical properties of pathogens; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, sick fish, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines	Activity content

and time	educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. - What are the bacterial pathogens of fish? "Do people get sick, too?" 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he raises the problem of laboratory diagnosis of the pathogen, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the pathogen, highlighting its importance in laboratory diagnosis, are used for diagnosis, prevention and treatment.	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write they get
Phase 3. Final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	They hear. They ask questions.

Basic terms: *Pseudomonas, GP, GPB, pathogenic microscopic fungi, bronchiomycosis, ichthyosporidiosis, carp, carp, necrosis, septic, fungus.*

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Pseudomonas aeruginosa is an infectious disease of fish characterized by the development of a septic process, general water accumulation, shedding of coins, and source bleeding in the skin and finC. The disease occurs in water bodies of China, Israel, Western and Eastern European countries.

The causative agent is a bacterium belonging to the genus Pseudomonas: P.Syprinsepticum, P.nov species, P.capsulata. P.Syprinsepticum - motile, monotrixial, gram-negative, rod-shaped, 1-2mkm long, 0.5-0.7mm wide, does not form spores, forms a capsule in the blood. In GPB, the stimulus slightly obscures the environment, creating muar waveC. On average on the 3rd day of growth in GPA the colonies reach 1.5–2 mm in diameter, are semi-transparent, the sides are convex and the surface is smooth.

Epizootiological data show that pseudomonas infects carp, carp, their hybrids, silverfish, ala forehead, white forehead, fish from one year old to offspring. Outbreaks appear to be exacerbated during the second half of the winter, from January to March, and are characterized by mass extinctions of diseased fish. Mortality of young fish is 30-40%, if the disease is in the acute course, all sick fish die.

The source of the disease is sick and diseased fish as well as wild fish.

Clinical signs of the disease. Sick fish are weakened, do not respond to external impressions, dust accumulates in the stream of water. Source shedding of skin coins and enlargement of the abdomen are observed. Coin shedding areas are dark green with dark green spots , dotted or source blood on various parts of the body, especially in the area of the jaw, chest and abdomen. flows are observed.

DiagnosiC. Put in a complex way. Epizootiological data, clinical signs, pathoanatomical changes, bacteriological examination are also based on bioprobe placement. Only live sick fish are taken for bacteriological examination. At least 5 fish were taken for each case. Blood, liver, spleen, kidneys are obtained from patmaterial and implanted in GPA and GPB larvae. Highlights from the clean mad pathogens and to determine immunogenik features biosinov. With each isolated culture, at least 10 healthy carp species of one-year-old or forehead fish from artificial farms are artificially infested. To do this, 0.1 ml of 2-day culture broth is sent and observed for 10–15 dayC. If 50% of the fish in the experiment die, the biosynthesis is considered positive.

The role of fungal diseaseC. Diseases caused by fungi in fish are characterized by mass death among fish. It poses a very high risk, especially in the context of the intensification of the fishing industry. Although these diseases have been occurring

in fish farms for a long time, they are still not well studied. An absolutely accurate method of diagnosis has not been developed, the epizootiology and pathogenesis of the disease have not been well studied, and effective measures to prevent and combat the disease have not been developed.

Diseases caused by bronchiomycosis, ichthyosporidiosis, and other fungi are widespread among fish fed in reservoirs and pose a major threat to fisheries.

Bronchiomycosis is a highly contagious disease of various species of fish, characterized by damage to the blood vessels in the jaw apparatus and necrosis of the jaw tissue. The disease occurs in fishing ponds in Western Europe. Although we have not reported this disease, there is a risk of its occurrence. It is found in several regions of the former Soviet Union, Ukraine and Russia.

Etiology. The causative agent of bronchiomycosis in carp, carp and their hybrids, carp, peskar species is Bronchiomyces sanguinis Br sanguinis - this is a specific blood parasite. The gifs of the fungi (egg-like pupae inside) are strongly branched, 8-30 μm thick and 10-15 μm long.

They are bud-shaped, usually thin, and thicken when they form sporeC. Strongly branched gifs are located only in the blood vessels of the jaw and in the compartments of the jaw and in the folds of the respiratory organ. The mycelium of the B demigrans fungus consists of tree-branched hyphae, the bark is in the form of a thick double-contoured membrane, 0.5-0.7 μm thick,

In the final stage of development it extends to 22-28 micronC. The width of the gif is 13-15 μm. The hyphae first enter the capillaries in the respiratory layers, and then the vein, which, as a result of its rupture, enters the connective tissue of the jaw and continues to grow there.

Epizootiological data. The causative agent of bronchiomycosis is widespread in nature. However, the epizootic and enzootic appearance of this disease is not recorded in natural water bodieC. The disease occurs mainly among fish fertilized in artificial ponds, which have favorable conditions for the development of the pathogen in such pondC. This is primarily due to the unsanitary condition of the pools and reservoirs and the very low level of veterinary-sanitary culture.

Epizootic and enzootic manifestations of the disease are observed in summer, when the water temperature is + 22 + 25 ^{0}C. Carp, carp and their hybrids, carp, pescars are prone to the disease. All ages of the above fish are prone to disease, but 1-2 year olds are more susceptible. The disease is severe and the mortality rate is 46-71%. The main sources of infection are sick fish, carcasses of fish that have died from the disease, and parasite-carrying fish. Damage occurs through mud in the pool. Pathogens are transmitted from one body of water to another through sick fish, or through diseased fish, or through the waters of unhealthy farms.

Feeding fish with malnutrition, low water flow, lack of water, and excessive contamination of water bodies with organic matter also contribute to the onset and progression of the disease.

Clinical signs of the disease. The disease is very severe. The epizootic manifestation of the disease is more often observed in the summer and lasts 5-12

days, depending on the temperature of the external environment, that is, there is an acute flow. At the beginning of the disease, punctate hemorrhages are observed when B. Sanquinis fungus enters the blood vessels of the jaw chambers, then the fungal hyphae grow inside the jaw blood vessel, causing its filling (parasitic embolism) and circulatory disorderC. as a result, the blood supply to some parts of the jaw tissue deteriorates, turning white. Some parts die (die) and the corners of the jaw remain uneven. Other parts of the jaw become bluish as blood collects in the arteries.

Sick fish do not receive food, their response to external environmental impressions is sharply reduced or do not respond at all, they float to the surface of the water but do not receive air, just like ‘zamor’ and it is much easier to catch fish by hand. Strongly damaged fish lie on their side and die in this position. The cost reaches 50-70%. In undead fish, the disease is semi-acute or chronic. The suffering of a sick and healed fish is like being eaten. Its recovery will take yearC.

PathogenesiC. The overgrown hyphae of the fungus clog the blood vessels, resulting in disruption of blood supply and oxygen exchange to the tissues, destruction of necrotic jaw tissue, and favorable conditions for the development of secondary saprophytic microbes and fungi. The fungal hyphae in all internal parenchymal organs, including the blood-forming organs, enter the bloodstream and cause the disease to progress further, leading to the death of the fish.

Pathoanatomical changeC. Gifs and spores of fungi are best seen when the carcasses of dead fish are dissected and histological specimens prepared from the gills are examined. The blood vessels are hyperemic, filled with fungal gifs, the blood vessels in the respiratory layers are sausage-like, its walls and epithelial tissue are ruptured. The tissues of the parenchymal organs are filled with blood , and the layer of fat and glycogen is thin.

Diagnosis is based on a complex method: epizootiological data should be taken into account, depending on the clinical signs and microscopic examination of the dead fish from the disease, based on the detection of fungal hyphae and sporeC. We need to differentiate bronchiomycosis from the “zamor” disease of fish. In bronchiomycosis, the head of the diseased fish is directed underwater.

No treatment methods have been developed.

Disease prevention and control measureC. When bronchiomycosis occurs, it is necessary to carry out anti-epizootic measures of the whole complex . First of all, to improve the zoohygienic conditions of fish storage, to accelerate the flow of water, to enrich the water with oxygen, to regularly catch fish with bronchiomycosis, especially the carcasses of fish that have died from the disease. it is recommended to feed the fish to animals and poultry after heat treatment.

Restricting the movement of fish to prevent the spread of the disease, all equipment used in fishing, which was used to catch sick fish, was disinfected for 2 hours in 2% formalin solution or boiled in containers for 30 minutes, burning wood and metal utensils in the fire. takeC.

2. Nephromycosis is an infectious disease of both carp and carp (zolotyx) fish, caused by infection of the fish kidneys with fibrous fungi, characterized by the mass death of diseased fish. This fungus belongs to the genus NephromyceC. The disease was first found in the early twentieth century in carp species aged 5-6 years, and later in carp species in water bodies of Western European countrieC. We do not have this disease, but there is a risk of it coming from other countries, so we must focus on preventing the spread of infection in our country.

Etiology. The causative agent is a fungus of the genus Nephromyces pisceium (plehn) belonging to the genus Nephromyces in the form of a thread. Gifs of the fungus (mycelium) are strongly branched, 1.5-3 nm in width. Gelatin made from fish broth grows well in a nutrient medium.

Epizootiological data. The ways in which fish are infected and the spread of the disease are poorly understood. Yarn fungi are more resistant to external environmental conditions and have the ability to maintain their viability for a long time.

PathogenesiC. Depending on the location of the numerous branching filaments of the fungus, it can be said that the infection begins in the urinary tract of the kidney and surrounds the lymphoid (hemapoetic) tissue. The growth and development of fungi begins in the urethra, where fungi enter through the external foramen, where they grow and pass into the anterior part of the kidney, as well as into the connective tissue of the kidney. . The urethra, which contains a large number of mucous cells and epithelium, is not affected by infection, but fungi grow in very small, small tubeC. In the interstitial tissues, especially in the decayed tissues, the fungi form brown, thick-walled spores-onidia.

Clinical signC. Sick fish are weak, loose, move slowly, respond weakly to the impressions of the external environment. Affected kidney function is impaired, there are signs of water retention in the body, the abdomen is enlarged, exophthalmia, and in some fish the coins in the body become dry and detached from the body.

Pathoanatomical changes . The kidneys are enlarged, white-blue in color, the back of the kidney is severely damaged.

DiagnosiC. In a complex way: based on epizootiological data, clinical signs and pathological changeC. In the laboratory, microscopic examination and sometimes a bioprobe are performed. To do this, a culture of the fungus is sent to the bladder of healthy fish. Symptoms of the disease appear after 4 weeks.

No treatment has been developed

Prevention and control measureC. The focus should be on improving the zoogenic conditions in fisheries, increasing the natural resistance of fish, improving storage and feeding conditionC. Sick fish are caught after technical inspection and cooking by animals with the conclusion of a doctor, and import from unhealthy farms for the purpose of fertilization and reproduction and acclimatization is strictly prohibited.

No special countermeasures have been developed.

3. Ichthyosporidiosis (ichthyponosis or pyanaya bolezn) of fish. It is a mycotic infectious disease of many species of freshwater and marine fish. caused by damage by.

The disease first reappeared in Germany in the late 19th century in trout species grown in artificial pondC. The disease has since spread and been observed in many freshwater and marine fish as well as aquarium fish. Although the disease is not currently found in our fisheries, there is a risk of it coming from other countries.

Etiology . The structure of the pathogen Ichthyosporidium hofer is very simple. It occurs in the form of cysts (spherical) of spherical plasmodievs in various tissues during parasitism in the fish organism. The body length of plasmodievs or fungi ranges from 6 to 20 microns in young and up to 200 microns in diameter in adults.

Epizootiological data. Many species of fish (seldevyx, lososevyx, treskovyx, kambalovyx and aquarium) are prone to ichthyosporidiosiC. However, the epizootic and enzootic appearance of the disease is observed only in fisheries engaged in the breeding and reproduction of trout species (especially ruchevaya and radujnaya trout species with fungi are intensively affected.

Under natural conditions, ichthyosporidiosis can last for years in chronic flow. The disease affects fish of all ages, but when they are under one year of age, the dangerous passage ends in death. Fish of all ages are susceptible to the disease, but the mortality rate is high when they are under one year old. The source of the disease is water contaminated with diseased fish, carcasses of fish that have died from the disease, and spores of the fungus.

Clinical signC. The clinical manifestations of the disease are diverse, depending on the nature of the organ and tissue, as well as the whole organism and the degree of damage. For example, as a result of intensive damage to the CNS, characteristic symptoms such as impaired motor coordination are observed in fish. Sick fish lose their ability to move normally, they have insecurity, they float on the shores in a state of exhaustion and weakness, they show trembling movements, like intoxication, hence the original name of the disease.

Although the appearance of fish does not differ from that of healthy ones as a result of severe damage to the jaw apparatus by fungi, they suddenly die suddenly (as a result of lack of oxygen). The presence of large amounts of plasmodievs in the kidneys and liver leads to pucheglazie in fish, dryness and separation of body coins, as well as the accumulation of exudates in body cavitieC. As a result of damage to the swimming bladder, the hydrostatic balance is disturbed, and the fish lie at the bottom of the water basinC. As a result of parasitism of fungi in the muscles and skin, there is a general weakness, the formation of wounds in various parts of the body, in which the process is complicated by the development of saprophytic microbes and fungi. Regardless of the clinical manifestations of the disease, fish do not receive food, lose weight, and become susceptible to secondary infections.

PathogenesiC. Parasites transmitted by parenchymatous organs and nerve tissue through the bloodstream are located in the intercellular spaces, causing a sharp response by the surrounding tissues, resulting in the formation of small cell infiltrates around the plasmodia, followed by a typical granulation to It is surrounded by rubble and then turns into rubetC. It retains colonies of parasites in the choked nodules, the size of which is the size of a pea grain and is distinguished by the fact that it is white or brown from the surrounding tissue. Degeneration of the tissues around these nodes is observed as a result of their displacement and crushing. As a result, the function of this or that organ and tissue is impaired and the symptoms characteristic of the disease appear.

Pathological changeC. Inflammation in the affected organs of fish, which ruptured in the initial period of the disease, and then the size of the organs increases as a result of the progressive development of the pathological procesC. For example, we see that the heart is 2.5 times larger than normal, and the liver is even 10 times larger, and then the size of the affected organs is much smaller due to the development of degenerative processeC. In this case, the wall of the heart is hard, and when held, it becomes rough.

In parenchymatous organs, muscles, subcutaneous connective tissue can be found brown granules with a round or indistinct shape. Sometimes we also encounter cysts with cracked bark. The granules in the inner layer of the liver and abdominal wall (having a granular structure) are reminiscent of the ovary at different stages of development.

Diagnosis is based on a complex: epizootiological data, clinical signs, pathoanatomical changes, as well as the results of microscopic and mycological examination. On microscopic examination, the fungus looks good on the affected organ, we can quickly and easily find its round body, which is surrounded by a capsule that attaches to it.

On mycological examination, primary sowing of the affected organs is carried out, sowing is carried out in gelatin or broth. If artificial nutrient media - gelatin, MPB, 1% cattle whey - are poured, the fungus grows well, forming a round body, from which the gifs branch.

No treatment methods have been developed.

Prevention and control measureC. When ichthyosporidiosis occurs, first of all it is necessary to take measures to prevent its spread in other water bodies, as well as to eliminate the source of infection. To do this, quarantine is established in unhealthy farmC. To create a concentration of free chlorine in the water of unhealthy farms around 5-8 mg / l, the mud under the water basins, pools is disinfected with chlorinated or quicklime (25-30 s / ha) and dried.

It is important to implement general veterinary-sanitary, fishery-ameliorative and zoohygienic measures, aimed at creating optimal conditions in some water basins, in a timely manner.

Veterinary sanitary examination. The causative agent of ichthysporidiosis is not dangerous to humans and carnivoreC. Fish caught from unhealthy farms can

be consumed without any restrictions if their marketable appearance and food quality meet the demand. If the appearance of the product and the quality of food do not meet the requirements, according to the conclusion of the veterinarian-ichthyopathologist, after boiling, the animals are slaughtered or technically disposed of.

Control questions

1. Give examples of bacterial diseases of fish
2. How are bacterial diseases of fish diagnosed?
3. Give examples of myological diseases of fish
4. How is mycological diseases of fish diagnosed?

Pathogens of bacterial and mycological diseases of bees

Lecture teaching technology

Time: 2 hours	*Number of students: ___ people*
Form of training	Information, visual presentation
Curriculum	1. General characteristics of bacterial diseases of beeC. 2 General characteristics of mycological diseases of beeC.
The purpose of the training: to get acquainted with the causative agents of bacterial and mycological diseases of bees	
Pedagogical tasks: introduction and coverage of the history of the pathogen, its place in the system, the definition of the disease; - Explain the morphology, cultural and biochemical properties of the pathogen; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity. - Introduction to diagnostic	*Learning Outcomes:* Students: - The history of the discovery of pathogens, their place in the system, describe the disease; - Explain the mechanisms of resistance, pathogenicity, pathogenesis, immunity; - Tell the methods of diagnosis; - can explain with examples the reasons for the final diagnosis.

methods; - Provides insight into the final diagnosis.	
Teaching methods and techniques	Copyright, brainstorming, quick question and answer, insert, test
Form of teaching	Frontal, group, individual
Teaching aids	Lecture text, projector, visual materials, sick animal, blackboard, chalk
Learning conditions	Sample audience

Technological map of the lecture

The work lines and time	Activity content	
	Educator	learners
Phase 1. Training training introduction (5 minutes)	1.1. Communicates the topic, purpose, learning outcomes, and lesson plan. 1.2. Invites students to work in pairs - to think and focus on the nature of the lesson, its problems.	They write. Homework they do.
Phase 2. Basic (60 minutes)	2.1. Conducts a blitz survey to activate students' knowledge. Addresses the following questions. "Do people get sick, too?" - What is the name of the pathogen? - What are its features? 2.2. In order to find answers to these and other questions, the disease is described, the characteristics of the pathogen are described in detail. 2.3. After explaining the basic concepts, he raises the problem of laboratory diagnosis of the pathogen, suggests considering the following questions. - What are the methods of diagnosis in the laboratory? - What is the final diagnosis based on? - What biological drugs are used? Organizes a discussion using the technique of "mental attack". The most optimal options are obtained from the answers. 2.4. The characteristics of the pathogen, highlighting its importance in laboratory diagnosis, are used for diagnosis, prevention and treatment.	They hear, the answer they give. They write, think to debate are prepared. Your own thoughts they say. Hear and write They will

Phase 3. Final (15 minutes)	3.1. Summarizes the lesson, draws conclusionC. Announces the results of the discussion and encourages active participantC. Explains the importance of the acquired knowledge in future professional activity.	They hear. They ask questions.

Key words : *Wax, larva, Aspergilla, European putrefaction, American putrefaction, sponge, gram-negative*

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American rot disease is an infectious disease of the bee family, caused by Batsillus larvae, which is characterized by the weakening and death of bee larvae during the fungal period.

The causative agent. Bacillus larvae are straight rods, 2-5 μm long and 0.5-0.7 μm wide. Bacillus larvae is a type of gram-negative microbe that stains well in ordinary dyes, forming spores that come in 1.2-1.8x0.6-0 microns.

Diagnosis and differential diagnosiC. External signs of the disease and pathological material are examined in the laboratory and based on its results.

The wax cells are in a blackened, perforated, and incised state, and the presence of sick, dead, and rotten larvae among the healthy offspring is diagnosed based on the presence of an odor similar to that of carpenter’s emine from the adhesive mass.

When a swab is prepared from rotten larvae and examined under a microscope, a long filamentous Bacillus larvae microbe or small round spores can be seen.

For laboratory testing, most patients separate the larval wax needles, take a piece of 10x15 cm from it, and put all the copies in a box without wrapping them in paper. Copies are placed on the bottom and sides, on top of which is placed a wooden film so that it does not touch the box. A paper with the name of the family

taken on each sample is hung. At the same time an appendix and a letter are drawn up, which indicate the name of the organization or the owner of the bee, surname, name, patronymic, address, date of receipt of pathological material, time of diagnosis, number of sick familieC. An appendix letter signed by a veterinarian will be sent to the veterinary laboratory immediately.

American putrefaction must be distinguished from European putrefaction . Larvae affected by European rot disease are yellow, lose their elasticity, and are in a dull state. The dead larvae are first yellow, then dry and dark. If the adhesive mass does not stretch, additional bacteriological and serological tests should be performed on suspicion of mixed infections.

Treatment, prevention and control measures . Therapeutic juice (feed) is prepared to treat the disease. To do this, take 2 parts sugar and 1 part water. First, the water is boiled and mixed with sugar until boiling. Then it is cooled to 30 degrees and dissolved in each liter of syrup by adding the following drugs: Biomycin -500 thousand TB, neomycin, erythromycin, oxytetracycline, 400 thousand TB of tetracyclines, norsulfazole sodium -1 g, sulfantrol - 2 g.

At the end of the day, ready-made treatment syrup for sick bee families is poured into each beehive in an amount of 100–150 ml. The treatment is repeated every 5–7 days, until the bee family is completely healed.

At the same time, beehives are well heated, holes in the hives are closed, and the number of holes through which bees enter and leave is reduced.

Healthy beehives should be protected from pathogens, equipment in beehives should be systematically disinfected and kept clean, and the use of equipment in other beehives without disinfection is prohibited.

In case of disease, all bee colonies in beehives are examined, sick families are separated, from which the larvae are sampled from infected beehives and sent to the laboratory for examination. Quarantine will be installed in beehives.

A newly identified infected bee family is lost, in which the bees are treated with sulfur dioxide, ether, or formalin. The beehives are burned along with the hives and dead beeC.

If the disease has spread to more families, sick families are transferred to new healthy, decontaminated nests and treated. Bees are moved at the end of the day when the flight of bees is reduced, when the thief has no risk of bees entering and leaving. The bees are knocked down on paper and directed to the new beehives using smoke. Once the bees have been moved, the papers are burned, and the loose waxes are quickly removed from the application. A week later, artificial beehives made of pure wax needles are placed, and the queen bees are replaced.

European rot disease is an infectious disease of bee families, which is caused by Streptococcus plutonium microbes and is characterized by the death of 3-4-day-old offspring of bees from the eggC.

The onset of the disease is caused by factors that weaken the bee family, such as cloudy, humid weather, cold weather in beehives, lack of food.

The causative agent of the disease . The causative agent is a gram-negative streptococcus called Streptococcus plutonium. European rot disease is complicated by secondary infectionC. These include Batsillus alvei, Streptococcus apis, and others.

When drugs prepared from dead larval tissue are examined, the causative agents are lancet-shaped cocci, one by one, in pairs, located in a chain. Their size ranges from 0.7 to 1.5 microns, unevenly stained, in special environments, the temperature rises to +35 degrees pH and 6.6. Stroptococci form a capsule.

Diagnosis and differential diagnosiC. Diagnosis of healthy 3–6-day-old open-seeded larvae is based on the presence of a musty or rotten apple-like odor, lack of elongation of the mass, the larvae are located in different parts of the hive, the weak attachment of dried larval skin to the walls of the hive. heats up. Batsilus alvei spores can be found in ointments made from foul-smelling mildew masses, and Streptococcus apis microbes can be found in ointments made from the body of larvae with a pungent odor. Mixed microflora can often be found.

We need to be able to differentiate European putrefaction from American putrefaction.

Treatment, prevention, and control measures are similar to those of American rot.

Aspergillosis is an infectious disease of bee families, caused by infection with Aspergillus flavus and Aspergillus niger fungi, the disease is characterized by the death and death of bee colonies and winged beeC.

Aspergillosis is a dangerous disease for humans and petC. The disease is caused by factors such as bee colonies being set up in extremely humid places and accumulation of dust in it, as well as frequent rainfall in summer.

PathogenC. Aspergillus flavus and Aspergillus niger fungi consist of mycelial and fetal (fruiting) body partC. The mycelium rises to the surface of the nutrient medium and forms a fetal-fruiting body, thickened to a height of 0.4–0.7 mm. Fetal bodies are almost round in shape and 30-40 μm in diameter. The surface of the fetal body is streaked with radial sperms in all directions, ending in a chain-shaped conidia or spores (exospores). Conodii (sporeC. Size 5x7 μm. Their body consists of a protoplasm surrounded by a bearded shell.The diameter of the fetal body of Aspergil fungus together with conidia reaches 90 μm.

Aspergillus fungi grow in all nutrient media, when the temperature is + 7- + 40 degrees (optimal temperature 20-35 degrees, pH 2.8-7.4 (optimal 3.1-4.0). The pathogens are severe aerobes, which are not affected by light in the growth of fungi. Aspergillus flavus colonies (clusters) are greenish-yellow in color and fine-grained, Aspergillus niger colonies are dark The pigments produced by fungi are insoluble in water.

Aspergillas produce toxins that affect heat-resistant nerve and muscle tissue. When these toxins are injected into the blood of warm-blooded animals, they first cause tremors and then death.

The pathogen is killed in 30 minutes when heated to 60 degrees, 2-5% phenol and 5% formalin solutions quickly kill the pathogen.

Diagnosis and differential diagnosiC. Diagnosis of the disease is based on the external signs of dead bees and adult bees, as well as on the basis of microscopic and mycological examinations.

I need to be able to differentiate aspergillosis from melanosis.

No treatment has been developed.

Disease prevention and control measureC. Beehives with bee colonies should be installed in dry and sunny placeC. It is advisable to keep strong families in boxes in shortened and well-heated nests.

In order to combat the disease, infected offspring from sick families are removed along with the hive and the beehives with the top fungus removed. Bee hives are transferred to other clean, dry and decontaminated hives with bees, all heated materials in the hives are renewed. The bee is provided with the required amount of pure honey for the family, and if there is no honey, it is fed with 67% sugar syrup. Strict adherence to the rules of personal hygiene is required in the fight against the disease. Beekeepers must wear wet bandages on their mouths and noses to prevent damage.

3.2 Practical training materials for practical training

Topic 1. Organization of the microbiology laboratory and its structure, equipment, purpose. Biological microscope, its structure and rules of operation.

The purpose of the lesson. To acquaint students with the laboratory of microbiology, its basic equipment and rules of work in it. Study the structure of the microscope and the rules of working with it.

Materials and equipment. Biological microscope of different models, immersion oil, a set of various ready-made microbial preparations painted.

Methodical instructions

The teacher explains to students the rules of behavior and work in the bacteriological laboratory, technical safety and the rules of personal prevention. Student:

1. Get acquainted with the structure of biological microscopy, draw a picture in a notebook and write the name of the main parts.

2. Study the methods of viewing the drug under a microscope and independently see the finished biological drugs stained on the immersion lens.

The State Center for Diagnosis of Diseases and Food Safety is a state institution that is part of the state veterinary service, its activities are aimed at the development of animal husbandry, prevention and eradication of infectious animal diseases, as well as public awareness for animals and humanC. aimed at protecting against common diseaseC. The system of diagnostic centers on the scale of work is as follows: district (city), inter-district, (zonal), regional and national diagnostic centers.

The diagnostic center reports to the State Veterinary Committee of the Republic of Uzbekistan and the Republican State Center for Diagnosis of Animal Diseases and Food Safety.

The main task of the diagnostic center is to diagnose diseases of farm animals, poultry, fur animals, fish, bees, etc. examination. Scientific work is also carried out in laboratorieC.

Bacteriology, parasitology and mycology at the diagnostic center; serology and biochemistry; virology; toxicology; IFA and PCR; food safety, microbiology and veterinary-sanitary examination; radiology; bees, fish and rabbit disease laboratories, nutrient media preparation department . In addition, a separate sterilization, washing, thermostat, autoclave, autopsy, special box with aseptic conditions, vivarium for laboratory animals (white mice, guinea pigs, white rats, rabbits, donor sheep, etc.) and a separate biosinov room must be. In addition, rooms for administration and specialists should be allocated. Laboratory work rooms are bright, spacious, high, poly linoleum or tiled, the walls are plastered or tiled, the table is 80 cm high, the top is covered with plastic, linoleum, glass or painted with a special white paint and all the necessary equipment , equipment,

jets, etc. should be provided. There should be hot and cold water, sewage, soap, towels and disinfectant solutionC.

The various samples tested in the laboratory *are* called *pathological materials* and include: Parenchymatous organs and their fragments, other injured tissues, tubular bone, exudates accumulated in the thorax and abdominal cavity from the patient forcibly slaughtered, dead organisms . Water, soil, air, feed samples and equipment wash from the external environment.

Methods of microbiological examination include the following.

Workers in the microbiology laboratory must follow the following rules to ensure sterility during work and the prevention of infectious diseases that occur in the laboratory.

1. Work in the laboratory wearing a white robe and hat. It is strictly forbidden to enter without a robe. It is not allowed to leave the laboratory without a robe.
2. Eating and smoking in the laboratory is strictly prohibited.
3. Every worker and student should use the workplace and the tools attached to it.
4. Hygiene must be observed during work and hands must be washed and disinfected after work.
5. Tools (tweezers, bacteriological loop, spatula, scissors, scalpel, etc.) should be placed in a flame or disinfectant after use.
6. All used materials, animal carcasses, microorganism cultures, etc. are incinerated or sterilized.
7. Suddenly contaminated items with microbial material are well disinfected under the supervision of the instructor.
8. At the end of the work, cultures of microorganisms and other materials are handed over to the teacher and the workplace is cleaned and tidied.

The structure of the biological microscope

In the practice of microbiology are widely used types of microscopes MBR-1, MBI-1, MBI-3, MBI-6, "Biolam" and otherC. They magnify the object up to 2000 and more times.

Biological microscopes consist of two parts: Mechanical and optical.

The mechanical part includes: microscope base, tube and tube holder, tool table, macro and microvint.

The optical part includes: mirror, condenser, lenses, eyepiece.

There will be dry and immersion (wet, oily) lenseC. When using a dry lens, there is a layer of air between the front lens of the lens and the drug. The front lenses of such lenses magnify 10, 20, 40 timeC. The front lenses of immersion lenses magnify 80, 90, 100 timeC. Their focal length and diameter are small. In order to produce the desired light, it is necessary to prevent the scattering of light rays, i.e. immersion oil is added to the drug, its light refractive index (1,515) is close to the light refractive index of the drug window (1, 52) because light rays do not scatter.

Placed on top of the ocular tube, they magnify 7x, 10x, 15x timeC. The magnification of the microscope is equal to the product of the numbers in the eyepiece and the lenC.

Ocular objective magnification

7 x 8 = 56

7 x 20 = 140

How to use the microscope:

1. The test drug is placed on the table, a drop of immersion oil is dropped on it and the lens is brought to 90 and focused on the drug. With a macrovint, his frontal lens is immersed in oil.

2. Observed from the eyepiece, the macrovint rises very slowly until bacteria appear, and the macrovint rotates 90^0 (part 1 - 4 of the rotation) forward or backward to ensure good visibility of the drug.

3. Hold the microvint well with the left hand to ensure good visibility of the drug. With the right hand, the drug is studied by sliding it in all directions, and the result is transferred to a notebook.

Remove the microscope from the working position

1. The drug is taken by lifting the tube with a macro screw.

2. Wipe off the oil residue on the front lens of the lens with a wiped napkin and restrict from the lighting system.

3. The lighting system is lowered below the table.

4. The window is dimmed relative to the lighting system.

5. The eyepiece is covered with a gauze napkin or the microscope is mounted in a special case.

Control questions.

1. Structure and functions of the laboratory of microbiology.
2. Basic safety rules during work in the laboratory.
3. The structure of the biological microscope.

Topic 2: Bacteriological dyeC. Drug preparation technique, simple staining method. Basic forms of bacteria.

The purpose of the lesson : to get acquainted with bacteriological dyes and learn how to prepare their solutionC. Study of bacterial drug preparation, simple staining method. Study of the basic forms of bacteria.

Materials and equipment : Dry dyes in bottles: basic and acidic fuchsin, gensianviolet, methylene blue, saffron, diamond green, ready-made solution set of dyes, immersion oil, distilled water, biological microscope, bacteriological loop, alcohol lamp , glassware, filter paper, cuvettes, Petri dishes, pure cultures of various forms of bacteria in test tubeC. Ethyl spirit, phenol (without crystals), glycerin (in solution), forfor with a mortar and pestle , beaker, ethyl spirit, 3-5% phenol solution in a special container for inserting used glassware, oil pen. Exhibition posters on the topic.

Methodical instructions

The teacher explains the topic, the students:

1. Get acquainted with dyes commonly used in the practice of microbiology.
2. Prepare a bacterial preparation from a microbial culture and dye it in a simple way.
3. After viewing the finished drug under a microscope, draw the shape of the bacteria in a notebook.

The microbe is seen under a microscope alive or dead. To study the morphology and tinctorial properties of microorganisms, specially stained drugs are prepared. Various dyes are used for this purpose.

The following aniline dyes are widely used in the practice of microbiology: basic - fuchsin, methyl red, neutral red - red in solution; carbolic crystalline violet, methyl violet, gensian violet, ready-made liquid Gimza dye-purple; methylene blue, diamond and malachite green.

Their solutions in alcohol or water are prepared from aniline dyes in powder or crystalline form. Alcohol solutions of the dye are well preserved for a long time in the dark. To increase the dyeing properties of the solutions, various chemicals (phenol, potassium permanganate) are added to them or the drugs are treated with them (weak solutions of chloride, sulfuric or chromic acids) before dyeing . Also, for this purpose, the dye-filled drug is heated, a heated, hot dye solution is poured into the drug. Perishable, long-lasting paint solutions are prepared only in the form of 1-2% solutions before use .

Alcoholic aqueous solutionC. Carbolic fuchsin. First, a saturated alcohol solution is prepared: 5-10 g of fuchsin based on 100 ml of 96% alcohol. Alcohol solutions are stored in a thermostat (shaken from time to time) until the dyes are completely dissolved to ensure good saturation. After a day the solution is ready. It should be stored in glass jars with the stopper tightly closed. The presence of a small amount of dye precipitate in the bottom of the glass container is an indicator of the saturation of the solution. Distilled water containing 5% phenol in 100ml of alcohol solution is added. The prepared aqueous-alcoholic solution of carbolic fuchsin is filtered through a paper filter. Because if there is no sediment in the solution, the grease will stain a flat well. Before using the tuberculosis fuchsia in a number of cases, it is once again diluted with distilled water (1:10) and its working solution (Pfeiffer fuchsia) is formed.

The tip of the working solution is poured into glass jars with a rubber pipette and glued with the name of the paint.

Carbol crystal violet, methyl violet, gensian violet. Crystallviolet, methylviolet dye solutions precipitate rapidly and they interfere when the drug is seen under a microscope. Often gensianviolet dye is used, in which the drug is painted a flat. To prepare its alcoholic aqueous solution, 1 g of dry gensianviolet is mixed well with 10 ml of alcohol, a few drops of glycerin and 2% phenol (without crystals) in a porcelain mortar and 100 ml of distilled water is added. To prevent the formation of sediment during storage, the saturated alcohol solution of the dye is soaked on sheets of filter paper, air-dried, cut into small pieces, and stored in a dark container.

When staining, put a piece of dry filter paper soaked in the drug gensianviolet dye to the drug, drip a few drops of distilled water on it, leave for 2–3 minutes.

Methylene blue solution (alkaline Leffler blue). To prepare the solution, 3 g of dye is dissolved in 100ml of 96 ^{0} alcohol for a long time (3-4 months), then 30ml of saturated solution is diluted in 100ml (containing 1ml of 1% potassium permanganate) in distilled water. Filtered.

Aqueous solutionC. 2% saffron: Pour 100ml of boiling distilled water into 2g of dry dye, filter and use for immediate dyeing.

1% malachite green solution: 1 g of crystalline dye is dissolved in 100 ml of boiling distilled water, filtered and used for cooling.

Ready-made liquid anzur - eosin dye (Gimza dye) is used in special dyeing methods of bacterial preparationC. It must be diluted with distilled water (1:10) before use, but a rapid precipitate is formed. To prevent the sediment from affecting the drug, Romanovsky recommends that it be painted as follows: At the bottom of the Petri dish, glass sticks or matchsticks from which the head is removed are placed. On top of them the drug grease is placed face down and the dye solution is poured under the drug (Romanovsky Gimza method).

Preparation of bacterial preparations

In order to determine the shape of microbes, their structure and biochemical properties, the drug is prepared for microscopic examination.

This process involves the preparation of grease, drying fixation and painting on the glass of the product.

The glassware used must be extremely clean and degreased. A bacteriological loop or Pasteur pipette is used to prepare the grease. The drug is prepared from cultures of microbes grown in a liquid or dense medium: milk, blood, pus (grease), liver, spleen, or other organ tissue, etc.

To prepare a drug from a culture of microbes grown in a liquid medium, a culture tube is taken in the left hand and a bacterial loop is held in the right. The loop is heated and sterilized by heating on the flame of an alcohol lamp, holding the test tube close to the flame with the little right finger, immersing the loop in the liquid, taking a drop, closing the test tube and placing it on a tripod. In the left

hand, the glass is taken and instilled into it, lightly rubbed into the glass, then air-dried, the loop is heated and sterilized in a flame (or, if using a Pasteur pipette, immersed in a container with a 5% solution of disinfectant phenol).

The dried drug is fixed in a glasC. To do this, often use the physical method: that is, the grease is passed through the back of the alcohol lamp flame 3-4 timeC. Fixing chemicals are used - ether, ethyl or methyl alcohol, formalin, formalin-alcohol and alcohol-ether mixtureC. For fixation, the dried drug is poured into a beaker containing a fixative liquid (or 1-2 drops of liquid is instilled into the drug) and left for 3-5 minuteC. The grease is washed with water and dried on filter paper.

Simple painting method and technique. In the normal dyeing method, a single dye solution, usually Pfeiffer fuchsia (dyed for 1-2 minutes) or methylene blue (dyed for 4-5 minutes), carbolic gensianviolet (dyed for 1-2 minutes) used. After washing with water, the drug is dried on filter paper, dripping immersion oil on it and examined under a microscope 90x.

Basic forms of bacteria

Bacteria come in three main forms: spherical (cocci), rod-shaped, and spiral-shaped (twisted).

Rod-shaped bacteria and bacilli. Some of the microbes in this form are called bacteria, some are called bacilli. Spore-forming rods are basil and non-spore-forming bacteria are bacteria. Spore-forming rods are called differently. If the spore is not larger than the diameter of the bacterium that formed it, it is called a bacilli. If the spore is on the transverse surface of the microbe, it is called clostridia. near one end is called a subterminal spore .

Control questions

1. Name the dyes used in the practice of microbiology.
2. Explain the process of preparation of bacterial drugs.
3. What is a simple staining method for microorganisms.
4. Name the main forms of bacteria.

Topic 3: Gram staining of drugs .

Objectives of the lesson: 1. **To** get acquainted with a complex method of microbial staining. 2. Study of gram staining of the drug.

Materials and equipment: Biological microscope, immersion oil, glassware, filter paper, alcohol lamp, bacteriological loop, with cuvette bridge, distilled water, 96 ^{0}ethyl alcohol, saline, dye solution (gensian violet, lugol, tuberculosis fuchsia), test tube, bacterial culture: gram-negative (staphylococci, streptococci), gram-negative (intestinal rods).

Methodical instructions

The teacher explains the lesson and gives the students the task: 1. Writing the Gram method of ink staining in a notebook. 2. Prepare a grease from a mixture of microorganisms and Gram stain. 3. Viewing under a microscope and drawing a picture.

A method that uses two or more dyes to paint greases is called a complex painting method.

Because the composition of the protoplasm of different microorganisms is not the same, they are stained differently with exactly the same dye. In many cases, dye solutions selectively affect different components of the microbial cell. The complex dyeing method is based on the same. One such method is the Gram method. This method was proposed in 1884 by Christian Gram. According to Gram staining, group 2:

The pH of the cytoplasm of Gram-negative bacteria is 2-3, in its outer layer there is a magnesium salt of ribonucleic acid. In such an acidic environment, basic dyes form a strong compound with iodine. The pH of gram-negative is 4-5, in which no such compound is formed. Due to this, gram-negative bacteria do not discolor under the influence of alcohol after staining with the first dye and retain their purple color. Gram-negative bacteria, on the other hand, decolorize under the influence of alcohol and, when additionally stained with TB fuchsia, turn red and are called gram-negative.

Gram staining

1. Hold the flame and paint with gensianviolet dye on the fixed grease filter paper for 2 minutes.
2. Remove the filter paper, pour the dye and pour Lugol's solution on the grease (it turns gray-brown), leave for two minutes.
3. Pour the Lugol's solution and pour in 96-degree alcohol (30 seconds).
4. Wash thoroughly in water.
5. Additionally stained with TB fuchsia for 2 minutes (the fuchsia should be diluted 1:10 with distilled water before use).
6. Wash in water, soak in filter paper and dry under a 90x microscope lens .

Control questions:

1. What is a simple and complex method of staining microorganisms?
2. What is the essence of Gram staining of microorganisms?
3. What is the cause of gram-negative or gram-positive staining of microorganisms?

Topic 4: Methods of staining spores, capsules and acid-resistant bacteria.

Course Objectives: To study and understand the methods of staining spores, capsules and acid-resistant bacteria.

Materials and equipment: Biological microscope, immersion oil, glassware, filter paper, alcohol lamp, bacteriological loop, cuvette with bridge, 95 ^{0}alcohol, 5% sulfuric acid solution, distilled water, paints in glass bottles : Leffler methylene blue, 0.5% neutral nitrate, carbolic Fuchsin, Gimza dye, 2% saffron (aqueous solution), saline, bacterial culture: spore-forming bacteria

(hay rod), capsule formation bacteria, acid-resistant and non-acid-resistant bacteria. PosterC.

Methodical instructions:

The teacher explains the lesson and gives the students a task:

1. Dyeing of spores by Peshkov, Zlatogorov, Meller methods, capsules by Mixin, Romanovsky Gimza, Olt methods, staining of acid-resistant bacteria by Sil Nielsen method.

2. Preparation and dyeing: spore-forming microorganism (potato bacilli) in a method of your choice, capsule-forming microorganism (silicate bacilli) in a method of your choice, acid-resistant and non-acid-resistant bacteria in the Sil Nilson method. Look at it under a microscope and draw a picture.

Methodical instructions

In the structure of a microbial cell, permanent and non-permanent elements are distinguished.

The rod-shaped microbes that form spores in the environment are called bacilli. During spore formation, the cell cytoplasm thickens and shrinks by up to 40%. The cytoplasm is wrapped in a multilayered shell. Due to its structure, chemical composition, the spores are resistant to heating, drying, exposure to most acids, alkalis and dyeC. When the process of spore formation is complete, the spore becomes free, without vegetative cell remnants; if the process is incomplete, the spores are located in the center of the cell, at one end or near the other, depending on the type of microbe.

Methods of staining spores are also a complex, special method. Basilla spores are resistant to impact due to their structure, chemical composition, especially the properties of the shell. Cannot be painted in normal ways.

Peshkov method.

1. The prepared grease is fixed in the flame of an alcohol lamp.

Leffler is stained with methylene blue , boiling for 2.15–20 seconds (over an alcohol lamp flame) .

3. Wash with water.

4. Dye again in a 0.5% solution of neutral nitrate for 30 seconds.

5. Wash with water and then dry.

Appearance under a microscope ; The spores are air-colored or blue, the vegetative forms of bacteria are pink.

Zlatogorov method.

The grease is prepared and air-dried. During fixation, the spores are passed back and forth 10 times over the flame of an alcohol lamp or gas burner to slightly soften the shell and destroy them. Put filter paper on the grease, pour carbolic fuchsia, then heat for 8-10 minutes until steam is formed (as a result, both spores and vegetative forms of bacteria are painted the same red color). The filter paper is

then removed, decolorized in a 5% solution of sulfuric acid for 6–10 s (spores remain red) and washed with water. Now additionally stained with a solution of methylene blue for 1 minute (discolored vegetative forms are stained). It is then washed with water, dried on filter paper and viewed under a microscope. An immersion lens is used. Vegetative cells are stained blue, spores are stained red.

Coloring the capsuleC. The capsule is a product of its high molecular weight polysaccharide, i.e. the top layer of the shell. So it is very difficult to paint them in a simple way. Special staining methods are based on the state of metachromasis (with one dye the cytoplasm is stained with a different color, the capsule substance with a different color).

Mixin method.

1. Fixed blood or branded grease is heated with Leffler blue until steam is formed and painted hot for 5-7 minutes.
2. The paint spills and is quickly washed off with water.
3. The filter is dried on paper and viewed under a microscope: Capsule - pink - red; The vegetative cell is blue.

Romanovskiy Gimza method.

1. The fixed grease is placed in a Petri dish on top of the matchsticks, with the grease facing down. A 1:10 solution of Gimza dye in distilled water is poured under it and dyed for 40-50 minutes.
2. It is washed with water, dried and viewed under a microscope. Capsule - pink, cell - blue .

Olt method.

1. Fixed drug, ie prepared hot 2% aqueous solution of saffron is stained with filtrate for 5-7 minutes.
2. Quickly wash with water and dry. Seen under a microscope. The capsule is yellow, the cell is red.

Dyeing bacteria resistant to acids, alcohols, alkalis.

Acid-resistant bacteria: pathogens such as tuberculosis, paratuberculosis, gram-positive bacteria. This special method is used to distinguish them from other gram-positive bacteria. Because the cytoplasm of acid-resistant bacteria and the cell membrane contain large amounts of fatty substances, it is difficult for dye to enter the cell when stained in the normal way.

TB-Nielsen method (staining of acid- **fast** bacteria).

1. Place a special filter paper on the fixed grease and pour carbolic TB fuchsia on it. The alcohol lamp is heated in a flame until steam appears and stays on the bridge for 5-7 minutes.
2. Remove the filter paper and pour a 3-5% solution of sulfuric acid on it for 5-7 seconds.
3. Wash thoroughly with water.
4. Additional Leffler is stained with methylene blue for 4-5 min.
5. The grease is washed with water and dried on filter paper.

Acid-resistant bacteria under the microscope - red; the unbearable will be blue.

Control questions.

1. What is the essence of the method of staining spores?
2. What is the essence of the method of dyeing capsules?
3. Why are spores and capsules not stained in normal staining?
4. What methods are available to identify spores and capsules of microbes?

Topic 5: Study of the morphology of fungi and the movement of bacteria

Course Objectives: To master the morphological features of mold fungi and yeastC. Study of the movement of bacteria.

Materials and equipment: A fungal culture belonging to the genus Aspergillus, a fungus grown in dense nutrient media in the Petri dish. Yeast culture grown in a liquid nutrient medium. Disposable and closed glasses, bacteriological loop, test tube alcohol, glycerin, an equal mixture of water, saline solution, microscope, intestinal rod, hay rod culture, themed posters.

Methodical instructions.

The teacher explains the lesson and gives the students a task:

1. Preparation of preparations from cultures of fungi and yeasts belonging to the genus Mucor, penicillium, aspergillus and microscopic examination. Identify the structural elements of fungi by drawing the result in a notebook.

2. Preparation of drugs by means of "crushed" and "hanging" droplets from mobile microorganisms (intestines, hay sticks). Seeing them under a microscope, observing the movement of bacteria, studying and writing in a notebook.

Fungi are chlorophyll-free eukaryotic microorganismC. The fungal cell has a shell, protoplasm, nucleus, and inclusionC. The shell consists of chitin, protein, glucan, fatC. In appearance, it resembles a plant in terms of nutrient uptake. But the difference is that fungi do not have chlorophyll, the reserve substance is glycogen (not starch), there is a chitin in the cell wall, the metabolic product is urea. The fungal cell is made up of thin filaments called gifs . The hyphae grow, branch out, and form the body of the fungus - the mycelium. The fungal mycelium is substrate in the nutrient medium (the colony is firmly embedded in the nutrient medium) and aerated (on the nutrient medium). Mitseliysining structure of all zambug'lar *low* and *high* antifungal divided into four classes.

Phycomycetes (Phycomycetes) - enter the lower fungi, whose mycelium is not divided into joints, consisting of a single strong branched cell with many nuclei. Ascomycetes (Ascomycetes), basidiomycetes (basidiomycetes) and immature fungi (Fungi imperfecti, Deuteromycetes) are higher fungi (mycomycetes). Their mycelial gifs consist of single or multinucleated cells divided into joints .

Fungi reproduce by vegetative, reproductive (sexual and asexual) methodC. Vegetatively occurs without special reproductive organs - mycelial fragments, spores formed by mycelial decomposition (chlamydia, spores, arthrospores,

blastospores, etc.). In the reproductive method, fungi reproduce using special organC. Asexual reproduction is carried out using special endogenous (sporangia, zoospores) or exogenous (conidia) cellC. In sexual reproduction, the nuclei of two cells join, then divide, and special gifs are formed. In hyphae, spore-forming organs appear.

Sexual reproduction capability mushrooms *(improved* reproductive cycle - the lack of *an immature* (referred to as Deuteromycetes). Takomiliashgan fungi during the development of sexual and reproductive spore stages.

Growth of fungi in suslo agar.

The head is a representative of the fungal mycosis fungi. Wet agar grows on the first day, forming a soft gray membrane layer. The body of this fungus is not divided into joints, and within the head -sporangia appear 2-4 endospores, after maturation the sporangia disintegrate and the spores spread to the external environment.

The mycelium of penicillium, aspergillius, etc., which is a representative of mycoses, is divided into multicellular joints, inside the mycelium are conidia, at the edges of the conidia are exospores.

Aspergilla is an immature fungus that grows more slowly than the funguC. On the second day, an increase occurC. The conidia are black (Aspergillus niger) and greenish-yellow (Aspergillus oryzae), and the ends carrying the conidia are like the head of a pin, from which grow exospores, which are chained in all directions like scattered light.

Penicillium is also an imperfect funguC. On the second or third day of wort agar grows as a thin layer of fluffy gray-green or green-edged white border. Mitseliysi fungi increase the network of joints, and the shahobchasimon gifi . At its end , spherical conidia (exospores) are formed and arranged in a chain.

An unpainted "crushed drop" drug is prepared for microscopic examination. For this purpose, take the material with a mycological loop and put it in a drop of liquid (saline, sterile water, of course, a liquid consisting of equal amounts of water, alcohol and glycerin is better). The mycelium is spread with threads and covered with a closed window. The drug prepared from mucus can be seen under a microscope x8 lens, penicillium, aspergillius x40 lens.

Actinomycetes (light fungi). They are single-celled microorganisms that resemble bacteria and fungi. The growth of actinomycetes mycelium hyphae spreads lightly across the substrate, bringing them closer to fungi. The thickness of the hyphae is not thicker than that of bacteria, so they are also seen in the immersion system of the microscope. The mycelium is first substrate and then airy, and the colonies are soft like velvet. The colony is taken along with the substrate due to its dense consistency, firm penetration into the nutrient medium. Because actinomycetes form pigment - they come in pink, red, black and other colorC. Actinomycetes grow at 30-35 ° C on aerobic, starch-ammonia agar.

To prepare the drug, a culture colony is taken with a loop on the glass of the product and crushed by placing a second such glass on top, pulled on both sideC. The result is two greaseC. Grease is prepared by taking a loop from the culture grown in a liquid medium. The hardened grease is stained with Pfeiffer fuchsia.

Yeast (yeast) - belongs to the class of bag fungi. They are round or oval-shaped fungi with single-celled buds without mycelium. Yeast cells have a shell, cytoplasm, formed nucleuC. Vacuoles appear in the cytoplasm over time. Their diameter is 10-15 μm larger than that of bacteria. Inside the yeast cell, 4 to 12 spores are formed, which turn into sacC. The resting cells of yeast differ from the vegetative forms by a double shell, a large supply of nutrients (glycogen, fat), and the absence of vacuoleC. Yeasts reproduce by germination, spore formation, normal division, and sexual reproduction.

To prepare the drug, a drop of yeast culture is taken on a glass slide with a loop. Closed with a closed window, it is seen in the immersion system of the microscope. Yeast cells can also be seen on the x40 lens.

Study of the movement of bacteria.

Some of the living microorganisms move and some do not.

This is one of the main characteristics that distinguishes their species from each other. The microbes move through the hives, which are located in four parts of the microbial body. Accordingly, the movement will also be different.

1. Monotrix - hivchini is one, located at one end of the body. Monotrix bacteria move towards the non-infected side.

2. Lofotrix - at one end of the body there is a bunch of hivchins.

3. Amphitrix - this group of bacteria is located in clusters at both ends of the body of the hives.

4. Peritrix - In this group of bacteria, hives are grown on all sides of the cell. Moves randomly.

The movement of bacteria is determined by preparing the drug by the method of "hanging drop", "crushed drop", inoculated vertically on a semi-liquid GPA or by inoculation on GPA condensate. A young (18–20 h) bacterial culture grown in broth is used to control the movement of bacteria. It can also be grown if. To test them, a suspension is prepared in a simple sterilized saline solution or water.

"Hanging" dropC. To prepare this drug is used a special glassware with a deep in the middle. A drop of the test material is dropped onto the cover glasC. Vaseline is applied to the edges of the hole in the glass of the appliance . The piece glass is then closed over the cover glass so that the drop in it is in the middle of the groove. The glass is carefully inverted so that the droplet hangs in the tightly closed recess so that it does not dry out. The drug is tested in a dry objective system, in a slightly darkened field of view (using a diaphragm and a lowered condenser). First find the edge of the drop in the x8 lens and then switch to x40 - 60.

The drug "crushed drop". A drop of the material to be tested is dropped in the middle of the glass window. It is then covered with a shutter window. It should not have air bubbleC. Excess liquid is soaked in filter paper. Such a drug can dry quickly. If it is used for a long time, it is necessary to apply Vaseline on the edges of the cover glass or prepare a "hanging" drop of the drug.

Control questions:

1. Morphological features of mold fungi.
2. Morphological features of yeasts.
3. The location of the bacterial sphincter.
4. What does the type of movement of bacteria depend on?
5. In what ways is the movement of bacteria studied?

Topic 6 **. Preparation of nutrient media**

Course Objectives: To get acquainted with the main nutrient media and methods of their preparation.

Materials and equipment: Ingredients for the preparation of the nutrient medium **(** broth, peptone, agar, gelatin, chemically pure table salt); GPA, GPB, Kitt-Tarossi, Endo, Levin media, with scales, funnel, Petri dish, stopper test tubes, tubes, cotton swab filter, electric hob, tripod, Michaelis comparator to determine pH, litmus paper, related posters.

Methodical instructions.

The teacher explains the lesson and gives the students the task: To study the steps of preparation of meat water, meat-peptone broth and meat-peptone agar and write it in a notebook;

1. Preparation of nutrient medium from dry food broth and agar, pouring it into test tubes;

2. Determination of pH of meat-peptone broth.

Any microbiological work, as well as the performance of practical tasks is associated with the preparation of nutrient media for the growth of microorganisms.

In microbiology, the nutrient medium is widely used to grow, collect, store, identify, isolate microorganisms, obtain from them various biological drugs and products (toxins, antibiotics, etc.).

Optimal conditions for the growth and development of microorganisms are created in any nutrient medium, which must meet the following requirements: contain sufficient amounts of organogenic elements - nitrogen, carbon, oxygen, hydrogen; phosphorus, sulfur, potassium should be inorganic compounds, macro- and micronutrients, growth factors.

0.5% NaCl, pH to a certain level, humidity must be sufficient, sterile, clear.

Agar-agar is a nitrogen-free organic substance derived from seaweed, which concentrates the nutrient medium.

Peptone is an intermediate in the breakdown of proteins, made from nectar. Rich in amino acids, peptides.

Gelatin is an animal protein. Uncle and bones are boiled, nitrogenous sour product.

Food media are classified by origin, consistency, use. natural, artificial and synthetic food environments are distinguished. Natural nutrient media are made from animal and plant products (meat, milk, eggs, serum, vegetables, casein, etc.). Artificial nutrient media are made from animal and plant products, mineral salts (GPB, GPA, GPJ). The composition of synthetic nutrient media is made from chemically pure substances obtained in precise proportions - amino acids, carbohydrates, vitamins, mineral salts (Saburo, Chapek media).

Food media by consistency:

It can be liquid, dense, semi-liquid and dry. Liquid media include GPB, Peptone water, milk, and hkIar. 2-3% agar should be added to the GPB for the nutrient medium to be dense, and 0.15-0.7% agar to be semi-liquid. GPJ should contain 20% gelatin. Many nutrient media currently used in varying amounts are produced dry. The dry food medium is sold in tightly closed glass containers (Gissa medium containing carbohydrates and polyhydric alcohols, Endo, Ploskirev medium, baktoagar J, dry food agar, etc.).

According to their use, nutrient media are divided into simple, special and differential-diagnostic typeC. Special nutrient media are used to grow microbes that do not thrive in normal nutrient media. Selective, elective, accumulative nutrient media are also special types of media. The selective nutrient medium from the material being tested (a mixture of different bacteria) is used only to grow certain types of microbeC. Elective nutrient medium is used only for the cultivation of certain types of microbes, others are lost (anaerobes, lactic acid-forming bacteria, Escherichia coli, hemolytic staphylococci, proteolytic microorganisms, etc.).

Differential-diagnostic nutrient media

(Gissa, Endo, Ploskirev medium, baktoagar, etc.) allows the detection of bacteria based on their enzymatic properties.

In the practice of microbiology are used mainly: meat-peptone broth, meat-peptone agar and meat-peptone gelatin. Freshly slaughtered beef or horse meat is used to prepare the broth. To do this, the meat is cut into pieces, separated from the bones and passed through a mincer. Cold water is poured over the minced meat (1: 2 ratio), stirred, placed in a cool place (4-6 ° C) for a day or kept at 37 C for two hours, then boiled for an hour and filtered through a cotton swab.

Squeeze the filter and add water to the filtrate until it reaches its previous volume. It is then placed in a glass jar and sterilized in an autoclave at 120 ° C for 20-30 minutes.

To prepare meat -*peptone broth (GPB)* , 0.9% sodium chloride and 1% peptone are added to meat *broth* . It is then boiled for 10 minutes, pH (7.2-7.4) is determined, cooled, filtered; water is added to the previous volume, poured into the necessary containers and sterilized in an autoclave at 120 ° C for 30 minutes.

To prepare *meat-peptone agar (GPA)* , add 2-3% dry agar, cut into GPB, and boil until completely dissolved, then the pH is determined to be 7.2-7.4. The cotton swab or filter paper is filtered, the reaction of the medium is checked and corrected, poured into the required vessel and sterilized in an autoclave at 120 ° C for 30 minuteC. The GPA in the solutions is skewed.

To make meat-peptone gelatin (GPJ) , 10-20% gelatin is added to the GPB, which is heated until it melts after boiling. The pH is adjusted to 7.2–7.4, the paper is filtered through a sieve, poured into test tubes and flasks, then sterilized in a Cox apparatus for 3 days and 20 minutes.

Meat-peptone semi-liquid is prepared as *if* GPB, only if a smaller amount — i.e. 0.15–0.5% — is added.

Microorganisms are very sensitive to environmental reactionC. The reaction of the nutrient medium is determined by two methods: electrometric (LPU 01 pH meter) and calorimetric. Often a simple Michaelis kit uses a Walpol comparator. The kit contains indicators with a pH of 5.4 -8.4 (methanitrophenol, paranitrophenol). Special 6 cells in the comparator as shown in the diagram (Fig. 34): 2 ml of medium and distilled water from 2 ml, 1 ml of indicator; 1, 3 cells 2 ml of medium and 3 ml of distilled water; 5- test tubes with 5 ml of distilled water in cell 5; Cells 4 and 6 are fitted with standard indi- vidualC. If the pH is lower than the required value of 0.1 N NaOH, if it is higher it is brought to the required level with 0.1 N HCl solution and how many ml are consumed. 0.3 ml was consumed in 2ml medium. The total volume of the medium is literC. How much NaOH do we add to it? So, 0.3x1000: 2 = 150ml 0, ln. or 15 ml of 1 n NaOH should be added. Usually the pli is taken 0.1-0.2 times more, because after autoclaving it changes to the acidic side and becomes optimal.

Control questions:

1. State the classification of nutrient media.
2. What is peptone, agar and gelatin? What nutrient medium are they used in?
3. Basic nutrient media and methods of their preparation.
4. Application of nutrient media in microbiological practice.
5. How to determine the pH of nutrient media.

Topic 7: Sterilization methods

Course Objectives: 1. **To** study the methods of sterilization.

Materials and equipment: Autoclave, Pasteur oven, Cox apparatus, Zeyts, Chamberlain filter, thermostat, sterilizer, Petri dishes, bacteriological probes, flasks, level pipettes, syringes, needles, tweezers, themed posters.

Methodical instructions

The teacher explains the lesson and assigns the task to the studentC. 1. Introduction to sterilizers, dryers, autoclaveC. 2. To study the preparation of glassware, equipment for sterilization.

Sterilization (Latin - *sterillis-sterilization)* is aimed at the complete elimination, ie killing, of all microbes (vegetative and spore) forms in different media.

In laboratories, food media, glassware (probes, pipettes, tubes, etc.), instruments, binders, gowns are sterilized. Air and box items are also sterilized to create special working conditionC. There are several physical and chemical methods of sterilization. Although the mechanism of action of these methods is different, they must meet two main requirements.

1. Complete germination of microbes.
2. Preservation of physicochemical properties of the sterilized material.

Physical method: 1.Sterilize with dry heat. *In the fire* - bacteriological loop, pasteurized pipettes, glasses, instruments are sterilized by roasting like coals.

Sterilization *with dry heated air is carried out in a* special double-walled metal drying cabinet - round electric, Pasteur oven. It sterilizes clean, well-washed, dried glassware. The flasks are covered with a cotton stopper, wrapped in paper and tied. The test tube, Petri dish and test tubes should be wrapped in parchment paper. After placing them in the dryer, connect them to the mains and set the start time of sterilization when the required temperature is reached. Sterilization duration: 160 ° C -2 hours; 170 ° C -1.5 hours, 180 ° C -1 hourC. At the end of the sterilization time, the appliance is switched off and only switched on when the temperature drops to 45 ° C. Flammable substances, liquids, food media, rubber items cannot be sterilized in dry heat.

2.Sterilize with wet heat. *Boiling is an* easy, simple method of sterilization using a special sterilizer (Fig. 30) or clean containerC. In this method, needles, syringes, tweezers, scissors, scalpels, rubber and glass objects are sterilized by placing them on a 2-3 layer layer of gauze on the sterilizer grid. Disassemble the syringes and place the needles in the sterilizer with a mandrel, sharp tools - scalpel, sharp parts of scissors wrapped in gauze or cotton. Distilled water is poured into the sterilizer until the instruments are completely closed. Cover and simmer for 20 to 30 minuteC. The tools are then used after the water has been drained and cooled.

It is based on step-by-step sterilization *with running steam* at 100 ° C and below 100 ° C. Cox apparatus is used. Sterilize at 100 C for 30- 40 minutes for 3 consecutive dayC. It can also be sterilized in an autoclave at 100 ° C. This method is resistant to temperatures above 100 ° C - carbohydrate media, milk, gelatin and other materials are sterilized.

Tyndalization is the gradual sterilization in a water bath at a temperature below 100 ° C. Sterilize for 3 days at 70 - 80 ° C, 5 days at 60 - 65 ° C, 6-7 days at 56 - 58 ° C: 2 hours on the first day and one hour on the remaining dayC. At 56 - 58 ° C, colloidal solutions, blood serum, i.e. protein preservatives are sterilized.

In the pasteurization method, food products - milk, meat, fish, canned vegetables - are heated at 80 ° C for 30 minutes and quickly cooled to 4 -8 ° C. In this case, the vegetative forms of bacteria die, the spores are preserved. Rapid cooling and storage of them at low temperatures (4 -5 C) prevents the growth and reproduction of spores.

Steam sterilization at high temperatures under pressure (autoclaving) is the most efficient method of sterilization at temperatures above 100 ° C. Along with the vapor pressure in the autoclave, the temperature also increases: 0.5 atm.-110-112 ° C, 1 atm.-12 (M21 ° C, 1.5 atm.-124-126 ° C, 2 atm.-132 -133 ° C. Vertical and horizontal autoclaves are available. The autoclave sterilizes 100 ° C resistant media (GPA, GPB, saline), paper-wrapped glass containers, metal binding materials, gownC. bacterial cultures, containers are decontaminated. The autoclave is switched off at the end of the sterilization time. boils, resulting in the stopper of the plugs being thrown along with the liquid,

In the filtration method, the sterilized liquid is passed through bacteriological filterC. There are solid-ceramic (cylindrical Sharaberlan, Berkefeld), asbestos (plate-shaped Zeyts, F_2 and SF) and membrane (porous ultrafilters, colloidal membranes) filters.

Special bactericidal lamps are used for *sterilization with ultraviolet light* . Boxing is more commonly used to decontaminate the air in operating rooms.

Ultrasonic sterilization is used to decontaminate water, milk, some products, skin raw materials.

Sterilization using chemicals is limited in laboratory practice. This method is mainly used to protect vaccines, therapeutic and diagnostic serums from bacterial contamination - *canning* . Vaccine and serum - with phenol (0.25 - 0.5%), chloroform (0.5%), formalin (0.05%), merthiolate (1: 500 -1: 10 000); The agglutinating whey is preserved with boric acid, toluene, glycerin.

Chemicals are also used for disinfection in laboratories: 1-3% chloramine, 3-5% phenol, 70% alcohol, 3-5-10% caustic alkaliC. Unlike sterilization, disinfection kills only pathogenic microorganisms, while sterilization kills all microbes completely.

Control questions

1. The concept of sterilization and disinfection.
2. Methods of sterilization
3. Structure and functions of the autoclave

Topic 8: Methods of isolation of pure culture

Course **Objectives:** **To** understand the diagnostic significance of the isolation of pure microbial culture and methods of isolation of pure culture.

Materials and equipment: 10 ml of sterile saline solution in a test tube for every 2-3 students; 9 ml of GPA in 5-6 test tubes, level pipettes and 5-6 sterile Petri dishes, a mixture of several types of bacteria in the test tube (staphylococci, salmonella, hay bales).

Methodical instructions

The teacher explains the different ways of separating pure culture.

Gives students the task: to master and independently perform planting in different methods used in the separation of pure culture, to write in a notebook.

In laboratory practice, when some materials are bacteriologically examined, they may contain a mixture of two or more species of microbeC. A microbe belonging to a species isolated from it is called pure culture

Separation of pure (one type) culture of microbes is the main work of bacteriological examinationC. Only its pure culture is used to study the properties of microbes and determine their type. In order to isolate the pure culture, special culture methods allow bacteria to grow in separate colonies (in a dense nutrient medium). Given that a colony is formed from the multiplication and development of a single microbial cell, it is possible to isolate a pure culture if it is replanted from a single colony into a sterile nutrient medium. There are different ways of separating pure culture: Pasteur, Cox, Drigalsky, physical, chemical and biological.

In the pasteurization method, take 9 ml of GPB in 8-10 solutions, add one drop of the test sample to the first with a pipette and mix, then transfer 0.1 ml to the second and subsequent solutions and mix, diluting to the last solution. As the dilution rate increases, the number of microbes decreaseC. Pasteur thought that a kind of microbe would remain in the final test tube. But it is unlikely to separate pure culture in this way. Pasteur's dilution method is currently used as an auxiliary method in the performance of other methods.

The Cox method is obtained from 10-15 ml of GPA dissolved in 5-6 test tubes and cooled to 45-50 ° C, in which the test material is diluted one by one and placed in separate Petri dishes from each test tube. Once the medium has hardened, the cups are inverted and placed in a thermostat for 18-34-48 hourC. In the last cups grow a pure culture of interest to us in the form of individual colonieC. Sterile GPB from a separate colony. GPA is planted in the larvae. Using the Cox Pasteur method, only a dense nutrient medium was used instead of a liquid medium (Fig. 38). Used in the inspection of water, milk, dung, etc. materials.

The Drigalsky method is obtained from Petri ***dishes with*** 5-6 GPA. A drop of test material is dropped into the center of the medium in the first cup and applied to the surface of the medium with a glass spatula.

The residual material on the spatula is transferred to the second bowl and rubbed on the surface of the medium, etc. to the last bowl. The cups are then placed in a thermostat. Separate colonies grow in the last cups, from which pure culture is separated by selective replanting in sterile nutrient medium. It is also

possible to use a bacterial loop instead of a spatula. In this case, the material is planted in the form of zigzag or bar lines.

The physical method *is* often used to separate the spore forms of bacteria from those without sporeC. The suspension of the test material is heated at 80 ° C for 30-40 minutes in a water bath. Bacteria in the vegetative form die, spores remain. The test is continued using the Drigalsky or Cox methods.

Chemical method - *when a* certain amount of chemicals is added to the food environment, some species of bacteria die (bactericidal effect) and some stop growing (bacteriostatic) without affecting other species, they are better o 'sadi. The use of selective and elective environments is also based on this.

The biological method *is* used to isolate a pure culture of pathogenic microbes: a susceptible laboratory animal (white mouse, guinea pig, rabbit) is infected with a suspension of the test material (tissue, bacteria). If there is a pathogenic microbe in the material, the animal will get sick and die. When a dead animal is dissected and cultured from its internal organs into nutrient media, a pure culture of the pathogenic microbe is released.

Shukevich method - When the material is ***inoculated into*** a condensate drop of GPA, the motile bacteria grow to the top of the medium, and if a small amount is taken out and inoculated into a pure nutrient medium, a pure culture of the motile bacterium is isolated.

Methods of separating pure cultures of anaerobes are also based on the above principleC. But special anaerobic microbial growth media are used.

Drigalsky method - *in* Petri ***dishes,*** instead of GPA, a special blood-glucose GPA is used to create anaerobic conditions (desiccator, microanaerostat).

The method of planting in the Wilson-Blair environment is to grow individual black colonies in the nutrient medium. When they are replanted in the Kitt-Tarossi environment, pure kuitura is released.

Biosinov method - *when* laboratory animals prone to the material under test or mixed culture are infected, they become ill and die. pure culture of pathogenic anaeroblaming is isolated using.

Control questions:

1. Give an understanding of pure culture.
2. What are the ways to separate pure culture,
3. The difference between Cox and Drigalsky methods.
4. Describe the chemical, physical and biological methods.
5. Describe the methods of separation of pure cultures of anaerobes.

Topic 9: Study of cultural, biochemical properties of bacteria

The purpose of the lesson : to acquaint students with the cultural properties of microorganisms, to master the specific growth characteristics of liquid, semi-liquid and dense nutrient media. To study some methods of determining the biochemical properties of bacteria.

Materials and equipment: for every 2-3 students: Microbial cultures grown in GPB and GPA. To determine the pure GPB and GPA, GPJ, Levin, Endo, blood agar in Petri dishes, indicator papers - hydrogen sulfide, indole, ammonia in test tubeC. Relevant tables.

Methodical instructions

The teacher introduces students to the growth properties of bacteria in liquid and dense nutrient media. Gives them a task: to examine microbial cultures - macroscopic and microscopic (with objective 8 or magnifying glass) examination. The microbial culture is examined by marking the selected microbial colony in a Petri dish with a special pencil: a) according to the scheme b) by sowing in clean nutrient media d) by preparing an ointment. It is stained by the Gram method and examined under a microscope, and the result is drawn in a notebook. Study of microbial cultures on carbohydrate media - saharolytic, proteolytic on GPJ, hemolytic properties on blood agar.

In the laboratory, each isolated pure microbial culture must be identified (compared), ie its type is determined. To do this, the following features are studied:

1. Morphology (cell shape, relative position, size, spore and capsule formation, movement).
2. Tinctorial properties (simple, relation to Gram and other staining methods).
3. Cultural features (growth in nutrient media)
4. Biochemical properties (saccharolytic, hemolytic, proteolytic)
5. Toxicity (formation of exo- and endotoxins).
6. Pathogenicity (infecting laboratory animals).
7. Antigenic properties (putting serological reactions).

The data obtained are used to determine the type of microbe using Berg's (1984) "Bacterial Detector". Only young (16-18-24-48 hours) bacterial cultures are used in the identification of microorganisms, as their properties may change with age. On the surface of a dense nutrient medium, bacteria form specific colonies.

A colony is a collection of microbes formed by the proliferation of a type of bacterial cell. Each colony can contain several hundred thousand to 2 billion microbial cells.

Liquid food background microorganisms features: 1. ***Perceived*** intensity and feature a xif (diffuse), **a strong, average, weak** . 2. The formation ***of a curtain*** , a ring ***on the surface of the environment*** . Curtain **color** , **luster** (blue, yellow, gray, white), **thickness** (thin, thick, thin, rough) , the nature **of the curtain surface** (layered, wrinkled, smooth, mesh, fluffy), **consistency** (brittle, slimy, oily) is taken into account. 3. ***Sedimentation*** - more, less, no. **Condition** - dense, soft, granular, like a piece of cotton, ipr-ipr, gritty, slimy. **Color** - white, yellow, green,

gray. **When stumbled upon, the** sediment disperses, blurring the environment uniformly, or becoming large, sometimes fine-grained. **The slimy sediment rises in the form of cut hair** . ***Germs*** can grow by ***sticking to the test tube wall*** . Microorganisms sometimes exhibit multiple properties.

Characteristics of microorganisms grown in a semi-liquid nutrient medium: inactive bacteria grow in the form of a white stem in the culture medium, while the surrounding environment remains clear. The motions **spread in the form of** clouds, blurring the environment to varying degrees.

Characteristics of a bacterial colony grown in a dense nutrient medium. ***Colonies will be delimited and merged*** . The unarmed eye is examined with a microscope (x8 lens), a magnifying glasC. First the **growth process is determined** - *more, average, lesC.* Then the same or different **shape** of the **colonies** and the following features are taken into account, *1*. ***Shape*** - straight (oval, round), irregular (root-shaped, star-shaped, amoeba-shaped, branched, etc.) picture) 2 ***size is*** represented by the diameter: large colonies - more than 4 mm, average 2-4 mm, **small** 1 - 2 mm and **smaller dewdrops are** i - lmm gaha. *3*. ***Edges*** - mountain settings (Figure C), knotty-fearing (R form), tolqinsimon, tassel, arratishli, curly (41). *4*. ***yalirashi sharpness*** (descending) -tiniq considered in the light, is not clear, fuzzy, dull, glossy, fluorescent colony. *5*. ***Color*** - gray-white, colorless, white, black, yellow, red, blue, golden, green and other colorC. Depending on the color of the pigment formed.

6. Cultures with *lateral view* are used because the cultural features *(**relief**) of the* old ones are convex, flat, conical, flat, centrally concave, etc. (Fig. 40). 7. ***surfaces*** - smooth, knotty-fearing, church steeples, ajinsimon floor floor. *8*. ***Konsistensiyasi*** - dense, ushoqsimon, dry, semi-xamirsimon, slimy liquid, powder, oil. *9*. ***Structure*** - uniform, sertola, granular, curtain (Fig. 42). *10*. ***Smell*** - no, there is (what does it remind you of?).

Biochemical properties.

The study of the biochemical properties of bacteria is an important differential diagnostic method in the detection of infectious pathogens.

The saccharolytic properties of the *bacterium are determined by inoculating* them in a differential-diagnostic nutrient medium containing various carbohydrates and indicatorC. To do this, the culture Gissa nutrient medium (containing -glucose, lactose, maltose, sucrose, mannitol, dulsite, arabinose, sorbitol, etc.) is grown in milk with sterile skim milk, litmus milk, methylene blue. The result of fermentation of carbohydrates grown in a thermostat is taken into account. The color of the environment turns red - carbohydrates break down to form acids and gases (Figure 44). For this purpose, Endo, Levin, Ploskirev dense nutrient media are also used, if semi-diluted with the addition of carbohydrates and indicators.

Proteolytic properties are often studied by inoculating the culture vertically into the GPJ. Under the influence of bacterial enzymes, gelatin undergoes proteolysis and melting (dilution) in the environment. Different types of microbes

dissolve gelatin differently. Some are funnel-shaped, some are sac-like, sock-like, etc. Bacteria are identified by the formation of end products of protein breakdown (indole, hydrogen sulfide, ammonia, etc.). Specially prepared litmus paper is used. **Paper soaked in lead acetate solution darkens under the influence of hydrogen sulfide** , pink under the action of **ammonia** turns litmus **paper blue** , and under the action of indole turns **yellow indicator paper pink** .

Some microbes exhibit reductive properties under the influence of their own enzymeC. That is, organic dye - methylene blue, malachite green, neutral red, etc., decolorizes it after growing in a thermostat for 24 hours when inoculated into the added nutrient medium (milk).

There are different ways to detect *catalase* . 1. If 1 ml of 1% l% hydrogen peroxide (H_2O_2) solution is spread evenly on the surface of the cultured daily culture . In the case of catalase, released oxygen gas bubbles appear. 2. Dissolve 3-10% hydrogen peroxide solution on the glass slide and mix the agar culture in a bacterial loop. Separation of gas bubbles (oxygen) indicates the presence of catalase. 3. Determination of catalase in broth culture - pour 1 ml of culture into a test tube and add 1 ml of 10% hydrogen peroxide solution **.** Separation of gas bubbles (to varying degrees) indicates the presence of catalase.

Hemolytic propertieC. During the life cycle of some bacteria , they produce hematoxins, proteins that lyse erythrocytes . It breaks down the erythrocyte membrane. To determine the hemolytic properties of bacteria, the culture is inoculated with 5% fibrin-deficient blood mixed meat - peptone agar (bloody agar). If there is a hemolytic property, the erythrocytes are lysed and a clear hemolysis occurs around the colony.

Control questions:

1. Cultural properties of microbes?
2. What properties of microorganisms are studied in identification.
3. How are the saccharolytic properties of bacteria determined?
4. What is the essence of proteolytic properties?
5. How are hemolytic properties studied?

Topic 10: Determination of antibiotic susceptibility of microorganisms.

The purpose of the training: to study the methods of determining the activity of antibiotics, the sensitivity and resistance of bacteria to them.

Materials and equipment: two Petri dishes with GPA for every 2-3 students, level 2ml pipette, microbial culture (staphylococcus or escherichia), tweezers, paper vials soaked in various antibiotics, Pasteur pipette, ruler, two pre-prepared GPA in Petri dishes The effect of antibiotic discs on bacteria, relevant tables.

Methodical instructions

The teacher introduces the unit of activity of antibiotics, its detection, methods of determining the susceptibility of bacteria to antibioticC. Gives students a task: to complete the paper disk method. Write a summary of the pre-prepared paper disk method in a notebook. Measuring the growth stop zone.

Antibiotics - from bacteria (gramicidin, polymyxin, thyrotricin, subtilin, etc.), actinomycetes (streptomycin, neomycin, tetracycline, erythromycin, etc.), molds and lichens (penicillin, grizeofulvin, etc.), animals (lizrin). ekmolin, etc.) and from plants (allicin, phytoalexin, aloe, onion and garlic phytoncides, etc.). These products, which are formed in their life activities, differ in the spectrum of antibiotic exposure in therapeutic practice: affecting a particular group of microorganisms (e.g., gram-positive or gram-negative) or affecting different groups of microbeC. Antibiotics are prepared on an industrial basis in the form of potassium, sodium, calcium salts and are released in special packaging. Its activity is always determined before the release of the drug

Antibiotics have an antimicrobial effect on a specific group of microbes, stopping or killing them.

Biological activity of antibiotics - the unit of action is determined by TB, expressed in 1 ml of solution (TB / ml) and the amount in 1 mg of the drug (TB / mg).

The unit of action of an antibiotic (TB) is said to be the minimum amount of a standard test that kills a microbe that is sensitive to it in a given amount of nutrient medium. A specific test microbe is used to determine the activity of each antibiotic: for penicillin - Staphylococcus aureus 209-R, for streptomycin and tetracycline - *Bac. For subtilis,* biomycin, chloramphenicol - *E.coli.* The unit of biologically active action of antibiotics is not the same: 1 TB of penicillin - 0.6 mcg, streptomycin - 1 mcg, neomycin.- 3.3 mcg equivalent to pure substance. The amount of weight equivalent to 1 TB of antibiotic is called the International Unit of Action (IUE).

In order to select effective antibiotics, the sensitivity of the pure culture isolated in the laboratory to antibiotics is determined. The susceptibility of a microbe to antibiotics is determined by the fact that their minimum amount stops or kills bacteria in 16-18 hourC. There are two ways to do this:

1. Dilute a number of antibiotics in liquid or dense nutrient media.

2. The method of diffusion of agar (paper discs soaked in antibiotics).

Method 1: a) selection of nutrient medium; b) preparation of antibiotic solutions; d) preparation of the culture for examination; e) taking into account the result. The nutrient medium should ensure optimal growth of the culture (pH 7.2 - 7.4) depending on the type of microorganism and the method of inspection. To determine the susceptibility of one type of microbe to a single antibiotic: from 2 ml in 6 test tubes - for successive dilution of the antibiotic; Nutrient medium (GPB) is obtained in 2 test tubes to dilute the culture from 9 to 10 ml and to prepare a

working solution of the antibiotic in the tube. Basic and working solutions of antibiotics are used.

The basic solution is prepared at the rate of 1000 mcg (TB) of antibiotic in 1 ml of distilled water. From it, working solutions are prepared by diluting in GPB before the experiment. Of course, the approximate susceptibility of microorganisms is taken into account. If it is 0.01 - 0.1 μg / ml, a sterile working solution with an activity of 0.5 μg / ml is prepared in a test tube and tube to obtain the required amount of antibiotic.

To the first of 6 test tubes containing 2 ml of nutrient medium, pour 2 ml of the working solution of the antibiotic in a flask containing 0.5 μg / ml and mix. Then dilute one by one by transferring 2ml to the test tube. As a result, the amount of antibiotics in the nutrient medium in the first solution was 0.25 mcg, in the second - 0.12 mcg, in the second - 0.06; 0.03; 0.015; Will be 0.007 mcg. For detection in a dense nutrient medium, a series of antibiotics are diluted in 6 test tubes: 400, 200, 100, 50, 25, and 12.5 mcg / ml. Pour 1 ml of each solution into a sterile Petri dish, add 19 ml (55 ° C) of dissolved GPA and stir gently. As a result, the amount of antibiotic in Petri dishes is reduced by 20 times: 20.10, 5, 2.5, 1.25 and 0.6 mcg. It stays on the table until the environment hardenC. The microbial culture of clear concentration (10,000 microbes / ml) grown in antibiotic-diluted nutrient medium solutions or Petri dishes for 16-18 hours is inoculated from 0.2 ml and then contains 1000 microbes per 1 ml of solution. Growing in a thermostat for 16-18 hours, the result is determined: the amount of antibiotic in the container in which the bacterium did not grow is added to the amount of antibiotic in the container in which the bacterium grew, and the number obtained by two indicates the bacteriostatic amount of antibiotic. Method 2 - In laboratory practice, the agar diffusion method is often used. It is performed in the form of perpendicular bars, agar molds, paper discs impregnated with standard antibiotics .

When using standard discs with antibiotics, 20 ml of dissolved GPA is poured into sterile Petri disheC. Once the medium has solidified, 1 ml of the 1 billion test microbial culture is applied evenly to the surface of the medium . The excess is removed with a pipette. The implants are dried at 37 ° C for 15–40 min. A disc is also placed in the center of the bowl. After installing each disc, the tweezers should be sterilized in a flame. The cups are kept at room temperature for 2-3 hours, then 16-18 hours in a thermostat, and the result is determined by adding to the disc: the diameter of the microbial growth zone around it is measured with a ruler, expressed in mm and evaluated as follows: up to mm the microbe is less sensitive to antibiotics; 15-25 mm sensitive; not sensitive if there is no undeveloped area. the larger the diameter of the undeveloped area, the higher the susceptibility of the bacterium to this antibiotic.

Control questions:

1. What are antibiotics? How do they affect bacteria?

2. What is the unit of action of antibiotics?

3. Describe the method of diffusion of agar.

4. What are some ways to determine the susceptibility of bacteria to antibiotics?

5. A method of diluting a series of antibiotics in liquid or dense nutrient media.

Topic 11: Methods of infecting laboratory animals

Course Objectives: To study the methods of infecting laboratory animalC. Understanding the LD-lethal dose of microorganisms, the dose of the pest - the essence of the detection of ZD.

Materials and equipment: Laboratory animals (white mice, guinea pigs, rabbits), bacterial culture at GPA *(E.coli)*, sterile bacterial solution, sterile saline solution, sterile syringe needle, cotton swabs, alcohol, tweezers, appropriate table and posters.

Methodical instructions

The teacher explains the lesson. Students will learn how to infect laboratory animals with saline.

Infection of laboratory animals - the purpose of biological testing: isolation of pure culture of the pathogen from the tested patmaterial, testing the pathogenicity of the tested microbial culture, determining the effectiveness of vaccines, immune serums.

Infection of laboratory animals to determine the pathogenicity of pure culture is called ‘biosinov’. In the evaluation of biopreparations, their safety is also determined in biosynthesiC. However, it is important to determine the quantitative characteristics of the microbe used to harm the animal. The virulence (toxigenicity) properties of the microbe are measured in special conditional units: the absolute lethal dose (Dcl - dosis certae letalis) kills 100% of experimental infected animals; Lethal dose of 50% (LD_{50}) - kills 50% of infected animals; Infectious dose of 50% (ZD_{50}) - 50% of infected animals become ill. LD_{50} and ZD_{50} are accurate indicators because they show that most of the animals tested are susceptible to microbeC. Dcl, on the other hand, shows susceptibility to resistant microbial species.

The LD_{50} index of the microbial culture under test is determined as followC. 500 million, 250 million, 125 million, 62.5 million dilutions are prepared from the suspension with 1 billion microbial cells in 1 ml . With each, 6 white mice were infected in a dose of 0.5 ml per abdomen or subcutaneously. Followed for 10 dayC. Typically, no dose of the pathogen kills 50% of infected animalC. Therefore, LD_{50} is determined statistically.

Calculation of LD = $_{0\ \text{in the}}$ Reed and Mench method

The amount of bacterial suspension	Number of infected mice	Actual information		Cumulative data			
		died	Live	died	Live	The dead Ratio of casualties	Scientist %
1	2	3	4	5	6	7	8
10^{-2}	6	6	0	14	0	14:14	100
10^{-3}	6	5	1	8	I	8: 9	88.8
10^{-4}	6	2	4	3	5	3: 8	37.5
10^{-5}	6	1	5	1	10	1:11	9
10^{-6}	6	0	6	0	16	0:16	0

Determination of $LD_{Si)}$ *by Reed and Mench method* . The actual numbers of the experimental results shown in the table are given in columns 3-4, and the cumulative data are given in columns 5-6. 10^{-2} row with the number 14, the same dose of small doses (10^{-3}, 10^{-4}, etc.) are likely to have been infected mice die due to: the 6 + 5 + 1 = 14 mice, the same 5 column against each dose, cumulative information is determined for all doses in column 6 (live). For example, the minimum dose of 10^{-6} infected 6 mice were alive after damage, but large doses can be alive all the mice die. So, 10^{-6} dose cumulative figure: 6 + 5 + 4 + 1 = 16 mice. For other doses, the indications are determined in the same way. Based on cumulative data, the percentage of mice that died when infested at each dose was calculated. In the experiment, no dose killed 50% of the infected animals, a mathematical calculation had to be made to find it. In our example, the LD_{50} is between 10^{-2} and 10^{-4}, closer to 10^{-4}. (37.5 to 50%) compared to the biggest difference (from 37.5 to 88.8%) proportionality factor, that is, 10^{-4} dose LD_{50} is determined from the difference. This factor is multiplied by the dilution (factor = 10, lg = l). U 1 ga teng. 10^{-4} subtract from the LD_{50} is due.

The pathogenicity of microorganisms is also determined by studying their other properties, for example, plasmocoagulase, hyaluronidase, hemolysin, fibrinolysin, lecithinase, DNA-aza tests show signs of pathogenicity of microbes.

Biosinov is most often carried on white mice, rats, guinea pigs, rabbits, and sometimes chickens, cats, dogs, and young naturally prone animals - sheep, large horned animals, and pigs.

Laboratory animals are kept in special rooms "Vivaria", in Vivaria there will be separate quarantine, sections for healthy and infected animalC. Infected animals are kept in a separate room reserved for them. After the veterinary examination of the newly introduced laboratory animals, white mice are quarantined for 10 days, rats, guinea pigs and rabbits are quarantined for 21 dayC. The vivarium should be equipped with the necessary equipment, laboratory utensils, scales, thermometers, equipment for drawing blood from animals, damage, splitting, etc., the temperature in the vivarium should be 12-20 C on cold dayC. Animals are kept in special cages, fed with a special ration.

For the transfer of biosinov are selected healthy, white mice of the same species, age and weight - 16 g, guinea pigs - 250–300 g, rabbits - 2, 3–5 kg. Their body temperature is measured and determined: white mice and rats with aniline

dyeC. guinea pigs and rabbits are marked with iron earringC. They are well fixed (immobilized) for comfortable and safe operation.

The affected area of the animals is cleaned of fur, except for white mice: disinfected with alcohol, 5% iodine solution, 2% carbolic solution. Microbial culture, its toxin or patmaterial suspension is used to infect laboratory animalC. The suspension of patmaterial is prepared by crushing it well in a sterile mortar with saline solution in a ratio of 1: 5, 1:10.

Methods of infecting laboratory animals

1. On the surface of the skin (scarification) - the surface of the skin is scratched with a scalpel and the test material is applied there.

2. Between the skin - the skin is pulled with the left hand, the needle is inserted into the skin, up to 0.2 ml of material is injected. Properly covered, it will withstand a great deal of adverse conditions.

3. When the skin is lifted subcutaneously with the left hand, a triangle is formed and a syringe needle is inserted into it: 20-25 ml on one side of the rabbit's waist, 10 ml for guinea pigs (Fig. 50), white mice and 1-10 ml is injected into the rat's tail.

4. Between the muscles - the number of most animals (from the inside), the breast muscle (breast) of pigeons and chickens, 0.5 ml for white mice, 3-5 ml for guinea pigs and rats, 5-8 for rabbits ml is sent.

5. The head of the laboratory animal is fixed in the abdominal cavity with the head down, and the test material is sent 0.1-0.2 mi, with the needle of the syringe, to the lower 3rd part of the abdomen outside the central white line (Fig. 49). .

6. The blood vessel - the ear vein of rabbits (Fig. 48), the tail vein of white mice and rats (Fig. 47), is directly affected by the heart of the guinea pig. Rabbits, mice, and rats are treated with hot water or xylene. Then the veins fill with blood and look good.

7. 0.2 ml is injected into the brain - the place where the bones above the eyes of rabbits are not finished (Fig. 52), and the mouse is pierced with a syringe needle by piercing the bone marrow (Fig. 51).

8. Nose - first anesthetized by holding a cotton swab moistened with ether on the nose of the animal , then pipette the material into the nose.

9. Oral Infection - Patmaterial is mixed with food, water, soaked in bread and fed to laboratory animals or sent through a small probe.

10. Damage to the conjunctiva of the eye is carried out only in large animals: dogs, rabbits, guinea pigC. Holding the eyelids, the material is instilled 1-2 drops into the inner corner of the eye .

Control questions:

1. What is the purpose of biosynthesis by harming animals?

2. What condition is determined by the virulence of microorganisms?
3. Determination of LD_{50} by Reed and Mench method .
4. Describe the species of laboratory animals and methods of infecting them.
5. What materials are used to infect laboratory animals.

Topic: Biopreparations used in veterinary medicine.

Biopreparations used in veterinary medicine include diagnostics, antiseptics, vaccines, and therapeutic serums.

DiagnosticC. The antigenic determinant of microorganisms is used for the production of biological drugs or diagnostics due to their pathogenicity.

1. Antigens are prepared in the form of a suspension of killed bacteria (agglutinogens), soluble antigenic drug (precipitinogens) or antigen-sensitized erythrocytes (erythrocyte diagnosticum). Sometimes stained antigens are prepared (milk-ring reaction).

2. Allergens are bacterial hydrolysates used in the diagnosis of tuberculosis, paratuberculosis, brucellosis in living animalC. They are released in ampoules as a colorless or stained liquid. Its specificity and sterility are controlled.

3. Depending on the use of **antiseptics** - agglutinating, precipitating, fluorescent, etc. It is usually obtained by hyperimmunization of animalC. Hemolysin - serum, complement, serum was produced for CBD.

4. Phages are also used for diagnostic purposeC. They lyse specific bacteria.

Vaccines are used for special prevention of infectious diseaseC. They are made from live attenuated, inactivated microorganisms, neutralized exotoxins, protective antigens (chemical vaccines).

Technology. A standard microbial suspension is obtained, chemically or physically inactivated, or the protective antigen and exotoxins are separated and neutralized with formaldehyde or another substance so that the antigen content is not compromised. Adjuvants (organic or mineral oils, neutral salts or other sorbents) are usually added to them. emulsified or adsorbed antigens are thick, and when they are sent to the body, they are deposited and released into the body in small doses from where they were sent. It enhances the immune effect of the vaccine and reduces its pyrogenic, toxic, allergic propertieC.

To determine the quality of the vaccine, it is tested for sterility, sterility (observed for 10 days after sending to laboratory animals), activity (after 1-2 weeks of vaccination of susceptible animals, lethal dose with homologous microbes should be infested).

In terms of the amount of antigen in the vaccine, they are mono-, di-, polyvaccines, and associated vaccines (i.e., have different antigens).

Therapeutic serums are used to treat sick animals and prevent disease. It is obtained by hyperimmunization of large animals on the basis of a scheme with specific antigenC. The obtained serum is tested for sterility, harmlessness, special

activity. To test for activity, it is sent to a prone animal with a lethal dose of the microbe or after infection.

Currently, globulins, lactoglobulins, immunoglobulins are being developed. They are also special therapeutic biopreparations.

Control questions:

1. What is included in biopreparations?
2. What are they used for?
3. What is the difference between a diagnosticum, a vaccine, and a therapeutic serum?
4. Explain the use of biopreparations in veterinary practice.
5. What indicators are used to check the quality of biopreparations?

M avz u. Agglutination reaction

Course **Objectives: To** know the essence of the agglutination reaction; study of methods of placement of test agglutination reaction (AR), droplet AR .

Course Description : Antigens are genetically foreign substances that interact specifically *in vivo* and *in vitro* with antibodies, triggering a response such as sensitization, tolerance, and antibody production when administered parenterally to the animal . There are corpuscular, cellular (bacteria, erythrocytes) and soluble (molecular-dispersed) antigenC. There are several determinant receptors that bind antigens to polyvalent - antibodieC. In addition to full-value antigens, haptens, i.e., protein-free polysaccharides, have the antigenic property of the lipopolysaccharide complex of the somatic antigen of the microbial cell.

Antibodies are high-molecular-weight special proteins (immunoglobulins) of the serum globulin fraction. In terms of antigen and antitelolaming interactions *in vitro* - sedimentary (agglutinin, precipitin), solvent (bacteriolysine, hemolysin) and neutralizing (neutralizes toxins) reactions, antibodies are distinguished.

In serological tests used for diagnostic purposes, one of the components must be known, through which the presence of another component is determined due to its specificity. Serological reactions are carried out in saline because the antigen and antibody bind in a weak electrolyte medium.

The essence of the agglutination reaction is that the antibody (agglutinin) in the serum binds to a specific antigen (agglutinogen), forms a precipitate (agglutinate) and settles in a characteristic form at the bottom of the test tube. Depending on the antigenic structure of the microbial cell, O-somatic antigens form fine-grained, Hivchin H-antigens form large-grained sedimentC. In

veterinary practice, AR is used in the diagnosis of diseases such as brucellosis, listeriosis, Ieptospirosis, campylobacteriosis, saimonellosis, colibacillosis, etc.

AR is applied in several ways: test tube (classic) method, drip, blood-drop, plate Rose-bengal, milk-ring. microagglutination methods.

In the classical method of placing AR in a test tube, the serum is diluted according to the instructions in the case of infection. In brucellosis of large horned animals is as follows.

Ingredients used: test serum, standard brucellosis antigen, electrolyte medium - saline solution (0.85% NaCl).

Y.sh.h. whey is diluted in the ratio 1: 50,1: 100, 1: 200, 1: 400. Collect 5 test tubes in the first row on the tripod and number. In the first, the basic dilution ratio is prepared 1:25: 0.1 ml of whey + 2.4 ml of saline. To the remaining four test tubes pour 1 ml of saline solution in the same way. Then dilute successively in a special pipette - 1 ml of the basic solution is poured into the second, from the third and final solution into a container with a disinfectant solution. From the second, 0.05 ml of antigen is injected uniformly into all test tubes (at the rate of 10 billion microbes per 1 ml). The total volume of components is 1 ml.

A separate pipette is used for each component. The solutions are mixed by shaking well and left at room temperature for 14–16 h after 4–6 h in a thermostat at 37 ° C. Simultaneous control reaction is required:

1. Positive brucellosis serum + standard brucellosis antigen result - (++++) positive.
2. Normal serum + standard brucellosis antigen result (-) is negative.
3. Standard brucellosis antigen + saline solution result (-) negative.

Accounting for the result begins with controlled solutions.

1. Sediment is in the form of a stream, the liquid is clear - 100% agglutination (++++).
2. Sediment in the form of an umbrella, the liquid is slightly turbid - 75% agglutination (+++).
3. The liquid is turbid, the umbrella is not well formed - 50% agglutination (++).
4. Sediment in the form of a button, the liquid is turbid - 25% agglutination
5. The liquid is turbid, no umbrella is formed - **no** agglutination **(-)**

The result is positive if the agglutination (++) is not less than 1: 100; At 1:50 is suspicious.

Drip AR method. Used to identify and differentiate a microbe type. To do this, separate drops of clear special serum and saline solution (for control) are taken on a glass slide. Each drop is added to the test microbe in a bacterial loop, mixed. In 5-10 minutes the result will be clear. As a result, the liquid becomes clear, the precipitate granular. In this method more colibacillosis, salmonellosis pathogens are typified.

Blood-droplet AR method. Often pullorosis is used in the examination for brucellosiC. A drop of blood is taken into the glass of a degreased vessel, a drop of

the desired antigen (stained with hemotoxylin) is added to it, and it is mixed with a glass rod. A positive result is the appearance of agglutinate after 30-60 seconds.

Milk ring reaction. Y.sh.h. used in the examination for brucellosiC. Take 2-3 ml of milk and add 0.2 ml (2 drops) of hemotoxylin-stained antigen to the test tubeC. The milk is mixed until uniformly colored and stored at 37 C for 45-60 minuteC. When milk contains antibodies, an antigen-antibody complex is formed, which is adsorbed on fat droplets and rises to the surface, forming a blue ring, the milk becomes colorlesC. As a result, the milk remains blue, no ring is formed **.**

Control questions:

1. State the nature of serological reactions.
2. What is an antigen, antibody? Give insight.
3. Components of test AR, placement technique and accounting get
4.Explain the essence of drip AR, the technique of putting it.
5. Explain the technique of putting the milk ring reaction.

M avz u. Precipitation reaction (PR)

Course **Objectives: To** know and master the essence of the precipitation reaction, methods of its application and application in practice.

Course Description *:* ***The*** reaction of precipitation (from the Latin *praecipitatus* - sediment) is characterized by the interaction of antibodies (precipitins) and antigens (precipitinogens) to form a precipitate (precipitate). Soluble (molecularly dispersed) antigens are used in PR. Precipitinogens are resistant to high temperatures (boiling, autoclaving) and decay. PR is placed in test tubes or in gel if diffuse precipitation method. Askoli's (1910) ring precipitation reaction is often used in the diagnosis of anthrax.

Components:

1. Extract - made from the test material. First the pathological material is autoclaved in 1.5 atmospheres for 30 minutes or 1 atm. Sterilize 1 hour. After cooling, it is crushed and extracted. There are two methods of extraction: a) hot method - 1-2 g of crushed patmaterial is placed in a test tube, a physiological solution in a ratio of 1:10 is poured and boiled in a water bath for 30-40 minutes; b) cold water - 1-2 g of patmaterial is poured into a saline solution of 0.3% phenol in a ratio of 1:10 and the suspension is prepared and left at room temperature for 16-24 hourC. The extracts are filtered with asbestos cotton.
2. Standard precipitating anthrax serum.
3. Electrolyte environment-physiological solution.
4. For control: standard anthrax antigen, material extract from healthy animal, normal serum.

PR placement technique. The reaction is set in two ways:

1. Transfusion of antigen on serum. Pour 0.2-0.3 ml of anthrax serum into the Ulengut test tube and gently pour an equal amount of extract (antigen) from the

test tube wall. In this case, the boundary between the components should be clearly visible.

2. Pour the serum under the antigen. In the second method, 0.2-0.3 ml of extract is first poured into the solution, and an equal amount of anthrax serum is poured under it with a Pasteur pipette. If the result is positive in both methods, an annular precipitate of a smoky color is formed between the two components, which is well visible in 1-2 minutes.

Control reaction.

1. Standard anthrax antigen + anthrax serum (result positive in 1-2 minutes).
2. Healthy animal material extract + standard whey (result negative in 1 hour).
3. Standard antigen + normal serum (result negative in 1 hour).
4. Saline solution + standard serum (result negative in 1 hour).

Evaluate the result. Positive result (+), suspicious result (+ -), negative result (-).

Diffuse PR. 1% agar is placed in the gel in the glass or Petri disheC. Once the gel has hardened, grooves are made with a standard stamp. Standard serum is poured into the central cavity, and antigen samples are poured into the surrounding cavity with a Pasteur pipette. After it has been in the thermostat for a day in a desiccator, a complex is formed where the same antigen and antibody meet, and clear precipitate lines appear. In this case, too, a control reaction is set. To make the precipitation lines look better, the plates are washed in saline and a 65% cadmium sulfate solution is poured in, making them more visible after a few minutes.

Control questions:

1. The use and significance of the precipitation reaction in practice.
2. The difference between antigens in precipitation and agglutination reactions.
3. Explain the technique of setting the ring precipitation reaction.
4. State the components of the ring precipitation reaction.
5. Putting a diffuse precipitation reaction, its essence.

M avz u. Compliment binding reaction - CBR

The purpose of the training: to master the essence of CBR, to put its basic experience.

***Aims* : Kompliment linking** reaction the first time in 1901, and by the Jangular-year terms, it is a very sensitive and specific reaction. It is based on bacteriolysis and hemolysiC. Manifestation of the reaction Unlike AR and PR, antigens and antibodies react only in the presence of a compliment. Therefore, the reaction takes place in two systems:

1. Bacteriolytic - diagnostic system (antigen + antibody + compliment). Because the liquid is clear, colorless, the result of their interaction is invisible.

2. The hemolytic-indicator system (hemolysin + erythrocyte) allows the bacteriolytic system to determine whether the compliment is bound or free. Hence, hemolysin-antibody in the hemolytic system; erythrocytes are the antigen for them. If a compliment is left free, it will affect them.

The hemolytic system is added to the bacteriolytic system. Depending on whether or not erythrocytes are hemolyzed, it is known whether there is a compliment bond in the bacteriological system.

As a result, the antibodies in the serum bind to the antigen in the bacteriolytic system and bind the compliment in it. As a result, erythrocytes do not lysis after the addition of the hermolytic system (erythrocytes precipitate).

As a result, the antigen-antibody complex is not formed, the compliment remains free, it lyses erythrocytes by participating in the interaction of hemolysin with erythrocytes in the hemi system. The solution is liquid, clear, red in color, no sediment.

The purpose of the compliment response is:

1. Detection of specific antibodies in the serum of a sick animal (brucellosis, peripneumonia, mange, leptospirosis, etc.).

2. Detection of a specific antigen in the test material in the presence of specific immune serum.

CBR components:

1 .Tested blood serum - obtained from animals.

2. Standard serum (positive result) - produced in biofactories.

3.Normal serum (negative result) - obtained from a healthy animal.

4. Compliment (protein is a substance of natural nature, a component of animal and human serum, lymph, tissue fluids) - made from guinea pig blood serum in a biofactory. A ready-made working solution diluted to a precise titre is used.

5. Antigen - made from a specific microbe in a biofactory. They will show the serial number, activity (titer) and how much dilution.

6. Hemolysin - is produced in a biofactory, by hyperimmunization of rabbits with sheep erythrocyteC. Glycerin is added in a 1: 1 ratio. A ready-made working solution diluted to a precise titre is used.

7. Sheep erythrocytes are prepared in 1:40 (2.5%) saline.

8. Physiological solution (0.85% NaCl).

Putting the basic experience of CBR

Components	Tested whey solutions 1:10		Standard zardobii		Normal whey		Control hemisphere
	№ 1	№ 2	№ 1	№ 2	№ 1	№ 2	
Whey	0.2	0.2	0.2	0.2	0.2	0.2	

Antigen	0.2		0.2		0.2		
PhyC. solution		0.2		0.2		0.2	0.6
Compliment	0.2	0.2	0.2	0.2	0.2	0.2	
Water bath for 20 minutes at 37 ° C							
Gem system	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Water bath for 20 minutes at 37 ^{0}C							
	GY	G	GY	G	G	G	GY

No GY-hemolysis, G-hemolysis.

Putting the basic experience of CBR. The whey (test, standard, normal) is first diluted 1:10 and inactivated at 56 ° C for 30 minuteC. Depending on the number of serums tested (2 for each serum), two sets of test tubes are taken and 0.2 ml of the tested serum is injected into them (one for each row). Two more pairs of test tubes were taken for control, and the first pair was filled with 0.2 ml of standard and the second with normal serum. 0.2 ml of antigen is added to the test tubes in the 1st row, and saline solution is added to the 2nd row. Then 0.2 ml of compliment is poured into all the solutions in two rows, the solutions are shaken and mixed well and kept in a water bath at 37 C for 20-40 minuteC. This is a bacteriolytic system. The solutions are removed from the water bath, 0.4 ml of hemsystem (an equal mixture of erythrocytes with hemolysin in the working titer) is added to it, and the second time it is kept in a water bath for 20 minutes.

The result of the reaction is determined twice: the first as soon as the solutions are taken from the water bath, the second final - after standing at room temperature for 18-20 hours.

First, the second line of test solutions and the second line of standard serum control solutions, as well as normal serum control solutions - in which erythrocytes are hemolyzed and the liquid turns red - the result is negative.

The first line of test, standard serum solutions, gem-system-controlled solutions do not contain hemolysis - the result is positive.

Evaluate the CBR result

(++++) - erythrocytes without hemolysis are completely precipitated in the form of dots, the fluid is clear.
(+++) - 25% of erythrocytes are hemolyzed, the liquid is bright red.
(++) - 50% of erythrocytes are hemolyzed, the liquid is red.
(+) -75% erythrocyte is hemolyzed, the liquid is intensely red.
(-) - hemolysis 100%, no precipitation at all.
(+++), (+++), (++) - the result is diagnostically positive; (+) - the result is doubtful; (-) - the result is negative.

Control questions:

1. What is the difference between the compliment response and AR, PR?
2. Name the component systems of the compliment binding reaction.
3. How is the basic experience of the compliment binding reaction set?
4. Explain the consideration of the outcome of the compliment binding reaction.
5. Explain the essence of the compliment binding reaction.

3.3 Training materials for laboratory classes

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«Method of bacteriological examination of the body. Methods of obtaining pathological material and sending it to the laboratory
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning aims to: 1. The method of bacteriological examination of the body, pathological material and sent to the laboratory methods.
Required equipment, jet and instrumentation: Dead laboratory animal carcass, Pasteur pipettes, scissors, scalpel, tweezers, pridmet glasses, oil pen, GPB, GPA, alcohol, tampons in solution, 5% phenol solution, cuvette, set of dyes , microscope.
For bacteriological examination of the body:

1. The body is dismembered
2. Changes in it are taken into account, transplanted from internal organs to GPA, GPB
3. Greases are prepared and stained (Gram method), viewed under a microscope

To learn how to take patmaterial and send it to the laboratory:

1. Patmaterial is taken from the cracked body
2. Placed in special containers
3. The remains are burned in special furnaces
4. All used tools, equipment and premises are disinfected

Books:

1. Shapulatova Z.J. Methodical manual on microbiology (laboratory classes). Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (laboratory classes). Samarkand, 2013
3. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
4. PJQuinn., BKMarkey and otherC. Veterinary microbiology. This edition first published New Delhi, India 2016 y.
5. Tracy H Vemulapalli. G Kenitra Hammac. Microbiology for veterinary TechnicianC. Textbook copyright Printed in the United States of America 2015 y.
6. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.

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1 - bacteriological tests the body of the subject: Methods of obtaining pathological material and sending it to the laboratory.

After the teacher explains the lesson, students dissect the carcass of the animal in the laboratory, inject GPA, GPB from its internal organs, Gram-stained, and view under a microscope.

Diagnostic examination is the separation of pure culture of the microbe, the animal infected with pure culture, which is exactly dead (the corpse is dissected to confirm, pathological changes, bacteriological examination is carried out. The body of the dead animal is dissected immediately or in 2-3 hours The rules of personal prophylaxis and asepsis are followed. The spread of the microbe into the environment is prevented. The carcasses of small laboratory animals are laid on their backs on a special board and fixed with needleC. and a transverse incision (Fig. 53) is made, the skin is separated from the muscle. The subcutaneous tissue is examined. Then the abdominal wall is cut and the abdominal and thoracic cavities are opened. the ribs are cut in half, removed, and the thorax is opened. The liver and spleen of the white mouse are separately sterilized by Petri. hair. Changes in it are taken into account. The surface of the liver, spleen and heart, lungs, kidneys are burned on a hot spatula, test tube GPA, GPB are inoculated, ointments are prepared. Examination, body numbers, date are written on test tubes, greaseC. The heart is implanted first with GPB and then with GPA with a sterile paste pipette.

Similarly, the edges of the abdominal wall are twisted and fastened with a needle to open the abdominal cavity well. Changes in the abdominal organs are also taken into account. Parenchymatous organs, lymph nodes, bone marrow are transplanted into nutrient media and ointments are prepared. Planted nutrient media are placed in a thermostat, stained drugs and viewed under a microscope.

The remains are autoclaved or burned in special furnaceC. The cuvette is poured on the board with 5% phenol solution and left for 10-12 hours, the desktop is disinfected, the instruments are sterilized. The animal cage in Biosinov is disinfected and the remaining fodder and waste are incinerated.

The bodies of naturally inclined animals are examined in the same way.

Obtaining pathological matcrial and referral to laboratory. When an infectious disease is suspected, the veterinarian sends the necessary pathological material to the veterinary laboratory for examination. The material is played from sick, forcibly slaughtered or dead animalC. But in all cases it is better to take from animals that have not been treated with antimicrobial drugC. Carcasses of small animals and birds as material for bacteriological examination, spleen from large animals, liver (with gallbladder), kidney tissue, muscle, heart (whole), lymph nodes, blood (covered with 15 ml rubber stopper for bacteriological examination) fibrin-deficient blood in solutions; coagulated blood for serological testing), gastric mass, pus, sputum, milk, urine, discarded fetus, brain, intestinal tract, bone marrow, suspected food sample, blood smears and stamps 'ali drugs are sent.

1. The material should be taken from the body of a newly dead animal (no later than 2-3 hours after the death of the animal). In some cases, compulsory slaughter of one or two from a group of sick animals may be appropriate.

2. When obtaining pathological material, the spread of the pathogen should not be allowed to infect animals and humans.

3. Tropism and location of microorganisms should be taken into account when obtaining pathological material. On hot days, the preservative should be chosen so as to protect the material from spoilage, not to kill the pathogen.

4. The pathological material is placed in an hermetically sealed aluminum or enamel container. Seals tightly closed. The carcasses of the animals are placed in dense wooden boxes filled with wood shavings (shavings absorb liquid). In the most dangerous diseases (anthrax, mange, tuberculosis, brucellosis, blackleg) are placed in special containers, if taken in a glass jar (Fig. 54-55). Sealed tightly and placed in a wooden box.

5. A referral is written. It includes the address of the farm, the name of the material sent, the number, type of animal, age, sex, time of illness and death, what treatment was used, information about the symptoms of the disease, when and with what vaccines, previous and current the epizootic condition at the time, the results of pathological examination, changes, suspected diagnosis are recorded.

6. Patmaterial is personally delivered to the laboratory by a veterinarian.

In the laboratory, unpreserved material can be stored at 4 ° C for 1-2 days, preserved in 50% glycerin for several weekC. For long-term storage, the material is frozen at -5-20 ° C.

Microbiological examination of the material consists of the following steps:

1. Detection of the pathogen in the test material: Non-immunological methods - microscopic examination of stained drugs, detection of the nucleic acid of the pathogen by genetic methods (gene probes, PCR). Immunological methods - detection of the causative antigen in serological reactions (PR, DPR, FAU, IFA, etc.). 2. BiosynthesiC. 3. Isolate the pathogen culture by inoculating the material into the nutrient medium. 4. Serological (retrospective) method - AR, CBR.

Control questions:

1. Explain the purpose and method of bacteriological examination of the body.

2. State the rules for obtaining patmaterial and sending it to the laboratory.

3. What information should be included in the referral.

4. What pathological materials are obtained for bacteriological examination.

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Laboratory work on "Laboratory diagnosis of staphylococcal infections" (2 hours)

PASSPORTS

M Purpose of the study: In the laboratory for staphylococcal infections study of diagnostic methods.

Required equipment, jet and instrumentation: pat.material, GPB, GPA, salt-blood GPA, glucose whey GPB, Pasteur pipettes, tweezers, antibiotic discs.

Laboratory tests for staphylococcal infections are carried out:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

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Topic: Laboratory diagnosis of staphylococcal infections.

Course Objectives: To learn how to send pathological material to the laboratory in various purulent-inflammatory processes . Introduction to nutrient media, methods of isolation and cultivation of staphylococci, methods of differentiation of pathogenic and non-pathogenic staphylococci. Determination of antibiotic susceptibility.

Staphylococci are spherical microorganisms that belong to the *genus Staphilococcus* . There are more than 20 species of them. In practice, pathogenic (hemolytic) cocci play an important role. Staphylococci show clinical signs in animals and humans, such as abscesses, phlegmon, boils, mastitis, pyemia and sepsis, food poisoning (in humans).

Patmaterial is taken and sent 1. **Wound** exudate, puC. 2. 10-20 ml of milk in mastitiC. 3. 5-10 ml of fibrin-free blood in sepsis.4. Hay in poisoning, substance in vomit. 5. From a dead animal - fragments of parenchymal organs.

Methods of laboratory testing:

1. Microscopy. Grease is prepared from patmaterial and painted by Gram method. The microscope shows inactive cocci (diameter 0.7-1.0 μm, saprophytes - 2-4 μm) that do not form gram-positive, spores, capsuleC. They are arranged in the form of balls of grapes.

2. Bacteriology. Separation of **pure** culture and study of cultural properties.

Patmaterial is planted - selective medium salt-blood GPA (8-10% sodium chloride and 5% fibrin-free blood added), GPB, GPA larvae. Seedlings are grown in a thermostat at 37 ^{0}C for 12-24 hourC. GPB-blurred, many sediments fall. A ring or curtain may form. At GPA, round, slightly indistinct colonies 2–6 mm in diameter appear. Their color can be whitish, yellowish, golden, depending on the type of staphylococcus that forms the pigment. Bloody agar forms a zone of hemolysis around the colony. The colony is planted in GPA, GPB larvae, and the culture grown is different. That is, their biochemical properties are determined. Decomposition of mannitol, hydrogen sulfide, DNA is characterized by the formation of the enzyme coagulase.

To distinguish between pathogenic and non-pathogenic staphylococci, a special selective medium-crystalline violet is added to the GPA. Non-pathogenic staphylococci do not grow due to the bacteriostatic effect of crystalline violet. Pathogens form purple colonies.

3. Putting biosinov. (rabbit, kitten).

Staphylococci secrete exotoxinC. 1) hematoxin (staphylolysin) lyses erythrocyteC. 2) breaks down leukosidin-leukocyteC. In the laboratory:

1. Detection of lethal toxin - 0.75 ml / kg of broth culture **filtrate is injected into the** rabbit vein.

2. Detection of necrotoxin - a certain part of the rabbit skin is cleaned of hair and disinfected, 0.2 ml of **broth culture filtrate is injected into the** skin (2 billion microbial cells per 1 ml) after 24 hours necrosis reaction (necrosis zone for 1-2 days) develops) appearC.

In case of poisoning - checked for staphylococcal enterotoxin. 10 - 15 ml of staphylococcal culture for 3 - 4 days is mixed with an equal amount of warm milk and fed to a kitten from 4 to 8 weekC. Positive results - diarrhea, vomiting and death of the kitten.

Based on this, the final diagnosis is made.

Control questions:

1. What material is sent to the laboratory?
2. Explain the morphology, cultural characteristics of staphylococci?

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Laboratory work on "Laboratory diagnosis of streptococcal infections" (2 hours)

PASSPORTS

M Purpose of the study: In the laboratory for streptococcal infections study of diagnostic methods.

Required equipment, reagents and instruments: streptococcal culture in test tubes, pat.material, serum GPB, glucose GPA, blood GPA, Pasteur pipettes, alcohol, cuvette, tweezers, scissors, scalpel, 5% carbol solution, microscope.

Laboratory tests for streptococcal infections are used:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

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Topic: Laboratory diagnosis of streptococcal infections

Course Objectives: To learn how to send pathological material to the laboratory in various purulent-inflammatory processeC. Familiarity with nutrient media, methods of separation and cultivation of streptococci, methods of differentiation of pathogenic and non-pathogenic streptococci. Determination of antibiotic susceptibility.

Streptococcus - *Streptococcus* generation. There are more than 20 specieC. The following types of pathogens are more common. *S.agalactiae (S.mastitidis), S.equi, s.pneumoniae, str.pyogeneC.* Non-pathogenic lactic acid streptococci - *str.lactis, str.cremoris, str.salivaris* , etc. There are 17 groups of streptococci on a specific antigen with a polysaccharide detected in the precipitation reaction. In animal and human pathology, the first five are marked with capital letters A, B, C, D, E, which are important.

The family Streptococcaceae includes 7 seeds, of which Streptococcus, Enterococcus, Aerococcus, Leuconostoc, Pediococcus and Lactococcus are pathogenic to humanC. Most often, streptococci and enterococci cause disease, while the rest of the disease is rarely observed.

Durability. Streptococci are more resistant to the external environment than staphylococci, but persist for a long time at low temperatureC. Streptococci do not lose their activity for several months when surrounded by dried pus, sputum and other protein substanceC. It dies in 1 hour at a temperature of 70 ° C, and in 15 minutes under the influence of a 3-5% solution of phenol.

Pathogenicity in animalC. Pathogenic streptococci cause various purulent inflammatory diseases in cattle, sheep, goats, horses, pigs and birdC. Rabbits and white mice from experimental animals are susceptible to streptococci.

Exotoxins secreted by streptococci, aggressive enzymes, and the microbe itself are also important in the **pathogenesis of the disease** . Diseases caused by streptococci are very diverse, including angina, chronic tonsillitis, jaundice, traumatic infections, purulent diseases of the skin and subcutaneous fat, phlegmon, sepsis, nephritis, cystitis, cholecystitis, rheumatism, purulent otitis , mastoiditis, endometritis and others.

The following are very important in overcoming the protective factors of streptococci in tissues (primarily phagocytic cells):

a) antihemotoxic factor;

b) capsule in A and B gypyh streptococci;

c) The M-protein of bacteria has the property of resisting the phagocytic reaction.

The infection enters the body from sick or diseased animals, food and items from which streptococci fall, through injured skin, mucous membranes, buttocks, but streptococci are mainly transmitted through airborne dropletC. When the body's natural resistance to microorganisms is weakened, the conditionally-

pathogenic streptococci in it multiply and cause disease. It injures various organs: skin, upper respiratory tract, lungs, kidneys and otherC. The result is streptoderma, otitis, abscess, phlegmon, cystitis, pyelitis, glomerulonephritis, cholecystitis, peritonitis, pharyngitis and other diseases.

Streptococcal infections cause purulent and non-purulent processeC. Examples of purulent diseases are acute diseases of the upper respiratory tract, jaundice, inflammation of the lymph nodes, impetigo, angina, inflammation of the throat and pancreas, and others.

Non-purulent streptococcal diseases include scarlet fever, rheumatism, and so on. The pathogenesis of these diseases lies in the autoimmune process.

In streptococcal diseases, immunity against bacteria and toxins is formed. Anti-toxin antibodies (antitoxins) neutralize streptococcal toxin and enhance phagocytosis in combination with complement, opsonin or other antibodies.

The causative agent of infectious mastitis

Getting patmaterial. In clinically manifest mastitis, milk is taken from each affected udder of the udder in separate sterile solutionC. In subclinical mastitis, the milk is first milked in a separate container, then the udder is washed and disinfected with 70 ^{0}alcohol, and the last portions of milk (parenchymal milk) are milked and sealed in sterile solutions from each sterile nipple. The sample should be inspected no later than 2 hourC.

Control methods

1. Microscopy . Patmarialdan, the Gram method, Gimzo painted surtmalarda *s.agalactiae* gram-positive cocci, in the form of long chains of it. The diameter of the cocci is 0.5 to 1 μm. Inactive, does not form spores and capsules.

2. Bacteriology . In whey GPB - the medium remains clear and a granular precipitate forms at the bottom of the test tube. In whey GPA, it grows in the form of grayish, light-transmitting tiny colonieC. Some strains of βλοοδ□agar form β□-hemolysis.

Biochemical properties - low activity of pathogenic streptococci. Does not dilute GPJ, does not ferment milk. It breaks down carbohydrates to form acid.

The CAMP (CAMP) method is used to distinguish *S.agalactiae* from other streptococci. This method is based on the restoration of hemolytic properties of B-group streptococci, which have lost or decreased hemolytic properties in a single cup of blood GPA, when they are cultured side by side with hemolytic staphylococci. The seedlings are kept in a thermostat at 37 $^{\circ}$C for 3-4 days .

3. Biosinov. 0.1 - 0.2 ml of milk or purulent exudate is injected into the abdominal cavity of a white mouse or guinea pig. As a result, the mice become ill and die in 1 to 2 days.

The ***mute*** **pathogen** - *s.equi* belongs to group "C" by antigenic structure. Causes disease in horses and ungulates from 6 months to 1 to 2 years of age. The disease is characterized by catarrhal purulent inflammation of the upper

respiratory tract, larynx, mucous membranes, submandibular lymph nodes (clinical abscess, manifested by nasal discharge).

Getting patmaterial. In sterile vessels, pus from the abscess (aseptically from an unexploded abscess), purulent nasal discharge is obtained.

1. Microscopy. In greases prepared from *pus*, s.equi is placed in the form of a long chain of cocci. Surt mada chains made from broth culture are short, while when prepared from a dense nutrient medium, the chains are short, even in the form of diplococci. Gram is painted in the Romanovsky method. The pathogen was gram-positive, immobile, without sporeC.

2. Bacteriology. Stimulating serum or fibrin-free blood, added, grows in the Kitt-Tarossi environment. In a liquid medium it grows in the form of small granules at the bottom of the test tube wall. Glucose on serum grows in the form of light-transmitting, fine mucous colonies on dewy agar.

Blood β□- hemolysis zone.

Biochemical properties: does not ferment milk, does not break down lactose, sorbitol, mannitol. Dumb antivirus does not grow in an added environment.

3. Biosinov . White mice or cats are infected by sending them under the skin or into the abdominal cavity. White mice die from pyemia in 3 to 10 dayC. The kitten dies when the broth culture is injected 1: 10,000,000 under the skin.

The causative *agent of* **pneumococcal infection in young cattle is** *S pneumoniae (Dipl. Septicum, Dipl. Lanceolatus).* The disease takes the form of lung and intestinal in young animalC. Animals become ill at 2-4 weeks to several months of age.

Patmetric extraction . Their secretions and blood are taken from sick animals . Fragments, blood, pus are taken from dead animals, their bodies or lungs, from the affected areas of the spleen.

Microscopy. Gram is located in the form of a pair of excitatory cocci in greases painted by the Romonovsky-Gimza methodC. It is gram-positive, capsular, immobile, does not form sporeC. Capsules are not formed in cultureC. In a grease prepared from the organs, the capsule surrounding the two cocci looks good. It is placed in the form of short chains in greases prepared from the culture.

Bacteriology . *C. pneumoniaye* grows at 37 ^{0}C under aerobic and anaerobic conditionC. In whey GPB, uniform turbidity, less sedimentation is formed. Serum GPA forms small dewy colonies, colonies with a zone of hemolysis in bloody agar.

Pathogenic pneumococci are soluble in bile. Decomposes inulin (unlike other streptococci).

3. Biosinov . The broth culture is diluted 1: 1,000,000 and injected into the abdominal cavity of 0.5 ml of white mice. Mice die in two to three days.

Control questions:

1. How many types of pathogens are there?
2. What is the resistance and pathogenesis of the pathogen?
3. When a positive result is considered a diagnosis.
4. The role of biosynthesis in diagnosis.

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_____ 2020.

Laboratory work on "Laboratory diagnosis of pasteurellosis."
(2 hours)

PASSPORTS

M Objective: To diagnose pasteurellosis in the laboratory
learn methods.

Required equipment, reagents and tools: Pat.material, GPA, GPB, blood agar, cultures grown in gissa medium, sterile GPA, GPB, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, paint kit, microscope, oil pen , cuvette.

The following test methods are used to diagnose pasteurellosis in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent **Shapulatova Z.J.**
Assistant **Ruzikulova UX**

Topic: Laboratory diagnosis of pasteurellosis

Course Objectives: 1. To master the rules of transporting patmaterial for bacteriological examination of pasteurellosiC.

2. To study the properties of the causative agent of pasteurellosiC. Study of bacteriological tests.

Course Support:

GPA, GPB, blood agar, cultures grown in a carbohydrate Gissa medium, sterile GPA, GPB solutions, Pasteur pipettes, patmaterial, scissors, scalpel, tweezers, object glasses, paint kit, microscope, brush, cuvette, biopreparations, tableC.

Course Outline:

The teacher explains the lesson. Students study the *cultural* characteristics of *P. Multocida* in GPA, GPB, bloody GPA and write in a notebook. By preparing ointments from these cultures, Gram paints them with Leffler blue, draws a picture of the stimulus on a microscope, and writes it in a notebook. Plants from patmaterial to nutrient media. Prepared branded greases and painted in Gram method. They draw their appearance in their notebooks under a microscope. Studies the enzymatic properties of the pathogen in the medium of glucose, lactose, sucrose, sorbitol, dulsite Gissa.

METHODOLOGICAL INSTRUCTIONS

Pasteurellosis - ***hemorrhagic septicemia*** - *is an* infectious disease of many different animals and birds, characterized by acute septicemia, semi-acute and chronic pneumonia, often accompanied by inflammation of the lungs . The causative **agent** is a bacterium that does not form **paste rella hemolytic** spores in large animals **pasterella multosida** and young animals, chickens . *Pasteurella is not highly resistant to physical and chemical influences , under natural conditions they are rapidly inactivated.* Pasteurellas die quickly under natural conditionC. Manure, blood, can live up to 2-3 weeks in cold water, up to 4 months in leeks, and up to 1 year in frozen chicken. It dies in a few minutes under the influence of steep sunlight, in 5-10 minutes at 70-90 ° C. Disinfectants of normal thickness have a quick effect.

Pasteurella mainly enters through the respiratory tract and mouth. The source of the pathogen is the patient and the patient recovered pasterella carrierC. Shelf life of pasteurella - 1 year. Cattle and sheep get sick at all ages, but they are more susceptible to age . The peculiarity of the disease is that it is repeated many times in one place, that is, the appearance of a stationary epizootic lesion. The patient separates the stimulus with the liquid coming out of the animal's nose , exhaled breath, saliva, feceC. The building, air, hay, bedding, and inventory contaminated with them serve as transmitters of the pathogen to other animalC. In birds, in addition to the factors mentioned above, the channels

in them are also of particular importance. Because they live in the body for more than 60 days.

The disease is most severe in cattle. In them , the fever suddenly rises to 41-42 ° C. As a result of heart failure or accumulation of water in the lungs of the animal in a few hours , in some cases the clinical signs you die. When the disease is acute, they experience general lethargy, malnutrition, fever up to 41 ° C. The nose mirror is cold and dry. chewing and milking stopC. At the beginning of the disease there is intestinal motility and defecation , fecal fluid, in some cases bloody, bloody fluid from the nose, conjunctivitis and bloody urine . Animals die in 1–2 days with septicemia, heart failure .

In sheep, transmission of the disease in the form of acute septicemia is very rare. Fever, frustration, jaw, neck. subcutaneous accumulation of water and pleuropneumonia . The sick sheep dies in 2-5 dayC. If the pigs are very sharp and sharp. nsitma rises to 41 C, heavy breathing, heart failure, lower jaw. neck The accumulation of water under the skin is observed. He dies in 1-2 days without breathing . If the disease lasts a long time, fibrinous pleuropneumonia , rapid breathing, cough and mucous purulent rhinitis are observed and die in 5-8 days.

In birds it is very sharp at the beginning of the epizootic . They suddenly collapsed. The wings have been shown solely to give a sense of proportion . Often the disease is acute. They are lohas, their wings dropped, their feathers fluttering, their heads bent under or behind their wingC. Body temperature rises to 44 ° C and above, appetite disappears and severe thirst is observed. Bubbly mucous fluid flows from the nose and nose . Then - diarrhea, in some cases bloody diarrhea. The crown and earrings are blue, it is difficult to fast, and it squeaks and dieC. In rabbits there is a sharp rise in temperature, loss of appetite , depression, colds, sneezing, in some cases diarrhea , and death in 1 -2 days.

Diagnosis of animal pasteurellosis is made on the basis of clinical signs, pathoanatomical changes, epizootiological data and, of course, the results of bacteriological examination.

Getting patmaterial. Liver, spleen, kidneys, lymph nodes, heart, bone marrow are sent to the laboratory for examination. On hot summer days, when the distance is long, the patmaterial is preserved in a 30% aqueous solution of glycerin. The bone marrow is wrapped in gauze soaked in 5-10% formalin solution.

1. Microscopy. Gram-negative bacteria are small, short, rod-shaped (0.3 x 1.5 μm) with twisted ends in Gram-stained greases made from patmaterial. In greases painted in the Leffler blue or Gimza method, the pasteurels appear bipolar (the ends of the bacterium are intensely stained). Culture- prepared greases show coccygeal or short-stemmed bacteria, one or two, sometimes in the form of short chainC. The capsule looks good when dyed in special ways (Mixin). Inactive, does not form sporeC.

2. Bacteriology. *P. multocida* is a facultative anaerobic, grows at 37-38 °C and GPAs and GPBs with a pH of 7.2-7.4. However, it grows better in bloody

GPAs, serum GPAs or GPBC. Seedlings planted from patmaterial are grown in a thermostat for 24-48 hours . If there is no growth, the seedlings remain in the thermostat for 4 - 5 dayC.

GPA da- pasterellas grow in the form of small, bulging , clear, round (*S*-shaped) colonies, sometimes large, slimy (*M* -shape) or wide colonies (*R* -shape). It has no hemolytic propertieC.

The GPB environment is uniformly turbid and forms a slimy sediment. When seen, the sediment rises in the form of "cut hair" (*S*- shape), mucoid strains grow intensively and form a lot of mucous sediment *(M*- shape), the environment in *R* -shaped strains does not blur, a fine-grained precipitate is formed.

P. multocida breaks down lactose, dulsite, glycerin, salicin, inulin, rhamnose, raffinose. Does not ferment milk, does not form indole.

3. Biosinov. White mice and rabbits are infected with the test material from cattle, pigs, sheep - 0.2 ml is injected subcutaneously into white mice, 0.5 ml into rabbits . Rabbits are first tested for pasteurization - two drops of 0.5% brilliant green solution in water are instilled into the nasal cavity for three dayC. Leakage of purulent discharge from the nasal cavity indicates pasteurellability. It is impossible to put biosinov in them. Poultry are infected with the test material by injecting 0.3 ml of suspension between the muscles of pigeons, chickens and duckC. As a result, the animals in the biosynthesis die in 18-36 hourC.

The result is positive:

If the morphological, culturally specific yacht culture characteristic of the pathogen is isolated in the patmaterial, and virulence is confirmed in the biosynthesiC.

Sick animals are separated in a warm, dry room and fed with nutritious food. Tetra cyclin is treated with a number of antibiotics and sulfanilamide preparations . Hyperimmune serum is beneficial in the onset of obesity. Antibiotics and hyperimmune serum are more effective when used in combination with symptomatic medications .

Prevention and control measures . Animals cured of pasteurellosis have immunity for 6-12 monthC. For special prophylaxis N. Nikiforova's precipitated formal vaccine, UzNIVI semi-liquid formal aluminum hydroxide vaccine, polyvalent vaccine against pasteurellosis and diplococci, emulsified vaccines are recommended. They should be used in strict accordance with the rules, taking into account all the epizootic situation.

All species are clinically examined. sick and suspected animals are separated and must be under prophylactic control. The rest are vaccinated against pasteurellosiC. Current disinfection is carried out every 10 days until the limit is reached . Restriction from the farm is 14 days after the end of the disease and when all animals are vaccinated. obtained after final disinfection.

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Laboratory work on "Laboratory diagnosis of swine fever" (2 hours)

PASSPORTS

M Purpose of the study: In the laboratory of swine fever study of diagnostic methods.

Required equipment, jet and instrumentation: Dead white mouse body, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, oil pen, ready-grown GPB, GPA yellow cultures, cuvette, set of dyes, microscope.

The following test methods are used to diagnose swine fever in the laboratory :

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent **Shapulatova Z.J.**
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Topic: Laboratory diagnosis of swine fever .

It is an infectious disease of pigs and is most common in pigs from 3 months to one year of age. Acute and chronic migraines are sometimes observed in cattle, lambs, poultry, fur animals, rodents, and humans.

The causative *agent of* **swine fever.**

Erysipelothrix rhusiopathiae. Infectious zooanthroponotic disease manifested by septitis semia, erythematous inflammation in the acute course, endocarditis, arthritis in the chronic course. Pigs from three months to one year of age, lambs older than three to four weeks are sick. The disease is rare in other specieC. People get sick too.

Durability. The bacterium is resistant to many environmental factors, especially the decay procesC. After 280 days of burying the carcass of a pig that had died of the disease, a yellowish rod was removed. Even in members left outdoors, the wand is stored longer. It can live comfortably in river water at 18-20 ° C for up to two months, in hydrogen water for 3 months, in urine for 5-6 months, in manure for 3 months, and in soil for up to 3.5 monthC. Salting and smoking do not kill bacteria. Steep sunlight kills in a matter of hourC. 100 ° C kills bacteria in a matter of secondC. Resistant to the substances used for disinfection, 10% solution of chlorinated lime, 2% solution of alkali and 20% solution of freshly prepared lime and other substances are recommended for disinfection.

PathogenesiC. The bacterium enters the pig's body through the alimentary canal, and when the integrity of the skin is compromised, it passes through the skin. The latent period of the disease can last up to 10 dayC. Bacteria that enter the body do not suddenly enter the blood and other internal organs.

Transmission and clinical signC. Depending on various factors (age, obesity, virulence), jaundice can be very acute, acute, semi-acute and chronic, as well as in the form of skin and hives.

Pathological changeC. In the septic state, dark red spots appear on the chest, abdomen, buttocks, ears, and feet. Because of the swelling in the lungs, a bloody foamy fluid flows from the nose. The abdomen is swollen and bloody, and when it is cut, mucous fluid flowC. The blood is dark red and coagulates poorly. There was serous fluid in the chest and abdomen and fibrin was precipitated. The large and small veins are full of blood, the lungs are swollen, and there is foamy fluid in the bronchi and trachea. The blood vessels of the heart muscle are full of blood and there is a pointy hemorrhage. Inflammation and sometimes bleeding in the gastrointestinal tract is observed. The liver becomes enlarged and hemorrhagic. The kidney is enlarged and a punctate hemorrhage is observed at the base of the capsule. Verrucous endocarditis occurs in the heart. This in turn leads to embolism and heart attack (lung, kidney and spleen). In arthritis of the joints, the joint swells and thick serous fluid flowC. If the process is heavy and deep, it can lead to caries of the bone tissue and deformation of the joint.

DiagnosiC. Diagnosis takes into account the epizootiology of the disease, clinical signs, pathological changes and the results of laboratory testC. The corpse is sent to the laboratory in its entirety or its heart, liver, spleen, kidneys and tubular bone. Laboratory tests include: microscopic examination of the grease, implantation in artificial media, and infection of laboratory animals.

Patmaterial . The body or parenchymal organs (heart, liver, spleen, kidneys, bone marrow) are sent to the laboratory for examination . Preserved in 30% glycerin solution if necessary .

1. Microscopy. Stamped greases are prepared from patmaterial and painted by Gram method. The causative agent of Saramas is a rod - shaped bacterium that does not form spores, capsules , is immobile, gram-positive, single, double or ball- shaped . Placed in the form of long threads in the grease prepared from the damaged heart valves . Can also be dyed with fluorescent serums . (IFR) Fluorescent microscopy.

2. Bacteriology . GPB, GPA from patmaterial is planted in the larvae . Seedlings are grown in a thermostat at 37 ^{0}C for 18-24 hours, leaving another 24 hours without growth. *E.rhusopathiae* aerobic, microaerophilic (grows well in 5-10% CO_2).

In GPB - the environment is slightly turbid. After 48-72 hours it settles and a precipitate forms at the bottom of the test tube . It rises in the form of a thin cloud when it stumbles . In GPA, the yellowish pathogen forms small, transparent, dewy colonies (*S* -shape). *R* - form a large, protruding from the surface is uneven edges colonies - the disease (chronic passed) .

Biochemical properties - the causative agent of jaundice releases hydrogen sulfide, does not form catalase, breaks down glucose, lactose to form acid, does not break down sucrose, mannitol .

Serological differentiation. AR with 1:50 yellow whey is applied dropwise in the subject glass . A culture grown on a one -day GPA is used.

3.Biosinov . White mice weighing 16-18 g are injected subcutaneously with 0.1 to 0.2 ml of patmaterial suspension or 1-2 day culture suspension grown in GPA . Positively infected white mice die after 2–4 dayC. Biosinov is observed for 7 dayC.

The diagnosis is considered to be :

1. If a fluorescent microscope detects a yellowish pathogen in patmaterial, mixed culture greases (even if pure culture is not isolated);

2. Separation of pathogenic culture from the material ;

3. If the animals in the biosinov die and a culture of the yellow pathogen is isolated from their organs (even if the primary pathogen is not isolated).

Control questions:

1. The rule of taking the material and sending it to the laboratory .

2. Morphological, cultural, biochemical properties of the pathogen.

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"Laboratory diagnosis of colibacetriosis."
laboratory work (2 hours)

PASSPORTS

M Objective: To diagnose colibacetriosis in the laboratory
learn methods.

Required equipment, jet and instrumentation: GPB, GPA, Endo media, *E.coli* cultures, sterile GPA, GPB, GPJ, bismuth sulfite agar, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, pat.material, agglutination serum , cuvette, paint kit, microscope.

The following test methods are used to diagnose colibacetriosis in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological
4. Serological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent **Shapulatova Z.J.**
Assistant **Ruzikulova UX**

Topic: Laboratory diagnosis of colibacillosis

The causative agent *E. coli* belongs to the genus Escherichia . It is an acute infectious disease of young animals, characterized by severe diarrhea, weakness, and death. Manifested in three forms - septic, entero toxemic, enteritiC. Calves get sick in a few days, in the first days of life of piglets, after weaning - with signs of edema, lambs from birth to 5 - 6 months of age.

Durability. In a dried protein environment, intestinal rods can live for months in animal feces, mucus, and blood. Not very resistant to heat, dies at 60 °C in 15 minutes, at 100 °C at the same time. Many disinfectants - formalin, phenol, caustic soda, lime - have a strong effect on them. Can be stored in water and soil for several monthC. Resistant to penicillin.

PathogenesiC. The mucous membrane of the intestine of a healthy newborn can cut off the passage of microorganisms . If a young animal is born weak , its protection is greatly reduced, and the pathogenic microorganism that enters it passes through the mucous membrane .

The disease begins with a sudden rise in body temperature , rapid heartbeat, shortness of breath. The patient lies down, his nose is dry and the mucous membranes of the eyes are bleeding. After 1–2 days, enteritis enters the septic state . The stomach goes like water, it is foamy, mixed with air bubbles, white-blue color, has a bitter odor . When undigested milk causes diarrhea, a clot builds up . Diarrhea is observed in a mixed state of mucous fluid and blood . Q to take place in abdominal pain by touch will be felt. As the diarrhea stops, the temperature dropC. The job is lost. He lies on his side, throwing his neck to the side. The eyes droop and the wool loses its natural luster. Sticky sweat hardens on the skin and gives off a foul odor.

Pathological changeC. The body of the dead animal is thin, the area around the back exit hole and the hind legs are contaminated with debriC. The mucous membranes bleed strongly. In the stomach there is a cheese-like mass, with the accumulation of sediment, the gastric mucosa becomes red and bloody, in the small intestine there is a liquid, mucous mixture of food residues . The mucous membranes of the small and large intestines are swollen, covered with mucous fluid, there is hyperemia and hemorrhage, lymph nodes are enlarged and red, the spleen is unchanged, the kidneys and liver are anemic, there is blood in the capsule tagC. ladi.

Patmetarial . The carcass or marrow of a newly dead animal , a piece of liver with a gallbladder, the spleen, kidneys, heart, intestinal lymph nodes, a piece of small intestine tied on both sides (it is placed in a separate vessel from the others). The material should be sent to the laboratory within 4 hourC. If the distance is long, it can be preserved in 30% glycerin, 10% table salt. The feces are taken from the rectum of a sick animal.

1. Microscopy . Greases are prepared from patmaterial and painted by Gram method. The causative agent is a twisted, gram-negative (pink - red) rod-shaped bacterium; does not form spores; length 1 - 3 μm, width - 0.8 μm. Placed one by

one. Only strains 08, 09, 0101 form capsuleC. There are active and inactive species.

2. Bacteriology. Patmaterial is planted in GPA, GPB, Endo environmentC. The test tubes are inoculated with Pasteur pipettes, the Petri dishes with a spatula or stamps from the organC. Seeds are grown in a thermostat at 37–38 °C for one day. *E. coli* aerobic and facultative anaerobic. If there is a characteristic colony in the endo environment, it is planted GPB, GPA, blood agar.

GPB is a homogeneous turbidity, rapidly dissolving sediment is formed. At 16–20 h in GPA it forms moist, rounded edges with smooth, smooth surface, gray colonieC. In a bloody GPA, a hemolysis zone is formed around the colony.

Biochemical properties - in the endo environment forms reddish-dark, pink, colonies (due to the breakdown of lactose). Forms indole, does not form hydrogen sulfide, fermentes milk, positively reacts with methylrot, reacts negatively with Foges-Proscauera.

The isolated culture is serologically typified. Antigen differs in somatic *"O"* shell *"K"* and *"H"* antigenC. Only diagnostic serums for *"0"* antigen were developed in the biofactory . Similarly, the serogroup and serotypes of *E.coli* are detected in AR in the droplet method in the subject window. AR is set according to the instruction. First with 4 polyvalent whey, then with monovalent whey. Each polyvalent serum contains 8-10 monovalent sera.

3. Biosinov. A daily suspension of *E. coli* culture at a concentration of 500 ml / ml was administered to the abdominal cavity of three white mice . Followed for 5 dayC. Even if one dies during this time, the result is positive.

Biopolymers - giperimmun, gamma globulin, serum poliva lent serum concentration of assosirlangan vaccines, koliprotektant, colitis silage.

In our country , a coli-salmonellosis vaccine has been developed that kills many strains of *E.* coli and cultures of several salmonella strains with formalin. Calf cows are vaccinated twice between 10-14 dayC. Polyvalent coli-gertner-phage has also been successfully administered to calves by enteral, subcutaneous, and intramuscular injection. Its effectiveness is further enhanced when used with antibiotics or sulfanilamide, nitrofuran drugs.

In Uzbekistan, VITI has developed a radioactive vaccine against calf colibacillosis and salmonellosis, hyperimmune serum. They are being used with great success.

Control questions:

1. The rule of receiving and sending patmaterial for testing for colibacillosis.
2. State the characteristics of the driver.
3. The purpose of serological typing.
4. The role of differential-diagnostic nutrient media in the isolation of pure cultures of *E.coli* .

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_____ 2020.

"Laboratory diagnosis of salmonellosis."
laboratory work (2 hours)

PASSPORTS

M Objective: To diagnose salmonellosis in the laboratory
learn methods.

Required equipment, reagents and instrumentation: salmonellosis culture suspension, sterile GPB, GPA, Endo, Ploskirev agar, bismuth-sulfite agar, diagnostic agglutination serums, pat.material, object glasses, Pasteur pipettes, cuvette, paint kit, kit.

The following test methods are used to diagnose salmonellosis in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological
4. Serological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent **Shapulatova Z.J.**
Assistant **Ruzikulova U.X.**

Topic: Laboratory diagnosis of salmonellosis .

Salmonellosis is an acute infectious disease that manifests itself in the septic form of all types of young animalC. The causative agent belongs to the genus *Salmonella* . Calves get sick at the age of 3-4 weeks to 4 monthC. The causative agent is *S.enteritidis* (dublin) and *S.tuphimiurium* . The disease is accompanied by fever and severe diarrhea (adults are carriers of salmonella, the disease passes without clinical signs). Pigs are infected at the age of 4 months, the causative *agent is S.choleraesuis, S.tuphimiurium* **.** Sheep become ill at all ages, and salmonel lysis is observed in eweC. The causative agent is *C. abortusovis* **.** Weddings are often damaged in the mother's womb, resulting in abortionC. In them the disease is caused by *S.abortusequi* . Poultry salmonellosis is manifested by mass morbidity and mortality in the first days and weeks of chick life. Chicken embryos and adult birds are also affected. The causative agent is *S.pullorum (S.gallinarum).*

Durability . Salmonella die at 60 °C in 1 hour and at 100 °C at that moment. In salted, smoked products can be stored for several months in boiled meat (need to boil for 2 - 2.5 hours). It dies in a matter of minutes under the influence of direct sunlight. It is stored in the external environment, in the soil for 20 to 120 days, and in animal carcasses for up to 100 dayC. Disinfectants kill them. Sensitive to antibiotics, nitrofuran, sulfanilamide.

Salmonellosis is acute, semi-acute and chronic. Body temperature rises (40-41 °C). Heart activity worsens . Breathing is 60-80 per minute. From the first day, serous conjunctivitis appeared , many tears flowed. The calves' response to the external environment is reduced, often with their head resting on the side of the lip. He does not stand on his own two feet. Appetite is unstable , sometimes drinking milk, in some cases not drinking it. After 2–3 days, diarrhea beginC. The stool is a mixture of mucus , air bubbles, a very unpleasant odor, followed by bloody diarrhea. When the disease is severe, the kidneys are injured and the sick animal urinates frequently, causing pain. When it is heavy, the temperature rises too much. The sick calf lies down, dies within 5–10 days, from not reacting to external influences . When the disease is mild, the diarrhea stops, the temperature drops, and the disease progresses to a chronic course. In this case, gastrointestinal injury is mild, and respiratory injuries occur. A mixture of mucus and pus flows from the nose. At first it is a dry, slow cough, which then gets worse. The process mainly begins with bronchitis and eventually turns into pneumonia.

Antigen structure and classification. Salmonella contains two main antigen complexes: O-somatic and H-hivchin antigen.

In addition to dividing salmonella into serological types, phagotypes are sometimes identified using specific salmonellosis bacteriophageC. About 100

bacteriophages are currently known. The method of determining the type of Salmonella is used to identify the source of infection for epidemiological analysis.

Patmaterial. Newly dead animal carcass or bone marrow, piece of liver with gallbladder, kidney, spleen, heart; from a sick animal - dung; from aborted animals - aborted fetus, placenta, secretions or organs of the stomach and parenchymatosis.

Methods of laboratory testing.

1. Microscopy. Marked greases from pamaterials, greases from isolated excipient cultures by Gram method

painted. Appearance under a microscope: gram-negative, rod-shaped, 2-4 μm-sized bacteria. Does not form spores and capsules, located in one, sometimes two. With the exception of **S.pullorum** , all are motile (peritrichous). It is checked by the crushed or hanging drop method.

2. Bacteriology . Potpaterials are grown on GPA, GPB and any of the elective media - Endo, Ploskirev, Levin, bismuth-sulfite agar. Seedlings are grown in a thermostat for one day at 37-38 °C. In GPB, the stimulus produces a uniform turbidity. At GPA - smooth, colorless, clear or gray-blue, with flat edges appear colonieC. In Endo, Levin, Ploskirev environments salmonella form colorless or gray-blue colonies, bismuth-sulfite agar black colonies.

Enzymatic propertieC. Salmonella breaks down glucose, mannitol, ***lactose, sucrose,*** does not dissolve gelatin, does not form indole, most form hydrogen sulfide. Positive with methylrot, negative with Foges - Proscauera.

For serological typing , the isolated pure culture of salmonella is first **tested** by polyvalent salmonellosis agglutination " *O* " serum by drip RA. If the result is positive, the polyvalent serum is tested with a separate monoreceptor " *O* " - serum. The same cultures are then examined with monorceptor " *H* " serum (phases I and II are denoted by numbers and lowercase letters). It is also possible to use the immunofluorescent diagnostic method.

3. Biosinov, put if necessary . 0.2-0.3 ml of culture suspension (50-100 million microbial bodies in 1 ml) is injected under the skin of white mice with a mass of 15-18 g. In a positive result, the mice die in 3–10 dayC.

BiopreparationC. In farms with salmonellosis, calves are vaccinated from 10 days of age, piglets from 2-3 weeks of age, and lambs from 2 days of age. Concentrated, polyvalent, associated vaccines are used for this purpose. The amount of vaccine and the order of vaccination will be indicated on its label. Calves, cows, pigs and sheep are vaccinated twice 1.5–2 months before birth.

Control questions:

1. What materials are sent to the laboratory for testing for salmonellosis.
2. Properties of Salmonella.
3. Serological typification.
4. The difference between Salmonella and Escherichia coli.
5. Which species of Salmonella are more common in animals?

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Head of the Department of Epizootology, Microbiology and Virology,
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"Laboratory diagnosis of anthrax."
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning: The aim of the laboratory diagnosis of anthrax learn methods.

Required equipment, jets ***and instruments:*** dead white mouse carcass, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, cultures of the pathogen grown in GPA, GPB, GPJ, sterile GPA, GPB, GPJ, Ulengut with a test tube, precipitating anthrax serum, antigen, saline solution, funnel, asbestos cotton normal serum, cuvette, set of dyes, microscope.

The following test methods are used to diagnose anthrax in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological
4. Serological (PR)

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent **Shapulatova Z.J.**
Assistant **Ruzikulova U.X.**

Topic : **Laboratory diagnosis of anthrax.**

Course **Objectives:** To study the rules of obtaining patmaterial for testing for anthrax and sending it to the laboratory. Mastering the examination of patmaterial by microscopic, serological (PR) methodC. Distinguish the pathogen from saprophytic bacilli.

Anthrax **is** caused by *Bacillus anthracis (* genus *Basillus*). It is an acute infectious disease, which is manifested in most farms, wild animals, as well as in humans with the appearance of intoxication, fever, septicemia, carbuncleC. The latent period of the disease lasts 1-3 days and is severe, acute and semi-acute. He dies a few minutes after the onset of the first seizure symptoms of the disease. In the acute phase, the body temperature rises to 41-42 ^{0}C and trembleC. Dies after 2–3 dayC. The above symptoms are also observed in the semi-acute course, but are less characteristic and slightly elongated. The situation may improve for some time. But then it happens again and the sick animal dieC. The disease can last for 8–10 dayC. Atypical and chronic shifts are very rare. Pigs go through a state of anthrax anginosis, body temperature rises to 40-41 ^{0}C and lasts for 1-3 days, then fallC. Death occurs as a result of suffocation due to swelling and constriction of the throat. Les will be very swollen. Blood mixed fluid flows through the natural poreC. The blood vessels in the subcutaneous tissue become full of blood, the muscles resemble the color of a red brick, and become swollen. Large amounts of serous-hemorrhagic fluid accumulate in the chest and abdomen. The spleen becomes enlarged several times, filled with blood, and when the pulp is loosened and cut, a dark or coffee-colored condensed fluid flowC. Dissection of the body is prohibited when anthrax is suspected.

Patmaterial. The base of the ear on the lying side (bottom) of the body is connected on both sides, cut, and the cut sides are burned with a heated spatula. The cut ear is wrapped in gauze soaked in 3% boric acid, wrapped in cellophane, again wrapped in parchment paper and placed in an airtight container (box, metal box). The area for blood collection is disinfected, blood is drawn, and the area is burned in a fire or heated spatula. From pigs - throat lymph nodes and swollen connective tissue fragments are obtained. If anthrax is suspected at the time of rupture, the rupture is stopped and a portion of the spleen is examined.

1. Microscopy. Greases made of patmaterial are painted on Gram and capsules by Mixin or Romanovsky Gimza methodC. The stimulus is gram-positive, rods, short chains, or pairs, placed one by one. As the sides of the wand facing each other are cut straight, the remaining sides are curved in a crescent. In

greases made from patmaterial, often obtained from pigs, the shape of the causative agent may change: the rods may be short, thick, bent, or granular, and the middle or both ends swollen. Forms a capsule (in an animal organism or in a special nutrient medium), forms spores (in culture and external environment). In greases prepared from the *culture* , *B. anthracis* forms long chains of rodC. Immediate response examination is given about the approximate result of microscopic examinations, it is noted that other examinations are ongoing.

2. Bacteriology. GPB from patmaterial, GPA is planted in larvae (pH 7.2-7.6) and grown in a thermostat at 37 ◦C for 18-24 hours, if the microbe does not grow, it stays in the thermostat for another two dayC. *B.anthracis* - aerobic. Forms smooth, slightly opaque, gray, broad (*R*- shaped) colonies on the GPA . The center of the colonies is darkened, the edges are curly, like curly hair. When viewed under a microscope, the colonies appear in the form of a "jellyfish head" or "lion's path."

The GPB remains clear and a soft cotton-like precipitate forms at the bottom. When the test tube is struck, the sediment breaks down into fine particles or rises like a cloud. Sometimes the culture grows diffusely (slight blurring), producing muar waves when we touch it.

In suspected cases, in order to distinguish the causative agent of anthrax from saprophytic bacilli, its mobility, hemolytic properties are determined, luminescent microscopy, phagocytosis, "Coral" test are performed, and laboratory animals are infected. The causative agent of anthrax is motile (grows in the form of an inverted spruce in GPJ, after 3-5 days, gelatin dissolves and forms a funnel-shaped), does not form hemolysis in bloody agar, forms a capsule in the body, sensitive to penicillin - "Coral" test is positive (1 ml of medium contains 0.5; 0.05 TB of penicillin containing GPA, cultured at 37-38 ◦C for 3 hours in a thermostat, the causative agent enters the form of coral). Fluorescent microscopy is performed using OKVC fluorescent anthrax serum. A positive result gives the cell contour radiation to four or three pluseC.

Phagotyping: flow droplet method ("Gamma - MVA" or "K" VIEV) is performed in test tubes or microsulphur with anthrax bacteriophageC. The test culture is propagated by evenly distributing the slope GPA in 6 test tubeC. Put in a thermostat at 37 ◦C for 15 minutes . Then one drop of phage agar is dropped into 4 test tubes, leaving 8-10 mm from the edges, and placed on a tripod. Phasolysis occurs after 6-8 hours at 37 ◦C , more pronounced after 12-18 hours - i.e. the culture does not grow in the droplet pathways, the culture around it grows normally, Gives the shape of a "curb".

3. Biosinov must be placed on the day of **submission of** patmaterial. 2 white mice are given 0.1-0.2 ml of tail base, or guinea pigs 0.5-1 ml of patmaterial suspension under the skin of the abdomen. Animals are observed for 10 dayC. The dead animal is dissected and thoroughly bacteriologically examined.

Serological testing (PR)

If the ear is bleeding, additional PR is also put on. If the material is degraded and is not suitable for bacteriological examination, it is limited to placing PR only.

The final diagnosis is:

- If anthrax is isolated from the material, one of the infected animals dies, if not, and the culture is separated from it.

- if the culture does not grow in the nutrient medium in which the patmaterial is planted, but even one of the animals inoculated with this material dies and the pathogenic culture is separated from its organs.

- luminescent microscopy gives a positive result and capsule bacilli are found in smears made of patmaterial.

- from the same (old) material, when the PR result is positive.

Differential diagnosis . It is necessary to distinguish between black spot, pasteurellosis and parasitic diseases of the blood. With Emkar, mainly cattle are infected from 3 months to 4 years of age. In anthrax, cattle of all ages and species are infected and the results of bacteriological testing are taken into account. In the cortex, a tightly bounded edema develops that swells in the fleshy areas of the body. In payeterellosis, there is an inflamed tumor in the subcutaneous tissue, which is injured, and the causative agent is pasteurella. In parasitic diseases of the blood, the parasite is observed in the ointment prepared from the blood.

Treatment. Sick animals are immediately transferred to the isolator and treatment beginC. Hyperimmune blood serum is used to treat anthrax. It is sent subcutaneously for prophylaxis and treatment. This drug is 15-20 ml for prophylaxis in horses, cattle, camels, 100-200 ml for treatment, 15-20 ml and 100-200 ml in cattle, respectively, 8-10 ml in sheep and goats and pigC. Apply in an amount of 50-100 ml. It is also sent to Vienna. Passive immunity lasts 14-15 dayC. Hyperimmune serum is more beneficial when combined with antibiotics (penicillin, biomycin, streptomycin, ecmonovosillin). The whey is heated to 37^{0}.

In order not to physically torture the animal, it is first tested by sending 0.5-1 ml of serum. Penicillin is administered 3 times at a dose of 500.0 thousand TB per 100 kg body weight, intravenous administration of 1 g of terromycin in a 10% solution for three days has been shown to give good resultC. Streptomycin and tetracycline are administered intramuscularly 4 times a day. In the case of carbuncles or tumors of the throat, it is better to inject a 3-5% solution of carbolic acid around the pathological procesC. Globulin is also recommended for treatment.

Immunity. 1. There is a liquid vaccine made from 55 strains used against anthrax. U 1 ml and 20-25 mln. is a vaccine that contains live sporeC. The vaccine is given subcutaneously for prophylactic and compulsory vaccination.

Young animals are not allowed to be vaccinated until 3 months of age. Sheep and goats are given 0.5 ml on the inside of the neck, chest or thigh. 1.0 ml is administered to the neck of horses, cattle, deer, camels, fur animals, pigs behind the ears or inside the thigh. Immunity appears after 10 days and lasts up to eighteen months.

The vaccine prepared from 55 strains of dry spores is dissolved in sterile saline or distilled water. It is sent only under the skin.

N harassment questions:

1. Explain the rules for obtaining patmaterial.
2. Methods of laboratory examination of anthrax.
3. *Properties* of *B.anthracis*

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"Laboratory diagnosis of tuberculosis."
laboratory work (2 hours)

PASSPORTS

M Objective: To diagnose tuberculosis in the laboratory
learn methods.

Required equipment, reagents and tools: pat.material, mixed culture of mycobacteria and other bacteria, sterile glycerin GPB, Petronian medium, ready-made greases painted by Sel-Nielson method, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, pat. material, cuvette, paint kit, microscope.

The following test methods are used to diagnose tuberculosis in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent Shapulatova Z.J.
Assistant Ruzikulova U.X. .

Topic: Laboratory diagnosis of tuberculosis.

Course **Objectives:** To learn the rules of obtaining patmaterial, its placement and sending to the laboratory, methods of processing (preparation) of patmaterial for bacteriological examination. To study the methods of examination of the given patmaterial.

Das content: **Tuberculosis (TB)** is a chronic infectious disease of domestic and wild animals, including poultry and humans, characterized by the formation of specific nodules (tubercles) in various organs and tissueC. It was discovered in 1882 by R. Cox. Currently, 5 types of tuberculosis pathogens are known.

1. In humans - *Mycobacterium tuberculosis*
2 **.** In cattle - *M. bovis*
3. In birds- *M. avium*
4. In mice - *M. microt (murium)*
5. In cold- *blooded* animals- *M.poycilothermorum.*

Pathologies of people and agricultural animals - *Mycobacterium tuberculosis, M. bovis , M. avium* species plays an important role. Tuberculosis is mainly chronic. To detect the sick animal in time, it is tested in an allergic way with tuberculin.

Pathological material: Samples are taken from *sick animals* - nasal discharge, sputum, tracheal mucus, feces, urine. *From the* dead - parts of the affected organ, bronchial, pharyngeal, umbilical, lymph nodes are removed. The body of the dead bird is sent. It is necessary to follow the rules of asepsis, personal prevention, safety when obtaining patmaterial. Patmaterial is sent to the laboratory

as soon as it is received. If this is not possible, 30-40% glycerin is sent canned or frozen.

1 . **Microscopy: The** pathogen belongs to the group of acid-alcohol-alkali-resistant bacteria. Its shell contains steorin acids and waxy substanceC. This is why tuberculosis bacteria find it difficult to accept dye. Special, painted in the Sil-Nielsen method.

1. A special filter paper is poured on the fixed grease, on which the carbolic tuberculosis fuchsia is poured. The alcohol lamp is heated in a flame until steam is formed and stands on the bridge for 5-7 minutes.

2. Remove the filter paper and pour a 3-5% solution of sulfuric acid on it. 5-7 seconds.

3. Wash thoroughly with water.

4. Extra Leffler is stained with methylene blue for 4-5 minuteC.

5. Wash the grease with water and dry it on filter paper.

Under the microscope, acid-resistant bacteria are red, and resistant ones are blue. Gram-stained grease shows gram-positive, rod-shaped bacteria 1.5-5 microns long and 0.3-0.6 microns in diameter. *M. tuberculosis* - thin, slightly bent rod, *M.bovis* - short, thick: *M. avium* - smaller than others, polymorphic. In the grease is placed one by one, in ballC. Inactive, does not form spores and capsuleC. In the grease prepared from the culture is also found a long form of ipsimon.

2 . **Bacteriology:** First, the material is treated in one of the Gon or Alikayev methods.

Gon method : The material is crushed in a sterile mortar and mixed with a solution of 10-12% sulfuric acid in water in a ratio of 1: 4. The resulting suspension is centrifuged for 10-15 minutes at a speed of 3000 rpm. Exposure (acid effect) should not exceed 20-30 minuteC. Greases are prepared from the sediment, planted in nutrient medium. The precipitate for biosinov is washed 1-2 times with sterile saline.

Alikayev method : Often used when the material is fresh, less contaminated. The material is crushed in a sterile mortar in the size of 0.5 cm and poured with an aqueous solution of 10-8-6% sulfuric acid. It takes 10-20 minuteC. The exposure time and concentration of the acid depends on the degree of contamination of the material. After 10-20 minutes, the acid is drained, replaced with saline solution and left for 8 minuteC. Then the saline solution is poured, the patmaterial is well crushed in a mortar, a suspension is prepared in the saline solution, 5-6 test tubes are inoculated into the nutrient medium.

Processed patmaterial-elective nutrient media: egg-starch, deaf rock-glycerin-broth-grown in media that inhibit the growth of foreign microorganismC. Most commonly used are Petranyani, Levenstein-Jensen, Gelberg environmentC. Glycerin GPBs and GPAs are also used.

Tuberculosis-aerobic, grows slowly (2-4 weeks and more). When grown in glycerin broth for a long time (6-8 weeks), the toxic

substance **tuberculin** accumulateC. It is used to diagnose tuberculosiC. In a liquid environment, the pathogen grows and forms a membrane after 10–30 days.

M.tuberculosis - **a** thick *membrane* , *M.bovis* - **a** black *reticular* tumor *membrane* , and *M.avium* - a thin, thin, whitish on the 7th-10th day forms a strongly wrinkled membrane on the 21st day. In dense nutrient media, microcolonies that are barely visible at first appear, then they grow. On the surface of the nutrient medium fine or large, glossy or opaque, smooth or broad 1–2 colonies, or colonies merge to form a single oozing layer with the surface. Duration of bacteriological examination - 2 monthC. The results are recorded every 4-5 days after sowing.

3.Biosinov . 1ml is injected subcutaneously into the guinea pig, 2ml into the rabbit ear vein, and 1-2ml into the subcutaneous vein in the chicken wing. The follow-up period is 3 months.

Animals taken for biosinov should be tested for tuberculosis in an allergic manner with tuberculin beforehand. Only those with negative results are used for biosynthesiC. The dead animal is cracked, greases are prepared from the characteristic tubercles, and they are inoculated into the nutrient medium.

Identification (typification) of pathogens.

M.bovis - culture *causes a* generalized tuberculosis process in guinea pigs and *rabbits* .

M.tuberculosis - generalized in guinea pigs, and in rabbits - causes a local process in the lungs.

M.avium - *causes a* septic process in rabbits, it dieC. Sometimes a local process ariseC. In guinea pigs, only a local process (abscess where the culture is sent) occurs.

To distinguish low-virulence culture from acid-resistant saprophytes, 3 tests are performed: 1. Catalase activity is determined by measuring the formation of gas bubbles in mm with 50% perhydrol solution. In saprophytes, this property is higher. 2. Formamidase activity - a blue ring appears in a culture solution treated with a formamide solution and several chemicalC. This condition occurs only in saprophyteC. 3. Sensitivity to drugs is studied in a nutrient medium with the addition of tuberculostat drugs (streptomycin, ftivazid, PASK, etc.).

M.tuberculosis and M.bovis are susceptible to them, while saprophytes and *M.avium* are resistant.

Biopreparations **:** BSG vaccine-Dried live culture of M.Bovis vaccine strain.

Purified, dry PPD tuberculin, for mammals.

Alttuberculin, for mammals.

PPD tuberculin for poultry.

Control questions:

1. Getting patm material for tuberculosis testing?
2. What are the methods of testing in the laboratory?
3. Morphological-tinctorial features of the pathogen?

"Approved"
Head of the Department of Epizootology, Microbiology and Virology,
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Shapulatova "____"
_____ 2019.

"Laboratory diagnosis of brucellosis."
laboratory work (2 hours)

PASSPORTS

THE purpose of the study: Diagnosis of brucellosis by serological methods.

Required equipment, reagents and equipment: brucellosis antigen for rosbengal sample, plates, brucellosis antigen for milk ring AR, positive, normal, test cattle serum, fresh milk solution, ready-made greases, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, pat.material, cuvette, paint kit, microscope.

The following test methods are used to diagnose brucellosis in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological
4. Serological examination

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

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Topic: Laboratory diagnosis of brucellosis.

Brucellosis pathogenic agent for the first time in 1886 the British microbiologist David Bruce, abattoirs dead man's worth and *Micrcoccus melitensis* called.

Brucellosis is a chronic infectious disease in animals and humanC. The disease usually goes without clinical signs, sometimes with clinical signs such as abortion, bursitis, orchitis, epididymitis, endometritis.

At the onset of brucellosis enzooticity is manifested by mass abortion in animals, resulting in rapid separation of the placenta, endometritis, infertility. In most cases it passes without clinical signs.

The migration of Brussels sprouts from one species to another is of great epizootiological and epidemiological significance. For example *Br. melitensis is* found in cattle and pigs , so such animals remain a source of brucellosis in humans (Ye.V. Kozlovskii, 1954-1956 and others). In addition, *Br.suis* cattle and sheep, goats, *Br abortion*, sheep, goats and pigs migration is clear.

Humans can be infected with all types of brucella germs, but sheep and goat brucellae are extremely contagious to humans and the disease is severe.

The causative agent belongs to the genus *Brussels* and consists of 6 species:

1. *melitenzis* (in sheep and goats)
2. *abortion* (in cattle)
3. *suis* (in pigs)
4. *ovis* (in rams)
5. *canis* (in dogs)
6. *neotoma* (in rats)

Brucella ovis causes infectious epidemic disease in pigC.

Durability . Brucellae are resistant to external influenceC. Lives in moist soil, 3 - 4 months in water, 160 days at low temperatures in cattle, 1.5 - 5 months in sheep wool, 2.5 hours in direct sunlight. Lives 8 days in milk, 45 days in cheese and cheese, 60 days in fat, 20 days in meat stored in the cold. Milk dies in 30 minutes when heated to 70 ◦C, and in 1-2 minutes when boiled. The milk is pasteurized at 70 ◦C for 30 minutes or at 85-90 ◦C for 20 secondC. For disinfection 2% sodium hydroxide, 20% fresh slaked lime, 2% formaldehyde, 4% creolin, etc. are used.

Pathological material. *From an* infected *animal* - aborted fetus, fetal stomach, liver and spleen fragments connected with the peritoneum or on both sides: hygroma substance, milk - (wash and disinfect the udder in 70 ° alcohol, then from each sucker to separate sterile solutions 10-15ml is taken from the last portions). From sheep and goats, milk is obtained sterile from the udder with a syringe needle. Milk should be inspected on the day of sampling. If this is not possible, it can be preserved with boric acid in an amount of 0.1 g per 10 ml of milk **.**

Obtained from rams (when slaughtered) with a bag of semen. A piece of patmaterial from each animal is wrapped separately in cellophane, parchment paper and placed in a waterproof container (polyethylene bag, box, jar). The blood of aborted animals must be tested (one week after abortion). tmaterial is brought by a specialist with a referral to the laboratory.

1. Microscopy. Two greases are prepared from the material and painted in Gram and Kozlovsky methodC. Brucellae are small, rod-shaped or coccygeal bacteria, 0.6-1.5 microns long, 0.3-0.5 microns in diameter, gram-negative, immobile, do not form spores, one, two or balls in the ointment. lib. In the ointments painted in the Kozolsky method - brussels sprouts are red, other microbes are green.

2. Bacteriology. Brucellae grow in special nutrient media: meat-peptone liver broth (GPJB), liver-glucose-glycerin agar (JGGA) and broth (JGGB), erythritol-agar, whey-dextrose agar, etc. One solution broth from the material, two test tube agar, two test tubes broth, five test tubes agar.

Nutrients grown from ram patm material are grown in the atmosphere, with 10-15% carbon dioxide.

Half of the patmaterial crops obtained from cattle are grown with 10-15% carbon dioxide, the rest is grown in a normal atmosphere.

Seedlings are grown at 37–38 ° C in a thermostat for 30 days.

In dense nutrient medium - small, clear, bulging, round, glossy, smooth (*S*- shaped) and bluish (also occurs in *R*- shaped) colonieC. When grown for a long time, the colonies darken and become pigmented - darkening and sticking together.

In a liquid nutrient medium, the same turbidity forms a bluish tinge ring, then less sediment falls.

3. Biosinov. First, 350-400 grams of guinea pig blood is taken from the heart and the serum is tested for brucellosis by the AR method. Biosinov can be put in them only if a negative result is obtained in a ratio of 1: 5.

A 1:10 suspension prepared from patmaterial is administered subcutaneously in a dose of 1 ml to the inside of the number of guinea pigC. On the 15th, 25th, and 40th days, blood is drawn from them and the serum is tested for brucellosis in the

AR method in a ratio of 1:10 to 1:80. If a positive result is obtained in ratios of 1:10 and above, the test result is positive, even if the culture is not separated from the given patmaterial. Biosinov is observed for two monthC. All isolated cultures are autoclaved in an autoclave for 1.5 h for 1 h at the end of the work and destroyed.

Serological testing methods include AR, CBR, UKBR, RBN, milk ring AR. AR is put in a ratio of 4 in a volume of 1 ml. Sheep, goats, owls, dogs serum 1:25 to 1: 200 (positive result 1:50 and higher titer). Eg, horse, camels 1:50 to 1: 400 (1: 100 and high titer positive). In guinea pigs and fur animals, 1:10 to 1:80 (1:10 and high titer positive).

RBN. 0.3 ml of whey is poured into the grooves of special enamel plateC. On top is poured 0.03 ml of brucellosis antigen stained with Bengal pink. Stir gently, stirring, for 4 minuteC. For control, the antigen is reacted with a positive, negative serum, saline solution. A positive result is the appearance of pink agglutinate. A serum sample with a positive result is re-tested in AR, KBR.

Milk ring reaction. Pour 2-3 ml of fresh milk into the solution, add to it 0.2 ml (2 drops) of the antigen stained with hemotoxylin. Shake the solutions and mix well, stand in a water bath or thermostat at 37ºC for 45-60 minuteC. Positive result - a blue ring appears, the milk discolorC. As a result, the milk remains blue.

Allergic method . In animals with brucellosis, an allergic reaction occurs when brucellosis allergens are injected into the skin. Cattle and pigs *Br.abortus* agglutinogens strains of non-allergenic brusellizat VIEV. The appearance of a tumor that is well manifested at the site of allergen delivery is considered a positive result of the allergic sample.

Sick cattle are handed over for meat without treatment. Vaccination against the disease is carried out using the following vaccineC. Active immunization against brucellosis was initiated in 1906 by Bang. Sht №19 1923 Separated virulently from cow's milk by Buk. By replanting potato agar for 10 years, the virulence of strain 19 was reduced. After the use of the SHT №19 vaccine, it became difficult to differentiate animals infected with brucellosis because the animals remained seropositive for a long time. This has prompted our scientists to conduct research to create more sophisticated live vaccines against brucellosiC. As a result, vaccines made from sht82 have been proposed and widely used.

Control questions:

1. What are the rules for obtaining and sending to the laboratory?
2. Principles of laboratory diagnosis of brucellosis?
3. Cultural characteristics of Brussels sprouts?
4. Putting biosinov on brucellosis?

"Approved"
Head of the Department of Epizootology, Microbiology and Virology,
Docent_____
Shapulatova "____"
_____ 2020.

"Laboratory diagnosis of measles."
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning goal: Suu disease laboratory diagnosis methodC.

Required equipment, jet and instrumentation: Kitt-Tarossi, glucose blood agar, ready-painted greases, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, *pat.material* , *CL.chauvoei* culture, *cuvette* , paint kit, microscope.

The following test methods are used to diagnose rabies in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

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Assistant Ruzikulova U.X.

Topic : **Laboratory diagnosis of cholera.**

The purpose of the lesson: To study the rules of obtaining patmaterial and sending it to the laboratory. Mastering the methods of bacteriological examination.

Blackheads are an acute infectious disease of horned animals, characterized by the formation of a rapidly growing gaseous edema that produces a wheezing sound in the muscle-rich parts of the body, accompanied by a rise in fever. Cattle are sick from 3 months to 4 yearC. The causative agent is *cl.chauvoei,* anaerobic.

Pathological material. For laboratory examination, the affected muscle fragments (cut deeper with sterile instruments and a piece of damaged tissue measuring 3x3x3 cm from the middle part of the muscle) are sent to the crepitating tumor exudate. If the body is torn, blood is taken from the liver, spleen, and heart. Patmaterial is taken no later than 4 hours after the death of the animal.

1. **Microscopy.** Greases made of patmaterial are painted in Gram, Peshkov method. The microscope shows polymorphic (spherical, spherical, noxious) granular gram-positive rods arranged in pieces or in pairC. In the grease stained by the Peshkov method, the spores appear blue. It can be placed in the middle, on the edges of the wand, or even freely. Capsule does not form, mobile, 2-8 μm long, 0.5-0.7 μm wide, anaerobic.

2 . **Bacteriology** . Kitt-Tarossi from patmaterial is planted in a nutrient medium. To do this, the muscle, liver, spleen fragments are passed through a fire, and then poured into an ambient solution. Blood, exudates are inoculated in a Pasteur pipette. At the same time in petri dishes can also be inoculated with glucose - bloody Seyssler agar. If the material is old, a suspension in four proportions is prepared from it in a saline solution and heated at 80 °C for 15-20 minutes . The seedlings stand in a thermostat at 37-38 °C for 24-48 hours . The cups should stand for 24-48 hours under anaerobic conditions.

In the Kitt-Tarossi environment - *cl.chauvoei* - a *uniform* turbidity appears on the broth. It settles in 36-48 hours and forms a precipitate. Produces less gas.

In seismic agar, the colonies grow as if the edges are trimmed, like a glossy button or a grape leaf, and a small hemolysis zone appears around the colony.

3. **Biosinov.** A suspension is prepared from patmaterial in a ratio of 1:10. Suspension is administered subcutaneously in the abdomen of two guinea pigs weighing 350-450 g in a dose of 0.5-1 ml. The animals are observed for 8 dayC. If the material is positive, the infected animals die within 24-96 hourC. The body should be dissected and bacteriologically examined. On the skin there is a serous - necrotic discharge, hemorrhage. The skin is difficult to separate from the damaged muscle. The muscles of the chest, abdomen, and hind legs are dark red. A few gas bubbles collect in the buttocks and underarms.

The diagnosis is made in the following cases :

1. If a pathogen culture is isolated from the material, and at least one animal in the biosynthesis dies with typical symptoms and the pathogen culture is isolated from it;

2. Even if the pathogen culture is not isolated from the given patmaterial, even one of the two biosynthetic animals dies with typical symptoms and the pathogen culture is isolated from it.

Concentrated hydroxyfarmol vaccine is used for vaccination. Immunity lasts 6 monthC. Cattle from 3 months to 4 years of age and sheep older than 6 months of age are vaccinated.

Control questions:

1. Rules of receiving and sending to the laboratory.
2. Morphological, tinctorial features of the pathogen (*cl.chauvoei*).
3. *Cultural* features of *cl.chauvoei* .
4. Placing biosynthesis in black, pathological changes in it.
5. In what cases is a blackbird diagnosed?

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"Laboratory diagnosis of gas gangrene."
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning purpose: Gas gangrenous laboratory diagnosis learn ways to put .

Required equipment, jet and instrumentation: cl. Grown in Kitt-Tarossi environment. septicum, cl.perfringens cultures, glucose bloody agar, ready-painted ointments, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, pat.material, cuvette, set of dyes, microscope.

The following test methods are used to diagnose gas gangrene in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

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Laboratory diagnosis of gas gangrene .

Gas gangrene is a type of animal that is rapidly spreading, inflamed as a result of injury or trauma, manifested by the development of tumors, tissue necrosis, intoxication of the organism. Gas gangrene has a polymicrobial etiology. Pathogens *cl. septicum, cl. oedematiens, cl. perfringens, cl. sordelii, cl.histolyticum, cl. chauvoei* **,** each of which can cause a separate disease, but often occurs together.

Pathological material. Damaged muscle fragments, tissue exudate, parenchymatous organs are sent to the laboratory for examination.

1. Microscopy . In greases made of patmaterial and painted by Gram method:

cl. septicum **-** thin, twisted ends, polymorphic, rod 2–10 μm long, 0.8–1 μm wide, in the form of a thread in the ointment prepared from serous layerC. Gram-negative, does not form capsules, spores, located at the tips or center, motile.

cl. oedematiens - large, polymorphic, the ends are twisted, located separately, sometimes in the form of a chain of 2-3-4. Length 5-15 microns, new 0.8-1.5 micronC. Gram-negative does not form capsuleC. Spores are located in the center or at the endC. Harakatchan.

cl. perfringens - thick, slightly bent at the ends, rods, located separately, 4-8 μm long, 1-1.5 μm wide. Sometimes it can be coccygeal. Grammusbat *forms a capsule* (in the animal's body), located in the center or at the ends of the sporeC. Inactive.

cl.histolyticum - twisted sticks with thin endC. One, two, sometimes in the form of a chain. It is 2-5 microns long and 0.2-0.5 microns wide. Gram-negative, does not form a capsule, the spores are small, located in the center or at the endC. Harakatchan.

2. Bacteriology. Patmaterial Kitt-Tarossi is transplanted into blood glucose Seyssler agar. It is grown under anaerobic conditions in a thermostat at 37-38 °C for 24-48 hours .

cl. septicum **-** Intensive turbidity in the Kitt-Tarossi environment, produces a lot of gas, grows thin, colorless, silk-like, with trimmed edges, in seismic agar. The colony is surrounded by a zone of hemolysis.

cl. oedematiens - grows intensively under the test tube, after 18-24 hours the broth becomes clear and sediment appearC. Produces less gaC. Seyssler agar is broad, rooted, layered, the edges are truncated, the center bulges, darkens, forms a strong hemolysis.

cl. perfringens - The Kitt-Tarossi environment becomes turbid earlier, producing more intense gaC. Sessions form round, smooth, bulging gray-green colonies in agar, strong hemolysis.

cl.histolyticum - intense turbidity in the Kitt-Tarossi environment, does not produce gaC. In seismic agar grows small, round, smooth, flat-edged colonies, no hemolysis.

3 . **Biosinov.** The suspension made of patmaterial is injected under the skin of the abdomen of two guinea pigs weighing 350-400 g in a dose of 0.5-1 ml. Followed for 8 days.

cl. septicum - guinea pigs die in 14–28 hourC. The skin is easily separated from the muscleC. The muscle, subcutaneous tissue is light red in color, with numerous gas bubbleC. The intestines are swollen, filled with a gaseous liquid mass.

cl. oedematiens - guinea pigs die in 12-36 hourC. At the injection site, gelatin-quality, revived swelling appears yellowish-pink in color. The muscles are whiter.

cl. perfringens - guinea pigs die in 36-48 hourC. In types " *A* " and " *D* " - at the injection site, the skin is separated from the muscles like a sac, the muscles are like meat when boiled. The intestines are swollen, the blood vessels are swollen.

Types " *B* " and " *C* " - the skin at the injection site is easily separated, but does not separate. Muscles, dry, red. The intestines are swollen, hemorrhagic inflamed, and sometimes ulcers appear.

cl.histolyticum - guinea pigs die in 18-48 hourC. When sent under the skin, they often heal. When the hip muscle is damaged, the skin is reddish in color, tense, and sometimes cracked. It loses muscle structure and turns into a muddy masC. The soft tissues are separated from the bones and veinC. There will be no gaC. Animals in dead biosynthesis are bacteriologically examined.

Biopreparations . Polyvalent hydroxyaluminum vaccine prepared against bradycardia, infectious enterotoxemia, malignant tumors of sheep and dysentery of lambs is used to generate immunity. Immunity lasts 4-5 months.

Control questions:

1. What patmaterials are taken for inspection.
2. Morphological features of pathogens.
3. Cultural characteristics of pathogens.
4. Applying biosynthesis to gas gangrene.
5. Biological properties of pathogens (pathoanatomical changes in biosynthesis).

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"Laboratory diagnosis of joint disease."
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning goal: lean disease laboratory diagnosis
learn ways to put .

Required equipment, jets ***and equipment:*** Kitt-Tarossi medium, glucose blood agar, ready-painted ointments, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, pat.material, white mouse, cuvette, paint kit, microscope .

The following test methods are used to diagnose joint disease in the laboratory:

1. Microscopic
2. Separation of toxins
3. Bacteriological
4. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

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Topic: Laboratory diagnosis of joint disease.

Course **Objectives: To** study the rules of obtaining materials and sending them to the laboratory. Mastering the methods of bacteriological examination.

The causative agent of scabies was first discovered in 1883 by a Russian scientist, ND Monastirsky, in the isolation of a sick man at the site of injury. A. Nikolayer, in 1884, sent soil from laboratory animals to rabbits and guinea pigs, in which he found the causative agent of scabies, and in 1889 Sh. Kitazato isolated his pure culture. As a result of injuries to animals and humans, the pathogen falls from the soil into the wounds, causing illnesC. The microbe releases a strong poison.

The toxin was isolated and expressed in 1890 by Bering and Kitazato. The clinical signs and pathogenesis of the coating depend on this toxin.

If timely treatment is not carried out on infected farms, 50-80% of adult sick animals and 90-100% of young sick animals die. The floor is spent on the treatment of sick animals.

Cataract is an infectious, traumatic disease of animals and humans, characterized by strong excitation under the influence of microbial **toxins** , reflex contraction of skeletal muscleC. The causative agent is *Cl.tetani.*

Clinical signC. The latent period of the disease lasts 4-5 days, is acute and usually ends in death. The disease begins with a sudden rise in body temperature (40–42 ° C) The sick animal is lame. In the most fleshy parts of the body (thighs, buttocks, etc.) appear tightly bounded, hot and hard swelling. In sick cattle, the cynical sign of the disease develops rapidly and is clearly visible within 8-10 hourC. When the swollen area is pressed, a creaking sound is heard. This occurs as a result of the formation of gas bubbles in the injured area. In some cases, the injury also occurs in the throat, diaphragm, jaw, ruminants, where the muscles are underdeveloped.

Swelling does not occur in the ear and tail when the temperature is low. With the appearance of disease-specific pathological tumors in the body, the general condition of the animal suddenly worsens.

The sick animal is very weak, can not eat anything, can lie down, has difficulty getting up, and carefully presses on the side of the lame leg. The function of the respiratory and cardiovascular systems is impaired. The diseased animal dies within 1–2 days due to hypothermia, when the vessels beat slowly.

If the disease persists in a state of septicemia, the general fever in 3-4-month-old calves rises, and they die within 5–10 hourC. In older animals, the clinical sign is split (abortive) and the sick animal dies within 1-3 days.

Pathological material - wound secretions, tissue fragments from the deepest layers of the affected area are sent to the laboratory for

examination. Blood, liver and spleen fragments are also taken from dead animals (5-10 ml).

Laboratory tests are performed in two directions: isolation of the toxin, isolation of the pathogen culture and determination of its toxicity.

1. Microscopy . *cl.tetani* - a thin, 4–0.6 μm-sized rod with a round spore at one end (in the form of a drumstick). Grammusbat, mobile.

Separation of toxins.

A suspension with saline solution in two proportions is prepared from the patmaterial and divided into two. One is used to isolate the pathogen.

The second is left for one hour at room temperature to extract the toxin. It is then filtered.

2. 2-3 white mice weighing 16-18 g with the filtrate are infected by injecting subcutaneously in a dose of 0.5-1 ml or two guinea pigs weighing 300-350 g in a dose of 3-5 ml. In the presence of toxin in the patmaterial, after 48-96 hours, animals in biosynthesis develop symptoms of the disease characterized by tetanic muscle contraction. The animals die in a characteristic position - the legs are elongated, the spine is bent to the side to which the material is sent.

Animals in biosinov are observed for 10 days.

If a solid toxin is isolated from the material being tested, no test is performed to isolate the culture.

Isolation of pathogen culture.

2. Bacteriology . A suspension made of patmaterial is inoculated into two test tubes in the Kitt-Tarossi medium. One is heated at 80 °C for one hour. Seedlings are grown in a thermostat at 37-38 °C.

In this environment, *Cl.tetani* - produces less gas, causing intense turbidity. After 48–72 hours, the broth begins to clear, a precipitate is formed. From the culture comes a peculiar smell of burnt horn.

The culture is grown again in a thermostat, at 4-5 days, to check for the presence of toxins in it. To do this, the culture is sent to white mice or guinea pigs.

Blood *Cl.tetani* - rose a little higher, tumors are sensitive colonies, sometimes small round colonieC. Separate colonies surrounded by a hemolysis zone are also found.

The duration of bacteriological examination of the layer is 15 days.

Biopreparation. Concentrated, one percent bitter stone anatoxin is used for active immunization. Immunity is formed after 30 days and persists for more than a year, and in horses for up to five yearC. Anti-aging serum is used for prophylaxis and treatment.

Control questions :

1. Rules of obtaining patmaterial in the alloy.
2. *Cl.tetani* in morphological features, tinktorial.
3. *Cl.tetani* 's cultures .
4. Methods of laboratory testing of the alloy.

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_____ 2020.

"Laboratory diagnosis of botulism."
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning goal: the laboratory diagnosis of patients with botulism learn methods.

Required equipment, jets ***and equipment:*** Kitt-Tarossi medium, glucose blood agar, ready-painted ointments, Pasteur pipettes, scissors, scalpel, tweezers, object glasses, pat.material, white mouse, cuvette, paint kit, microscope .

The following test methods are used to diagnose botulism in the laboratory:

1. Microscopic
2. Separation of toxins
3. Bacteriological
4. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent Shapulatova Z.J.

Assistant Ruzikulova U.X.

Topic: Laboratory diagnosis of botulism.

Course **Objectives: To** study the rules of obtaining materials and sending them to the laboratory. Mastering the methods of bacteriological examination.

Botulism is a toxic infectious disease of all animalC. It occurs as a result of eating foods that contain botulinum toxin and is characterized by severe damage to the central nervous system, paralysis of the larynx, tongue and lower jaw. A person with botulism also gets sick. The causative agent - spore-forming anaerobic - are *types* A, B, C, D, E, F of cl.botulinum. These types differ only in immunological terms: each is neutralized by its own similar serum.

Pathological material - samples of suspected foods (silage, grain, mixed feed, meat and fish waste), as well as the mass in the stomach of dead animals, liver fragments and blood of sick animals are sent to the laboratory for examination.

Patmaterial is taken no later than two hours after the death of the animal.

A suspension is prepared from the patmaterial together with saline solution in one or two proportionC. Stands for two hours to be extracted at room temperature.

One part is used to separate the toxin and the other is used to separate the pathogen.

1. Microscopy. *Cl.botulinum* is a *spherical* , anaerobic rod with *spiral* tips . The spores are oval in shape and are in the shape of a tennis racket as they are located close to the ends of the cellC. Grammusbat, mobile. The size is 4-6 micronC. Toxin 15-20 min. decomposes in boiling water for up to two hourC. Spores are very hardy, they die when boiled for 5–6 hourC.

Separation of botulism toxin.

The suspension prepared from patmaterial and food samples is filtered. Divide in half in a boiling water bath for 20–30 min. heated. Boiled and unboiled filtrates for one are injected into the abdominal cavity of two white mice 0.5-0.8 ml, or 3-5 ml under the skin of guinea pigs (weighing 300-350 g).

If botulism toxin is present, laboratory animals who are given an unboiled filtrate will die on the second to fifth day with clinical signs of botulism (loss of balance, shortness of breath, skeletal muscle relaxation, collapse of the abdominal wall "like a bee's waist"). and the animals remain healthy.

The isolated toxin is specifically neutralized by different types of botulism serum. To do this, the filtrate is mixed with polyvalent antitoxic botulism serum and placed in a thermostat for one to two hourC. The mixture is then sent to laboratory animalC. The toxin is neutralized with serum and the animals survive.HP results are taken into account for four days.

Isolation of the pathogen.

2. Bacteriology . Patmaterial Kitt-Tarossi, Hottinger broth, bloody Seyssler agar are planted. Seedlings are placed in a thermostat at 30–35 °C. It is necessary to create anaerobic conditions by placing the seedlings in petri dishes on an anaerostat. The pathogen grows for two to four days.

In Kitt-Tarossi, the growth of the pathogen - the environment gradually becomes cloudy (in 2-3 days), forming a gaC. It **smells of sour oil** . Toxins are detected in the culture fluid in 5-7 days.

Seissler agar - *cl.botulinum* colonies have round, *rooted* tumors, are colorless or gray zone of intensive hemolysis.

Biopreparation . Typically, mink is vaccinated against botulism with a formal kvass anatoxin vaccine. Immunity is maintained for up to a year. An antitoxic serum against botulism has been proposed for treatment. Special butulism types of serum have been developed for the neutralization reaction.

Control questions :

1. What patmaterial is sent to the laboratory for testing for botulism.
2. Morphological, *cultural* features of *Cl.botulinum* .
3. Methods of laboratory testing for botulism.
4. Putting a neutralization reaction in botulism.
5. Biopreparations used in botulism and botulism.

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Head of the Department of Epizootology, Microbiology and Virology,
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_____ 2020.

"Laboratory diagnosis of pathogenic fungi."
laboratory work (2 hours)

PASSPORTS

M Objective: Laboratory diagnosis of pathogenic fungi
learn ways to put .

Required equipment, jet and instrumentation: Fungal cultures grown in Saburo environment, patmaterial, mycological loop, object and cover glass, microscope.

The following test methods are used to diagnose pathogenic fungi in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent **Shapulatova Z.J.**
Assistant **Ruzikulova U.X.**

Topic: Laboratory diagnosis of pathogenic fungi .

The purpose of the lesson: To acquaint students with the rules of obtaining patmaterial in dermatomycoses (trichophytia, microsporia), candidiasis and fungal mycoses, methods of mycological examination.

Mycoses are a special group of diseases caused by pathogenic microscopic fungi. These include pathogens of dermatomycosis, fungal mycosis, candidiasis.

Dermatomycosis pathogenC. Dermatomycoses include mycoses that infect the skin and its derivativeC. The pathogen parasitizes tissues that have keratin. All farm animals (mostly young ones), fur and wild animals, as well as humans, get sick. Dermatomycosis pathogens belong to immature fungi (class Deuteromycetes). Includes trichophyton, microsporon, and aharion offspring.

Trichophytia is a chronic disease characterized by a severely limited lesion of the skin and hair. *Pathogen* : *Tr.verrucosum in* calves and lambs, *Tr.equuinum* **in** horses, *Tr.gupseum* in rodents, *Tr.gallinae* in birds .

Morphological and cultural featureC. Under a microscope, the body (mycelium) of the fungus can be seen to be composed of finely branched filaments with colorless round sporeC. When the damaged wool is seen under a microscope, it is clear that the fungus and its spores are arranged in an orderly chain inside or around the wool.

The causative agent of trichophytia - aerobic, grows well in special nutrient media. After 10–20 days in a thermostat at 26–28 °C on Saburo agar , smooth, skin-like, layered, sometimes unsimon-layered colonies are formed. From the colonies a strong, deep branching emerges into the nutrient medium.

Poultry trichophytosis (favus, parsnip) - is characterized by damage to the skin, feathers and internal organC. On the crown, earrings, near the beak appear gray-white layers - scutuleC. The causative agent is *Tr.gallinae.*

Diagnosis . For laboratory examination, the damaged epidermis and wool fiber fragments are removed from the border with healthy tissue. In the laboratory it is examined by microscopy, if the result is doubtful, the patmaterial is inoculated into the culture medium, pure culture is isolated, luminescent analysis and biosinov are performed.

The shavings are treated with 10% alkali (*KOH* or *NaOH*) for 15-30 minuteC. The drug is prepared by the crushed drop method and viewed under a microscope. The damaged hair appears as endospores arranged in a row, inside and outside.

BiopreparationC. A team of authors such as AX Sarkisov, SV Petrovich, LI Nikifirov, LM Yablochnik, 1974 developed the LTF-130 vaccine for the treatment and prevention of cattle trichophytia, the SP experimental vaccine for the treatment and prevention of equine trichophytia. The LTF-130 vaccine is administered intramuscularly in two doses for treatment, and 2 times at intervals of 10-14 days for prevention.

Microsporia pathogenC. Microsporia (microsporosis, temiratki) is an infectious disease of the skin and its derivatives, characterized by extreme infectivity, manifested clinically in 3 different forms: superficial, deep or follicular, atypical. Dogs, cats, pigs, horses, etc. as well as people get sick, especially young children.

Morphological and cultural featureC. In the patmaterial, the fungus appears in the form of branched mycelium. It decomposes to form sporeC. The spores are arranged randomly around the damaged wool, reminiscent of the appearance of a scab. Unlike trichophytosis , *M. yequinum* develops on 6–7th day at 26–28 °C on glucose Saburo agar , *forming a* skin-like, grayish-white mycelial-covered colony.

Fungi of the genus Microsporum produce a radiant pigment - pterygium. The mature colony is yellow or brown.

Fluorescent **analysis** - placing the patmaterial in a Petri dish and giving green radiation to wool fibers damaged by microsporia at a distance of 20 cm under ultraviolet light of a mercury-quartz lamp (PRK-2, PRK-4) in a dark room. In this way it is possible to detect the latent form of microsporia.

For laboratory examination, the injured damaged epidermis and a piece of wool fiber are removed from the border with healthy tissue and placed in a bag.

Trichophytia, microsporia is diagnosed in the laboratory by microscopy. Patmaterial in 10% alkali for 20-30 minuteC. costs The drug is prepared from it in the form of crushed dropC. Or the material being examined is scraped with scissors in Petri disheC. Then a piece of wool, sweater is taken to the object window. A drop of 20% NaOH or KOH is added to it and heated slightly (over an alcohol flame). Then a drop of 50% glycerin solution is poured on it, and a closed window is closed. It can be seen first in the x8 lens, then in the x40 lens or in the immersion system. The presence of fungal mycelium and spores is the basis for diagnosiC. Trichophyton and microsporum differ from each other depending on the order in which the spores are located in the affected wool.

If the result of microscopic examination is doubtful - a pure culture is separated from the patmaterial, luminescent analysis and biosinov are placed.

Saburo, suslo - agar, 2% glucose GPA, Chapeka media can be used to isolate pure cultures.

DiagnosiC. When microsporia is suspected, scraps taken from the affected foci are examined microscopically to confirm the clinical diagnosiC. if necessary, a pure culture of the pathogen is isolated. In addition, trichophytosis should be distinguished from microsporia. For this, luminescent analysis is used. In the case of microsporia pathogens, characteristic green radiation (light) appears under the influence of ultraviolet light. The trichophytia pathogen is not irradiated.

Biopreparations . No specific treatment method has been developed. Drugs used in trichophytia are used for local treatment. Highly fungicidal drugs have been proposed: yuglon, phenothiazine, amkazol, iodine - vasogen, yam, etc. There are no specific disease-preventing agentC.

The causative agents of fungal **mycoses** are fungi belonging to the genus *Aspergillus, penicillium, Mucor* , etc.

Aspergillosis is a non-communicable disease of domestic and wild animals, sometimes infecting y.s.h., m.sh.h., horses, pigs, bees as well. Respiratory organs are mainly characterized by granulomatous lesions of the lungs.

Patmaterial . The bodies of newly dead small animals, nodes, damaged organs, eggC. Chapeka, Saburo, bloody, brain and corn agar, GPAs are used.

At 25–37 °C, aspergilla colonies grow in dense nutrient media for 3–5 dayC. *A.fumigatus* forms a flat or *broad* colony in the Chapeka environment. The developed mycelium gives a felt-like shape, first white and then green. Mature cultures are black at the stage of spore formation.

The causative agent of **mucormycosis is the** *MM racemosus* , which belongs to the genus Mucor . Mucormycosis is a chronic disease characterized by the development of granulomatous processes in the lymph nodes, lungs, other organs and tissues.

Patmaterial . Pus, necrotic tissue, exudate, granulomatous tissue.

Microscopy . Mycelium, spores not divided into joints, appear in the ointment.

It is grown in Chapeka environment (Petri dish) at 25-30 °C. On the third day, fungal cultures form gray-white colonies in the form of felt tuftC. Later it changes to brown.

The causative agent of candidiasis is *Candida albicans* . *A* yeast-like fungus of the genus *Candida* . It is a facultative parasite that lives permanently in the mucous membranes of animals and causes candidiasis (molochnisa). The digestive tract is characterized by damage to the mucous layer, various organs and tissueC. Mostly birds are affected. Fewer calves, lambs, etc. young cattle get sick.

Patmaterial. Scrape is taken from the mouth, esophagus, goiter, layers.

Microscopy . Dyed (Gram, Sil-Nielsen), undyed drugs are considered. Many oval yeast cells are visible in unpainted grease.

Saburo agar, suslo-agar, grows in glucose GPAC. Seedlings are grown at 25-30 °C. Brinchi colonies grow on the 2-3rd day. In liquid media, *C.albicans form* rings and sedimentC. The pathogenicity of the culture is determined by placing biosinov in rabbits, guinea pigs, white mice. The culture suspension is injected intravenously. As a result, the fungus develops in all internal organC.

Control questions :

1. Distinguishing features of trichophytia and microsporia pathogens.
2. Obtaining patm material for examination for dermatomycoses.
3. Candidiasis, pathogens of aspergillosis, their cultivation.
4. Pathogenic properties of fungi belonging to the genus Candida.
5. In what nutrient media do fungi grow.

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_____ 2019.

"Laboratory diagnosis of leptospirosis."
laboratory work (2 hours)

PASSPORTS

M Purpose of the lesson: Diagnosis of leptospirosis in the laboratory learn methods.

Required equipment, reagents and instruments: leptospira culture, object, closed glasses, Pasteur pipettes, subject glasses, pat.material, agglutination leptospirosis serum, antigen, ready-made milk, microscope.

The following test methods are used to diagnose leptospirosis in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological
4. Serological

Books:

1. Shapulatova Z.J. Text of lectures on microbiology. Samarkand, 2017
2. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 y.
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. CHast 3, M.2007 g.
5. K islenko VN, Kolychev NM, Veterinary microbiology and immunology. Chast 1, Obshaya microbiology. M.2006 g.

Developers:

Docent **Shapulatova Z.J.**

Assistant **Ruzikulova U.X.**

Topic: Laboratory diagnosis of leptospirosis.

Leptospira cause zooanthropozonosiC. Leptospirosis affects many species of animals, as well as humanC. In animals, the disease is manifested by short-term fever, hematuria, anemia, jaundice, hemoglobinuria, hemorrhagic diathesis, necrosis of mucous membranes and skin, atony of the digestive organs, sometimes abortion, stillbirth or stillbirth ladi. Natural hearth disease. According to the current classification , the *genus* Leptospira (*lepto*- nosic, *spira*- spiral) is divided into two groups: pathogenic for animals and humans (*L. interrogans*) and saprophytic (*L. biflexa*). Pathogenic leptospira consist of 25 serological groups and include more than 180 serological variants , of which the following serogroups are found in farm animals - Pomona, Grippotyphosa, Tarassovi, Icterohaemorrhagiae, Hebdomadis, Canicola, Kazakhstan.

Pathological material. 5-10 ml of blood, urine, aborted fetus is sent from a sick animal . Urine is taken in the morning before feeding hay.

Patmaterial should be tested in the laboratory no later than 6 hours (10-12 hours if stored in the refrigerator).

Diagnosis is made by bacteriological and serological methods.

Microscopy. Leptospira react poorly to dye. They are tested by the crushed drop method, in a darkened condenser. Leptospira are a slender, mobile filamentous organism in a spiral shape, straight or *C*- shaped . Length 5-20 microns, diameter 0.1-0.2 microns, the ends are bent in the form of loopC. Leptospira move through fibrilC. Grammanfiy is pinkish-purple when dyed for 48 hours in the Ramonovsky Gimza method. Luminescent microscopy uses a special fluorescent globulin of leptospirosis.

If leptospira are detected on microscopic examination, this may be limited to the diagnosiC. Leptospira move through two long, thin threads located on the body axis and a cytoplasmic spiral twisted into them like a screw. There are 12-18 primary twists that stick together. The first twists of the spiral are very small and stick tightly together. Depending on the shape and size of the twists, leptospira can be in the form of the letters C, S, X, sometimes the number 8. The ends of the leptospira are bent in the form of loopC. But loopless forms are also common. Some have rounded, thickened tipC. The cell length is 7–15 μm, (30 μm and longer) occurs 0.1–0.25 μm wide. The body consists of a bullet strip, a cytoplasmic cylinder, transverse rings, and a multilayered shell. It has microfibrils on it. The nucleoid is eccentrically located. Does not form spores and sporeC. Active mobility is one of the diagnostic signs of microorganisms of the *genus Leptospira* . It does not dye well with ordinary aniline dyeC. Of the special methods, the Romanovsky Gimza method is dyed pink-blue after 48 hourC.

Bacteriology. Leptospira are not always isolated from patmaterial in nutrient media. Leptospira are facultative aerobes, chemogeteroorganotrophs, the optimal growth temperature is -28-30 ^{0}C, pH 7.2-7.4. Leptospira do not grow in normal nutrient media. Grows in special nutrient environments containing 5-

10% rabbit or ram serum: Ulengut, Eorski, Fervolt-Voloff, Korthaf, Terskix, Lyuboshenko environmentC. In dense nutrient media, leptospira form S-, O-, and R-shaped colonies that resemble a dull, clear, or semi-transparent homogeneous disc, and in liquid nutrient media, turbidity occurs after 7–20 dayC. The presence of leptospira in the medium is determined by microscopy. Propagated by transverse division. In this case, the cell center becomes thinner and splits in two. Division results from the active movement of two daughter cellC. Most cultures die after 7 to 20 days, sometimes less than 3 to 5 days, and after 1 to 2 months or more.

Biosinov. With its help, leptospira can even be separated from the soil. Biosinov is laid in 20–30-day-old golden rabbits, 10–20-day-old young rabbits, 3–5-week-old young guinea pigC. Patmateri hand suspension is administered subcutaneously or intra-abdominally in a dose of 0.5-1 ml for rabbits, 2-3 ml for rabbits, 1-2 ml for guinea pigC. At 3-5 days of fever, blood is taken from the ear or heart, examined microscopically, and cultured in nutrient media. If the infected animals do not die, they can be killed and examined on the 14th or 16th day. Their serum is tested in a microagglutination reaction with 13 serogroup leptospira. A positive result at a ratio of 1:10 and above indicates the presence of leptospira in the test material.

The heart, liver, and kidneys of dead laboratory animals are transplanted into nutrient media.

Guinea pigs die only
when *infested* with *L.icterohaemorrhagiae* . *Serological testing* is based on the detection of specific antibodies in animal serum in microagglutination (MAR) and macroagglutination reaction (AR). Serological diagnosis of leptospirosis includes general and individual (individual) examinationC. The diagnostic field of immunological examinations includes animals with different immune status: infected, sick, diseased, immune, immunized as a result of immunosuppressive subinfection, healthy, so the results are difficult to interpret.

Blood serum from sick animals is taken twice a day, 5-7 days, 7-10 dayC. Freshly obtained, dried on filter paper, canned (with phenol or boric acid) whey is used for the reaction.

RMA. the whey is diluted in a ratio of 1:50, 1: 100, 1: 1250. The reaction is placed on slotted plateC. From each diluted whey, 6 separate rows of 0.1 ml are infused into 3 cavities (depending on the number of antigens). Pour 0.1 ml of each of the 6 leptospira cultures into 3 cavities over the whey and mix until the whey is diluted 1: 100, 1: 500, 1: 2500. Gently shake the plate and place in a thermostat at 30 ^{0}C for 1 hour. Simultaneous control: 0.1 ml of culture +0.1 ml of saline. The result is determined by preparing the drug in the form of crushed drops and examining it under a microscope. Agglutination in all diluted whey is positive if it is estimated at 4.3.2 pluC. In addition to the control reaction.

The macroagglutination reaction - AR - is **applied dropwise** to the subject **glass** . 0.04 ml of each diluted whey or whey itself + one drop of antigen is

mixed with a glass rod or shaken. The reaction is accounted for for 10 min. Agglutination is positive for 4, 3, 2 plus, negative for one plus.

BiopreparationC. Special prevention and treatment of leptospirosis in farm animals was first developed by S.Ya. Lyuboshenko (1941) and applied in veterinary practice. For active immunization, two different variants of the polyvalent phenol vaccine against leptospirosis in farm and game animals and the depolarized polyvalent VGNKI vaccine are used. In the first variant, leptospira have groups of pomona, tarassovi, ichthegemorrhagia, and canikola. Dogs and pigs are vaccinated with it. The second variant has 4 main serovars of pomona, tarassovi, influenza, and gebdo madiC. Large and small horned cattle are vaccinated with it. Immunity appears after 14–20 days and persists for 6 months in young animals and up to 1 year in adults.

Control questions:

1. The rule of obtaining patmaterial for testing for leptospirosis and sending it to the laboratory.
2. Morphological, tinctorial cultural features of the causative agent of leptospirosis.
3. Methods of serological testing of leptospirosis.
4. Name the antigen used for serological tests.

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_____ 2020.

"Laboratory diagnosis of bacterial diseases of fish."
laboratory work (2 hours)

PASSPORTS

M Objective : To diagnose bacterial diseases of fish
learn methods.

Required equipment, jet and instrumentation: microbial culture, subject, closed glasses, Pasteur pipettes, subject glasses, pat.material, microscope.

The following test methods are used to diagnose bacterial diseases of fish in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological
4. Serological

Books:

1. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013
2. PSKhaqberdiyev, FIQurbanov, V.Sh.Karshiyeva "Fish and bee diseases" textbook. Tashkent 2016 Navruz Publishing House
3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 268 p
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. Chast 3. Chastnaya microbiology. M.2007 g.

Developers:

Docent **Shapulatova Z.J.**
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Pseudomonas aeruginosa is an infectious disease of fish characterized by the development of a septic process, general water accumulation, shedding of coins, and source bleeding in the skin and finC. The disease occurs in water bodies of China, Israel, Western and Eastern European countries.

The causative agent is a bacterium belonging to the genus Pseudomonas: P.Syprinsepticum, P.nov species, P.capsulata. P.Syprinsepticum - motile, monotrixial, gram-negative, rod-shaped, 1-2mkm long, 0.5-0.7mm wide, does not form spores, forms a capsule in the blood. In GPB, the stimulus slightly obscures the environment, creating muar waveC. On average on the 3rd day of growth in GPA the colonies reach 1.5–2 mm in diameter, are semi-transparent, the sides are convex and the surface is smooth.

Epizootiological data show that pseudomonas infects carp, carp, their hybrids, silverfish, ala forehead, white forehead, fish from one year old to offspring. Outbreaks appear to be exacerbated during the second half of the winter, from January to March, and are characterized by mass extinctions of diseased fish. Mortality of young fish is 30-40%, if the disease is in the acute course, all sick fish die.

The source of the disease is sick and diseased fish as well as wild fish.

Clinical signs of the disease. Sick fish are weakened, do not respond to external impressions, dust accumulates in the stream of water. Source shedding of skin coins and enlargement of the abdomen are observed. Coin shedding areas are dark green with dark green spots , dotted or source blood on various parts of the body, especially in the area of the jaw, chest and abdomen. flows are observed.

DiagnosiC. Put in a complex way. Epizootiological data, clinical signs, pathoanatomical changes, bacteriological examination are also based on bioprobe placement. Only live sick fish are taken for bacteriological examination. At least 5 fish were taken for each case. Blood, liver, spleen, kidneys are obtained from patmaterial and implanted in GPA and GPB larvae. Highlights from the clean mad pathogens and to determine immunogenik features biosinov. With each isolated culture, at least 10 healthy carp species of one-year-old or forehead fish from artificial farms are artificially infested. To do this, 0.1 ml of 2-day culture broth is sent and observed for 10–15 dayC. If 50% of the fish in the experiment die, the biosynthesis is considered positive.

Control questions:

1. How are fish diagnosed with bacterial diseases?
2. What are the symptoms of pseudomonas disease?
3. How is the final diagnosis of pseudomonas aeruginosa?

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_____ 2019.

"Laboratory diagnosis of mycological diseases of fish."
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning goal : mikologik fish disease diagnosis
learn methods.

Required equipment, jet and instrumentation: microbial culture, subject, closed glasses, Pasteur pipettes, subject glasses, pat.material, microscope.

The following test methods are used to diagnose mycological diseases of fish in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013
2. PSKhaqberdiyev, FIQurbanov, V.Sh.Karshiyeva "Fish and bee diseases" textbook. Tashkent 2016 Navruz Publishing House
3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 268 p
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. Chast 3. Chastnaya microbiology. M.2007 g.

Developers:

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Laboratory diagnosis of mycological diseases of fish

Diseases of fish caused by fungi are characterized by mass death among fish. It poses a very high risk, especially in the context of the intensification of the fishing industry. Although these diseases have been occurring in fish farms for a long time, they are still not well studied. An absolutely accurate method of diagnosis has not been developed, the epizootiology and pathogenesis of the disease have not been well studied, and effective measures to prevent and combat the disease have not been developed.

Diseases caused by bronchiomycosis, ichthyosporidiosis, and other fungi are widespread among fish fed in reservoirs and pose a major threat to fisheries.

Bronchiomycosis is a highly contagious disease of various species of fish, characterized by damage to the blood vessels in the jaw apparatus and necrosis of the jaw tissue. The disease occurs in fishing ponds in Western Europe. Although we have not reported this disease, there is a risk of its occurrence. It is found in several regions of the former Soviet Union, Ukraine and Russia.

Etiology. The causative agent of bronchiomycosis in carp, carp and their hybrids, carp, peskar species is Bronchiomyces sanguinis Br sanguinis - this is a specific blood parasite. The gifs of the fungi (egg-like pupae inside) are strongly branched, 8-30 μm thick and 10-15 μm long.

They are bud-shaped, usually thin, and thicken when they form sporeC. Strongly branched gifs are located only in the blood vessels of the jaw and in the compartments of the jaw and in the folds of the respiratory organ. The mycelium of the B demigrans fungus consists of tree-branched hyphae, the bark is in the form of a thick double-contoured membrane, 0.5-0.7 μm thick,

In the final stage of development it extends to 22-28 micronC. The width of the gif is 13-15 μm. The hyphae first enter the capillaries in the respiratory layers, and then the vein, which, as a result of its rupture, enters the connective tissue of the jaw and continues to grow there.

Epizootiological data. The causative agent of bronchiomycosis is widespread in nature. However, the epizootic and enzootic appearance of this disease is not recorded in natural water bodieC. The disease occurs mainly among fish fertilized in artificial ponds, which have favorable conditions for the development of the pathogen in such pondC. This is primarily due to the unsanitary condition of the pools and reservoirs and the very low level of veterinary-sanitary culture.

Epizootic and enzootic manifestations of the disease are observed in summer, when the water temperature is + 22 + 25 ^{0}C. Carp, carp and their hybrids, carp, pescars are prone to the disease. All ages of the above fish are prone to disease, but 1-2 year olds are more susceptible. The disease is severe and the mortality rate is 46-71%. The main sources of infection are sick fish, carcasses of fish that have died from the disease, and parasite-carrying fish. Damage occurs through mud in

the pool. Pathogens are transmitted from one body of water to another through sick fish, or through diseased fish, or through the waters of unhealthy farms.

Feeding fish with malnutrition, low water flow, lack of water, and excessive contamination of water bodies with organic matter also contribute to the onset and progression of the disease.

Clinical signs of the disease. The disease is very severe. The epizootic manifestation of the disease is more often observed in the summer and lasts 5-12 days, depending on the temperature of the external environment, that is, there is an acute flow. At the beginning of the disease, punctate hemorrhages are observed when B. Sanquinis fungus enters the blood vessels of the jaw chambers, then the fungal hyphae grow inside the jaw blood vessel, causing its filling (parasitic embolism) and circulatory disorderC. as a result, the blood supply to some parts of the jaw tissue deteriorates, turning white. Some parts die (die) and the corners of the jaw remain uneven. Other parts of the jaw become bluish as blood collects in the arteries.

Sick fish do not receive food, their response to external environmental impressions is sharply reduced or do not respond at all, they float to the surface of the water but do not receive air, just like ‘zamor’ and it is much easier to catch fish by hand. Strongly damaged fish lie on their side and die in this position. The cost reaches 50-70%. In undead fish, the disease is semi-acute or chronic. The suffering of a sick and healed fish is like being eaten. Its recovery will take yearC.

PathogenesiC. The overgrown hyphae of the fungus clog the blood vessels, resulting in disruption of blood supply and oxygen exchange to the tissues, destruction of necrotic jaw tissue, and favorable conditions for the development of secondary saprophytic microbes and fungi. The fungal hyphae in all internal parenchymal organs, including the blood-forming organs, enter the bloodstream and cause the disease to progress further, leading to the death of the fish.

Pathoanatomical changeC. Gifs and spores of fungi are best seen when the carcasses of dead fish are dissected and histological specimens prepared from the gills are examined. The blood vessels are hyperemic, filled with fungal gifs, the blood vessels in the respiratory layers are sausage-like, its walls and epithelial tissue are ruptured. The tissues of the parenchymal organs are filled with blood , and the layer of fat and glycogen is thin.

Diagnosis is based on a complex method: epizootiological data should be taken into account, depending on the clinical signs and microscopic examination of the dead fish from the disease, based on the detection of fungal hyphae and sporeC. We need to differentiate bronchiomycosis from the “zamor” disease of fish. In bronchiomycosis, the head of the diseased fish is directed underwater.

No treatment methods have been developed.

2. Nephromycosis is an infectious disease of both carp and carp (zolotyx) fish, caused by infection of the fish kidneys with fibrous fungi, characterized by the mass death of diseased fish. This fungus belongs to the genus NephromyceC. The disease was first found in the early twentieth century in carp species aged 5-6

years, and later in carp species in water bodies of Western European countrieC. We do not have this disease, but there is a risk of it coming from other countries, so we must focus on preventing the spread of infection in our country.

Etiology. The causative agent is a fungus of the genus Nephromyces pisceium (plehn) belonging to the genus Nephromyces in the form of a thread. Gifs of the fungus (mycelium) are strongly branched, 1.5-3 nm in width. Gelatin made from fish broth grows well in a nutrient medium.

Epizootiological data. The ways in which fish are infected and the spread of the disease are poorly understood. Yarn fungi are more resistant to external environmental conditions and have the ability to maintain their viability for a long time.

PathogenesiC. Depending on the location of the numerous branching filaments of the fungus, it can be said that the infection begins in the urinary tract of the kidney and surrounds the lymphoid (hemapoetic) tissue. The growth and development of fungi begins in the urethra, where fungi enter through the external foramen, where they grow and pass into the anterior part of the kidney, as well as into the connective tissue of the kidney. . The urethra, which contains a large number of mucous cells and epithelium, is not affected by infection, but fungi grow in very small, small tubeC. In the interstitial tissues, especially in the decayed tissues, the fungi form brown, thick-walled spores-onidia.

Clinical signC. Sick fish are weak, loose, move slowly, respond weakly to the impressions of the external environment. Affected kidney function is impaired, there are signs of water retention in the body, the abdomen is enlarged, exophthalmia, and in some fish the coins in the body become dry and detached from the body.

Pathoanatomical changes . The kidneys are enlarged, white-blue in color, the back of the kidney is severely damaged.

DiagnosiC. In a complex way: based on epizootiological data, clinical signs and pathological changeC. In the laboratory, microscopic examination and sometimes a bioprobe are performed. To do this, a culture of the fungus is sent to the bladder of healthy fish. Symptoms of the disease appear after 4 weeks.

No treatment has been developed

Control questions

1. Give examples of myological diseases of fish
2. How is mycological diseases of fish diagnosed?
3. How is the final diagnosis of mycological diseases?

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_____ 2020.

"Laboratory diagnosis of bacterial diseases of bees."
laboratory work (2 hours)

PASSPORTS

THE purpose of the study is to study the laboratory diagnosis of bacterial diseases of bees.

Required equipment, jet and instrumentation: microbial culture, subject, closed glasses, Pasteur pipettes, subject glasses, pat.material, microscope.

The following test methods are used to diagnose bacterial diseases of bees in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013

2. PSKhaqberdiyev, FIQurbanov, V.Sh.Karshiyeva "Fish and bee diseases" textbook. Tashkent 2016 Navruz Publishing House

3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 268 p

4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. Chast 3. Chastnaya microbiology. M.2007 g.

Developers:

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Assistant **Ruzikulova U.X.**

American rot disease is an infectious disease of the bee family, caused by Batsillus larvae, which is characterized by the weakening and death of bee larvae during the fungal period.

The causative agent. Bacillus larvae are straight rods, 2-5 μm long and 0.5-0.7 μm wide. Bacillus larvae is a type of gram-negative microbe that stains well in ordinary dyes, forming spores that come in 1.2-1.8x0.6-0 microns.

Diagnosis and differential diagnosiC. External signs of the disease and pathological material are examined in the laboratory and based on its results.

The wax cells are in a blackened, perforated, and incised state, and the presence of sick, dead, and rotten larvae among the healthy offspring is diagnosed based on the presence of an odor similar to that of carpenter's emine from the adhesive mass.

When a swab is prepared from rotten larvae and examined under a microscope, a long filamentous Bacillus larvae microbe or small round spores can be seen.

For laboratory testing, most patients separate the larval wax needles, take a piece of 10x15 cm from it, and put all the copies in a box without wrapping them in paper. Copies are placed on the bottom and sides, on top of which is placed a wooden film so that it does not touch the box. A paper with the name of the family taken on each sample is hung. At the same time an appendix and a letter are drawn up, which indicate the name of the organization or the owner of the bee, surname, name, patronymic, address, date of receipt of pathological material, time of diagnosis, number of sick familieC. An appendix letter signed by a veterinarian will be sent to the veterinary laboratory immediately.

American putrefaction must be distinguished from European putrefaction . Larvae affected by European rot disease are yellow, lose their elasticity, and are in a dull state. The dead larvae are first yellow, then dry and dark. If the adhesive mass does not stretch, additional bacteriological and serological tests should be performed on suspicion of mixed infections.

Treatment, prevention and control measures . Therapeutic juice (feed) is prepared to treat the disease. To do this, take 2 parts sugar and 1 part water. First, the water is boiled and mixed with sugar until boiling. Then it is cooled to 30 degrees and dissolved in each liter of syrup by adding the following drugs: Biomycin -500 thousand TB, neomycin, erythromycin, oxytetracycline, 400 thousand TB of tetracyclines, norsulfazole sodium -1 g, sulfantrol - 2 g.

At the end of the day, ready-made treatment syrup for sick bee families is poured into each beehive in an amount of 100–150 ml. The treatment is repeated every 5–7 days, until the bee family is completely healed.

At the same time, beehives are well heated, holes in the hives are closed, and the number of holes through which bees enter and leave is reduced.

Healthy beehives should be protected from pathogens, equipment in beehives should be systematically disinfected and kept clean, and the use of equipment in other beehives without disinfection is prohibited.

In case of disease, all bee colonies in beehives are examined, sick families are separated, from which the larvae are sampled from infected beehives and sent to the laboratory for examination. Quarantine will be installed in beehives.

If the disease has spread to more families, sick families are transferred to new healthy, decontaminated nests and treated. Bees are moved at the end of the day when the flight of bees is reduced, when the thief has no risk of bees entering and leaving. The bees are knocked down on paper and directed to the new beehives using smoke. Once the bees have been moved, the papers are burned, and the loose waxes are quickly removed from the application. A week later, artificial beehives made of pure wax needles are placed, and the queen bees are replaced.

European rot disease is an infectious disease of bee families, which is caused by Streptococcus plutonium microbes and is characterized by the death of 3-4-day-old offspring of bees from the eggC.

The onset of the disease is caused by factors that weaken the bee family, such as cloudy, humid weather, cold weather in beehives, lack of food.

The causative agent of the disease . The causative agent is a gram-negative streptococcus, which is called Streptococcus plutonium. European rot disease is complicated by secondary infectionC. These include Batsillus alvei, Streptococcus apis, and others.

When drugs prepared from dead larval tissue are examined, the causative agents are lancet-shaped cocci, one by one, in pairs, located in a chain. Their size ranges from 0.7 to 1.5 microns, unevenly stained, in special environments, the temperature rises to +35 degrees pH and 6.6. Stroptococci form a capsule.

Diagnosis and differential diagnosiC. Diagnosis of healthy 3–6-day-old open-seeded larvae is based on the presence of a musty or rotten apple-like odor, lack of elongation of the mass, the larvae are located in different parts of the hive, the weak attachment of dried larval skin to the walls of the hive. heats up. Batsilus alvei spores can be found in ointments made from stinking moldy masses, and Streptococcus apis germs can be found in ointments made from the body of larvae that smell bad. Often mixed microflora can be encountered.

We need to be able to differentiate European putrefaction from American putrefaction.

Treatment, prevention, and control measures are similar to those of American rot.

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Docent_____
Shapulatova "____"
_____ 2020.

"Laboratory diagnosis of mycological diseases of bees."
laboratory work (2 hours)

PASSPORTS

M ashg'ulotning purpose: to study on bee diseases mikologik laboratory diagnostics.

Required equipment, jet and instrumentation: microbial culture, subject, closed glasses, Pasteur pipettes, subject glasses, pat.material, microscope.

The following test methods are used to diagnose mycological diseases of bees in the laboratory:

1. Microscopic
2. Bacteriological
3. Biological

Books:

1. Shapulatova Z.J. Textbook on microbiology (practical and laboratory classes). Tashkent, 2013
2. PSKhaqberdiyev, FIQurbanov, V.Sh.Karshiyeva "Fish and bee diseases" textbook. Tashkent 2016 Navruz Publishing House
3. Carter. G. R darla J. Wise Essentials of Veterinary Bacteriology And Mycology Sixth Edition 2004 268 p
4. K islenko VN, Kolychev NM, Suvorina OS Veterinary microbiology and immunology. Chast 3. Chastnaya microbiology. M.2007 g.

Developers:

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Laboratory diagnosis of mycological diseases of bees

PathogenC. Aspergillus flavus and Aspergillus niger fungi consist of mycelial and fetal (fruiting) body partC. The mycelium rises to the surface of the nutrient medium and forms a fetal-fruiting body, thickened to a height of 0.4–0.7 mm. Fetal bodies are almost round in shape and 30-40 μm in diameter. The surface of the fetal body is streaked with radial sperms in all directions, ending in a chain-shaped conidia or spores (exospores). Conodii (sporeC. Size 5x7 μm. Their body consists of a protoplasm surrounded by a bearded shell.The diameter of the fetal body of Aspergil fungus together with conidia reaches 90 μm.

Aspergillus fungi grow in all nutrient media, when the temperature is + 7- + 40 degrees (optimal temperature 20-35 degrees, pH 2.8-7.4 (optimal 3.1-4.0). The pathogens are severe aerobes, which are not affected by light in the growth of fungi. Aspergillus flavus colonies (clusters) are greenish-yellow in color and fine-grained, Aspergillus niger colonies are dark The pigments produced by fungi are insoluble in water.

Aspergillas produce toxins that affect heat-resistant nerve and muscle tissue. When these toxins are injected into the blood of warm-blooded animals, they first cause tremors and then death.

The pathogen is killed in 30 minutes when heated to 60 degrees, 2-5% phenol and 5% formalin solutions quickly kill the pathogen.

Diagnosis and differential diagnosiC. Diagnosis of the disease is based on the external signs of dead bees and adult bees, as well as on the basis of microscopic and mycological examinations.

I need to be able to differentiate aspergillosis from melanosis.

No treatment has been developed.

Disease prevention and control measureC. Beehives with bee colonies should be installed in dry and sunny placeC. It is advisable to keep strong families in boxes in shortened and well-heated nests.

In order to combat the disease, infected offspring from sick families are removed along with the hive and the beehives with the top fungus removed. Bee hives are transferred to other clean, dry and decontaminated hives with bees, all heated materials in the hives are renewed. The bee is provided with the required amount of pure honey for the family, and if there is no honey, it is fed with 67% sugar syrup. Strict adherence to the rules of personal hygiene is required in the fight against the disease. Beekeepers must wear wet bandages on their mouths and noses to prevent damage.

Control questions:

1. What are the mycological diseases of bees?
2. What are the clinical signs of aspergillosis?
3. How is aspergillosis diagnosed?

3.4 Learning materials for independent study

Topic 1. IMMUNOFLUORESSENCE REACTION

(Fluorescent antibody method).

The luminescence phenomenon underlies the method of fluorescent antibodieC. Its essence is that the atoms of some things absorb different energies (light, electricity, etc.) and go into an excited state, then return to their previous state and release the absorbed energy in the form of light radiation. . Luminescence is observed in the form of fluorescence or phosphorescence. Fluorescence is radiation that occurs during exposure to excitable light and stops when it is exhausted.

Phosphorescence is radiation that lasts for a long time, even when the excitation process is over.

Most substances in a living organism have their own fluorescence (it is called primary or autofluorescence), but their intensity is low. Substances that have primary intensive fluorescence properties and are used to impart fluorescence properties to non-fluorescent substances are called fluorochromes (fluorescent dyes). Such fluorescence is called secondary fluorescence. Fluorochromes are widely used in luminescent microscopy to process biological objects with weak primary fluorescence. The wavelength of fluorescent light is larger than that of excitation light. If the excitation light is blue, then the fluorescent light is green.

A fluorescent microscope uses a near-ultraviolet or blue-purple part of the spectrum to excite the fluorescence. Special microscopes are used for this purpose. Currently, ML-1, ML-2, ML-3, and Lumam series luminescent microscopes are used in laboratories (Figure 1). The fluorescent microscope is mounted on a sturdy table that does not move in the dark part of the room. Room ventilation should be good. If the current is 4 - 5 A during operation, the lamp will have full light power after 5-10 minuteC. Luminescent microscopy uses high-quality non-fluorescent immersion oil.

Virosophogy In practice, luminescent microscopy is used in two main ways: fluorochromization and the method of fluorescent antibodieC. Fluorochromization is the treatment of a drug with fluorochrome in order to increase the intensity and contrast of light in the drug. A special set of fluorochromes has now been produced. Their acridine and thiozil groups are widely used. A very small amount of aqueous solution of fluorochromes (1: 1000 to 1: 1000 000) is often used.

Preparations for fluorochromization can be prepared in two ways:

a)drip 1 - 2 drops of acridine orange working solution (1:10 000) on a new branded grease (organ, prepared from mucous membrane scraps) or damaged cell suspension and cover with a closed glasC. The drug is viewed under a fluorescent microscope for 10-20 minutes after preparation .

b) smeared ointments or pathological cell cultures obtained from pathological material (in a closed glass), fixed in 96 ° meat alcohol for 15-30 minutes, washed in a solution of Hanks, instilled in the drug 1 - 2 drops of acridine solution (1:10 000), 10 - 12 minutes later is checked by closing with a shutter window.

As a result, the DNA in the cell nucleus emits green light , while the RNA in the cytophase irradiates red or orange. For example,

In an adenovirus-preserving drug, its DNA is irradiated green in the nucleus in the form of granules of various sizeC. In a drug made from RNA-containing influenza virus, the viral material is present in the cell cytoplasm in the form of red granules.

To differentiate the origin of DNA or RNA (cellular or viral), drugs are treated with a 0.5% solution of RNA-aza or DNA-aza for 5 to 10 minutes or irradiated with ultraviolet light. As a result, the radiation of cellular DNA and RNA disappears immediately, while that of viruses lasts another 20-30 minutes.

The simple fluorochromization method is not complicated, but in most cases does not allow complete differentiation of pathogens.

Fluorescence antibody method (FAU), or immunofluorescence reaction (IFR). The principle of this method is that antibodies attached to fluorochrome retain the ability to bind specifically to a homologous antigen. The resulting antigen + antibody complex gives a characteristic radiation at the expense of fluorochrome in a fluorescent microscope. Hence, it is possible to observe the first phase of the serological reaction using IFR; along with the specificity of this method, the sensitivity is high.

Antibodies are derived from hyperimmune serums that are purified from heteroanthelial, highly active antiviralC. By separating the homogeneous fractions of whey, the antibodies in it are treated with fluorochrome. FITS - fluorescein isothiocyanate (green light) and RSX - rhodamine sulfochloride (red light) are used as fluorochrome. Antibodies marked with *fluorochrome* are called *mining yugat* .

It is recommended to store conjugates in hermetically sealed containers at temperatures of -20 C or lower. Conjugate can also be stored at 4 ° C by preserving with 1:10,000 thiomersal. Fluorescent serums and their globulin fractions remain active for a long time in the lyophilized state. Before using each batch of conjugate, its working solution is tested experimentally. To do this, the drugs are stained with a conjugate of different dilutions (of course, at a dilution 1 to 2 times higher and lower than indicated on the label of the drug), the highest dilution, which gives intensive radiation, is selected and doubled.

Preparation of the drug:

Grease, stamping, histological incision, and cell cultures are used for this method of examination. The subject glasses are thin, clean, degreased, colorless, non-scratched and stored in alcohol or alcohol-ether. Clean glasses should be passed through an alcohol flame and cooled before use. The subject is written with a pencil in a specially prepared blurred area of the window. Branded ointments are made from the organs and tissues where the virus can accumulate the most.

The finished greases are air-dried, then fixed, and stored in the refrigerator until inspection begins.

For viral antigens, pure acetone cooled to -10 - 15 ° C is a good fixative, methyl alcohol can also be used. The drugs are fixed for 10 -20 minuteC. The

duration and temperature of fixation depend on the type of viruC. In very dangerous diseases, the fixation time is prolonged. For example, when working with rabies virus, drug fixation should not be less than 4 hours.

There are two main methods of applying fluorescent antibodies: direct and indirect (Figure 2).

1. When using the ***direct method*** , fluorescent antibodies corresponding to each antigen are used to detect different viral antigenC. The drug is poured directly into the conjugate and stored in a humid chamber at 37 ° C for 20-60 minuteC. Some of our scientists, on the other hand, prefer to extend the time and store at 4 ° C. The drug is washed with a physiological solution (pH 7.2 - 7.5), dried in air, viewed under a microscope with a special immersion oil. The result is taken into account depending on the intensity and specificity of the object's radiation: (++++) - glows in a shiny, bright green color; (+++) - bright green radiation; (++) - weak, yellow - green radiation; (+) -Very weak radiation in indistinct color; (-) - the object does not radiate. For control, of course, there is no virus to be sought, preparations prepared from the organs of healthy animals are taken and treated in the same way.

The direct method allows the detection and differentiation of antigen.

2. Indirectly, the antigen is first treated with homologous non-fluorescent antibodies (stage 1).

An antigen + antibody complex is formed, fluorescent serum is used against the animal species from which the homologous antibody was obtained (step 2). For example, if antibodies derived from chickens are used, then fluorochrome-marked antibodies against chicken globulins are used.

Homologous non-fluorescent serum or gamma globulin is infused into the fixative in this method and allowed to stand at 37 ^{0}C for 30 min . Unbound antibodies are washed away. The drug is poured into a conjugate with antibodies against the type and stored in a humid chamber at 37 ^{0}C for 20-60 minutes . The drug is washed with a physiological solution (pH 7.2 - 7.5), dried in air, viewed under a microscope with a special immersion oil.

The drug is poured into a conjugate with antibodies against the type and stored in a humid chamber at 37 ^{0}C for 20-60 minutes . The drug is washed with saline solution (pH 7.2 - 7.5), dried in air, viewed under a microscope with a special immersion oil.

Direct FAU detection of rabies virus antigen in cell culture (a, b, c, g) and in a marked drug from infected mouse brain (d, ye) Indirect method has a number of advantageC. It is used not only to detect antigen but also to detect and titrate antibodieC. The sensitivity of this method is several times stronger than the direct method. Because each molecule of the antigen binds more than one molecule of the antibody. Antibodies bound to the antigen being tested are, in turn, antigens for fluorescent antiglobulins, which bind more. In addition, this method uses a single fluorescent serum to detect different viral antigenC. Lyophilized conjugates produced in the biofactory are dissolved in 1 or 0.5 ml of distilled water. The

ampoule is then diluted with saline to the level indicated on the label. The melted conjugate can be stored at 2 - 4 ° C for 1 to 2 months.

Several modifications of the indirect method have been developed. The method with the participation of complement is of great importance. Its essence is that the drug is first treated with inactivated non-fluorescent special serum and guinea pig supplement, and then infused with fluorescent anticomplementary serum to determine the antigen + antibody + complement complex. This method is more sensitive than the previous one and only one fluorescent anticomplementary serum is needed to detect different viral antigenC. Both variants of the indirect method are used to detect and differentiate antigen, to detect and titrate specific antibodieC. In this method, the diagnosis of viral infections is simple and quick. FAU allows to study the morphology of the process of interaction of the virus with cells, the dynamics of accumulation of viral antigens in the cell, the pathogenesis of viral infectionC. It is especially important in the study of mixed and chronic infectionC.

FAU is an express method of diagnosis because it allows the detection of the least amount of antigen in a short time (several hours). However, FAU sometimes also gives unsatisfactory results in laboratory diagnosticC. It is difficult to indicate the degree of specificity of the reaction. The cause of nonspecific reactions has not been fully elucidated. It was determined that: 1) the presence of fluorochrome, which does not combine with proteins in the conjugate; 2) the presence of heterogeneous antibodies in the conjugate; 3) nonspecific adsorption of proteins defined in the drug.

Topic 2. FOOD ENVIRONMENTS USED FOR THE GROWTH OF ANAEROBIC MICROBES, THEIR PREPARATION

Meat broth. The meat of a large horned animal, horse or other animal is separated from the bones, fat, stakes, passed through a meat grinder, pour two or four times the amount of tap water and boil for 1 hour. The liquid is filtered through a sieve or cotton, then through a filter paper. Measure the filtrate and add distilled water to the previous volume. Or pour two or four times the amount of distilled water over the meat removed from the meat grinder, mix well and leave in a cool place for a day. The next day the floor is squeezed, and the water is boiled for 30 minutes and filtered. Pour the filtrate into 3-5 liter butyls and sterilize at 120 ° for 30-40 minutes,

Fermented broth. To 1 kg of minced meat (more horse meat is used) pour 2 1 water and heated to 40 °. Add 4 g of bread or brewer's yeast (cirojja) and put in a thermostat (37 C) overnight. The minced meat is then squeezed, and the broth is boiled for 30 minutes, filtered, and sterilized.

Meat peptone broth (GPB). 1% peptone 0.5% chemically pure salt and 10% water are added to the broth (it evaporates when boiled). Boil until the peptone meltC. When hot, the pH of the broth is determined (normalized with a desinormal

solution of caustic soda or baking soda) pH *7.2-7.4.* In a strong alkaline reaction, as well as when prepared from frozen meat, the broth becomes dull. After the addition of alkali, the broth is boiled for another 15-20 minutes and filtered through a layer of filter paper soaked in distilled water. The filtrate should be clear, transparent, yellow-straw color.

The broth is poured into sterile, dry test tubes or flasks and immediately sterilized in an autoclave at 120 ° C for 15–20 min. If the broth is sterilized in large butyls, the sterilization time is extended.

Meat peptone agar (GPA). 1 1 Add 10 g of peptone and 5 g of chemically pure salt to the broth and boil for 30 minutes (until the proteins are completely precipitated), the pH is determined and filtered, 30 g of a good variety of Arkhangelsk agar is added (Odessaniki). if 60 r), is heated until completely dissolved and the reaction is determined. The hot hoda is filtered through a cotton swab or gauze and poured into clear test medium tubes or vialC. Sterilize at 120 ° for 15–30 minutes.

At present, ready-made dry food environments are produced at special enterpriseC. Such environments take less time to prepare them and make the job easier. All dry media are removed in powder form and stored as indicated on the label, and nutrient media are prepared (e.g. GPB, GPA, etc.).

Liver broth. The liver, cut into small pieces, is boiled in tap water in a ratio of 1: 2 for 30 minutes, then filtered, and the resulting liver juice is mixed with an equal amount of marten peptone. Adding 0.5% (chlorine to sodium) to it, pH 7.6-7.8 is determined, filtered, poured into a test tube (vial) with liver fragments, poured Vaseline oil on top. Sterilize at 1 atm (121 °) for 30 minutes.

Kitt-Tarossi nutrient medium (meat peptone liver broth). Fresh or frozen liver, preferably beef liver, is cut into pieces, pour an equal amount of tap water and boil for 1 hour. The extract is filtered with a cotton swab and mixed well by adding GPB in a ratio of 1: 3 (1 part to liver extract: 3 parts GPB). The mixture is heated to boiling and sterilized for 11, salt (l, 25g 1 1 to the nutrient medium) is added and pH 7.6-7.8 is determined. After boiling the broth for 15 minutes, it is filtered through a sieve or damp cotton. Then the solutions are filled with finely chopped liver pieces of 1.5–2 g (100 g of liver per 1 liter of broth) and filtered broth (10 ml), on top of which is poured Vaseline oil (0.5 ml). Sterilize at 20 ° for 30 minuteC. Its sterility is then checked by keeping it in a thermostat for 3 dayC. If the finished nutrient medium is not used within 5 days, it is then regenerated before use.

Glucose-blooded Seyssler agar. Pour 3% GPA (pH 7.2–7.4) into 100 ml flasks and sterilize at 1 atm for 30 min. When necessary, dissolve the agar in the flask in a boiling water bath, cool to 48 ° C and add 2% glucose: 10 ml of sterile 20% glucose solution or 5 ml of 40% glucose solution (medical glucose in ampoules can be used) and 15 -20 ml of sterile, fibrin-derived horse, sheep or cattle blood is added. The mixture should be mixed carefully so that no foam

appears in it. The nutrient medium is poured into Petri dishes and placed in a thermostat for 4-6 hours to allow it to dry slightly after solidification.

Blood taken from fibrin can be prepared in advance, but not more than 15 days in advance. Pour it into sterile flasks of 15–20 ml and store in refrigerator. Prepare a 20% glucose solution in advance, pour into 15-20 ml flasks and sterilize at 0.5 atm for 20 minutes.

This is the difference between Fortner blood-glucose agar and Seysller nutrient medium. 5-7% rabbit blood is added to it.

Whey-glucose agar. Dissolved and cooled to 48 ° GPA (pH -7.2–7.4), sterile 2% glucose and 5–20% sterile clear ram blood serum (horse or large horned cattle) are added. For example, 10 ml of 20% sterile glucose solution and 15-20 ml of sterile serum are added to 100 ml of agar. This mixture is poured into Petri dishes or test tubeC. Pour into petri dishes, it is preferable to use the frozen agar slightly dried at 37 ° C. This nutrient medium is *conducive* to the growth of *B.necrophorum* .

Topic 3. BACTERIOPHAGES (VIRUSES OF BACTERIA).

Bakterofaglar (the word "bacteria" and grekchadan *phagos* eat) into the bacteria out of them until bacteria cells (lysis) parasitic viruseC. NFGamaleya, one of the founders of microbiology, first observed the spontaneous lysis of anthrax bacteria in 1989. In 1915, the British bacteriologist F. Tuort described the ability of staphylococcal filters to dissolve a new culture of these bacteria. However, only the French scientist FDErel (1917) correctly assessed this condition by separating the filtered solvent agent from the feces of those with gina dysentery. When the solvent agent (fecal filtrate) was added to the broth culture of the dysentery bacterium, the turbid medium was completely clarified.

FDErel concluded that the solvent agent he discovered was a bacterial virus and called it a “bacteriophage” —a bacterial eater.

Bacteriophages are very common: they are present in many bacteria. as well as other microorganisms, such as fungi, found in actinomyceteC. Therefore, they were broadly referred to simply as phageC. Phages are called by the name of the microbes they secrete: coliphages, staphylophages, actinophages, microphages, etc.

Hence, the size of bacteriophages is very small (10–350 nm), characterized by rigid obligate parasitism with specific antigenic propertieC. The parasitism of bacteriophages is manifested only in a homologous bacterial culture for the young phage. Bacteriophages can be distinguished from various materials (stagnant water, wound secretions, animal and human feces, soil) that contain live microbes.

To separate the phage, the material being tested is filtered by bacteria. The filtrate is filled into the GPB in the tube and a certain type of bacteria is inoculated into it. Place in a thermostat at 37 ° C for 16–18 h, then re-filter the culture and examine the phage. To do this, 0.05 ml of thick bacterial suspension is inoculated into 10 ml of GPB, 0.1 ml of the filtrate being tested is added and placed in a thermostat. Every two hours, the growth rate of the culture (depending on the

turbidity of the medium) and the control (culture without filtrate) are checked against the GPB. In the first hour of growth, the culture grows in the experimental controlled solutions, and then the developing phage in the growing culture lyses the young culture, and in the solutions in which the filtrate is added, the broth becomes clear and the turbidity disappearC. In controlled solutions, turbidity is increased due to the growth of the culture.

Phage can also be detected in dense nutrient media. The microbial culture is inoculated evenly on the surface of the medium to the inclined GPA in the solution; dried and 1-2 drops are poured from the top so that the drop should flow over the seedling down. The culture is placed in a thermostat for 18–20 hourC. If the phage is homologous to the planted culture, no bacteria will grow in the trail of the droplet flowing, appearing in the corridor and bacteria growing around it.

Given the specificity of phages, they are used for diagnostic purposes, comparing bacterial cultures isolated from the material being examined. Special methods are used when necessary to determine the activity of the phage.

Cell reproduction of most bacteriophages causes it to lyse.

The practical application of bacteriophages is based on the fact that phages are specifically adapted to specific bacterial species (strains) and are manifested by bacterial cell damage (lysis). It is possible to identify and compare bacteria using a known (diagnostic) phage.

In addition, the biological industry produces therapeutic prophylactic bacteriophages.

Comparison of bacteria using phageC. Phages are used to identify the type of bacteria (anthrax, listeriosis) or the phage of a particular bacterial strain.

A dense nutrient medium is usually used to compare unknown bacterial cultures using diagnostic bacteriophage. For example, the 18-hour listeria culture under study was transplanted into glucose GPB, grown for 4 hours at 37 ° C. The medium is lightly turbid, then 0.1 ml is taken and inoculated into the dried 2% GPA in a Petri dish. After growing at 37 ° C for 1–1.5 h, slightly open the lid and instill one drop of 2A listeriosis bacteriophage on one side and 4A phage on the other side. Seedlings are grown for 16–24 hours at 22–25 ° C. Consider the result: if there is a culture of listeriosis, a clear lysis zone appears instead of at least one phage drop.

To detect phage, the culture is examined with a set of phage typeC. This kit contains all the phagovariants of a given bacterial specieC. This determines which phage is susceptible to a given strain and serves as its marker.

The method of increasing phage titers is used to compare microbes in environmental objects and to diagnose infectious diseaseC. This allows the pathogen to be detected directly, even if there is a foreign microflora in the material being examined. To do this, 10 times more GPB (pH 6.8-7.0) is placed on the test material (without preservatives), mixed with glass beads in a shutter for 5 minutes and placed in two test tubes of 9ml. To the first solution add 1 ml of clear titrated indicator phage at 1: 100, to the second - 1 ml of broth (to control the

presence of free phage), to the third solution (control of phage titration) - 9 ml of sterile GPB and 1 ml of phage. The solutions are placed in a thermostat at 37 ° C for 4-5 hourC. The presence of homologous phage microorganisms in the material increases the phage titer. The mixture in each solution is then diluted 100, 1000, and 10,000 times with broth at 58 ° C, heated in a water bath for 30 min, and examined by the method of agar layers of the indicator culture. The result is counted on phage colonies (spots) after 4-5 hours.

The result is positive if the phage titer in the experimental solution is 5 times higher than in the control.

It is recommended to use this method when inspecting water, soil, milk and other materials.

Topic 4. GROWTH OF MICROORGANISMS.

Microorganisms grown under laboratory conditions are called microbial cultureC. To obtain a culture, the test material (blood, tissue emulsion, edema fluid, pus, milk, etc.) is inoculated into sterile nutrient media in a test tube, tube, or petri dish and placed in a thermostat for a period of time. The thermostat maintains the required temperature (37-38 ° C; 26-30 ° C; 22-25 ° C) for different groups of microorganisms.

Equipment for the cultivation of microorganismC. The thermostat is a double-walled cabinet, covered with a heat-insulating material (plastic) on the outside. Thermostats can be watery or dry-air. In a water thermostat, water (usually distilled water) is poured between two walls, and in dry weather, the air circulating in it is heated due to the heating of the inner metal layer. The heated water or air provides heat to the inside of the cabinet through an internal metal wall.The thermostat is connected to the mains, at the bottom of which electric heaters are installed between the wallC. Inside the thermostat there are several lattice shelves, on which are placed tripods, baskets with test tubes, flasks, petri dishes, desiccators, microanaerostats.

The temperature is maintained in the thermostat using a thermostat. If the temperature exceeds the required, the thermostat automatically shuts off the heater, if it drops - turns it on. Thermoregulators can be bimetallic, “cushioned” and contact (symbolic).

The bimetallic thermostat consists of two mutually *welded* zinc and brass U-shaped bent plateC. One side of this plate is fixed to the inner wall of the thermostat so that it does not move ,

the second is a free, moving side that is very close to a terminal connected to the mains by an electrical contact. When the thermostat is heated, the zinc and brass plates slide the free side by the force of the expansion coefficient difference, stopping the thermostat from heating up. The temperature is controlled in the thermostat by pre-setting the terminal at a certain distance from the free plate of the thermostat.

The principle of action of *"cushion" thermostats is as* follows: the liquid is *welded* to a flat brass folded box, which is fixed with a special device that when

the temperature rises too much, the liquid in the box expands and puts pressure on its wallC. a power outage occurC. As the thermostat cools, the liquid in the continent also cools and does not put pressure on its walls (‘pads’), so the ‘pads’ touch the lever rod and it connects to the heating network.

Modern thermostats typically use *contact* thermostats - a symbolic thermometer with platinum wires welded on both sideC. One end of the wire comes to the thermometer channel and the other ends at the terminal at the outside. Using a wire external magnet, the thermometer is placed at different levels from the mercury column and the temperature is automatically maintained in the thermostat.

Desiccators and anaerostats are used to grow anaerobic and microaerophilic bacteria.

E xicator is a glass container with a tightly closed lid. At its bottom is placed an open Petri dish filled with a chemical that actively binds oxygen in the air (e.g., sodium hydroxide with pyrogallol). Above, a perforated porcelain plate (base) is placed on the bulging part of the existor, on which the inoculated test tube or cups are placed, and the lid is tightly closed. Vaseline is applied to the edges of the desiccator to seal hermetically, then placed in a thermostat.

An aerostat- hermetically sealed metal cylindrical vessel has taps and vacuum monometers to vent or supply the gas (CO_2, N_2, O_2, etc.) required for operation. By placing the implants inside the cylinder, the lid is closed and the air inside the desiccator is removed using a pump. The vacuum-monometer shows its position in millimeters of mercury (0 to 760). The anaerostat is placed in a thermostat with implants.

Microbial culture techniques.

Sut, yog ', salmon. silage, water, pus, are cultured in sterile nutrient media to obtain bacterial cultures from dead animal tissue. Of course, this process is done near the flame of a burning gas or alcohol lamp to prevent bacteria from falling from the outside during planting. Planting is carried out with a loop or pasteurized pipetteC. Each material submitted to the laboratory for testing is recorded in special journals.

Before sowing, the test number, the name of the microorganism and the date of sowing are written in a test tube (tube or Petri dish) with a special brush. If the microorganisms are grown in a dense nutrient medium, the bacteriological material for planting or preparation of the drug is obtained with a bacteriological loop or needle; sterile pipettes are used to remove cells from the liquid nutrient medium. The bacteriological loop is made of thin platinum wire, which is attached to a metal handle. The diameter of the bacteriological loop is 1.5-3 mm. The bacteriological **loop** (needle) is sterilized before removing the microorganism cellC. To do this, the wire is heated to the point where it is connected to the holder until it glows red in the flame of a burning gas or alcohol lamp. In this case, for a smooth sterilization, the loop is held vertically in the flame, then quickly placed in a container containing microorganisms.

In order not to damage the cells of microorganismC. the loop (needle) is cooled by touching the inner surface of the container or the microbial area of the nutrient medium, and only then is a small amount of microbial mass obtained.

The cells of microorganisms grown in a dense nutrient medium are obtained as follows: the culture solution is held in the left hand, the surface on which the microorganisms have grown in the nutrient medium should be facing upwards and should look good. The test tube is held horizontally or slightly tilted. In the right hand, the loop is held like a pencil, heated in a torch flame. Then, without releasing the loop, press the outside of the cotton-wrapped stopper with the palm of your hand with your small and nameless fingers, and the stopper is removed from the test tube. The edges of the open test tube are lightly heated over a flame, a sterile loop is inserted into the test tube, less microbial mass is obtained, and the loop is removed from the test tube. The edges of the test tube are again heated in a torch flame, then the inside of the cotton-wool stopper is also passed through the flame and the test tube is closed and placed on a stand.

The resulting material is used for drug preparation. The cells of the remaining microorganisms in the loop are burned in the flame of the burner.

Cells of microorganisms grown in a liquid nutrient medium are taken in a sterile pipette, in rare cases - in a loop. A sterile pipette is taken with the middle and thumbs of the right hand, holding a test tube (tube) of liquid medium in the left hand, and taking the above precautions, the pipette is sent to the liquid. A portion is removed from the medium and the test tube is closed with a stopper. The resulting sample is used for drug preparation or for planting in a new nutrient medium. The used pipette is then quickly immersed in a disinfectant solution (0.5-3% aqueous solution of chloramine or 3-5% aqueous solution of phenol) without touching the surrounding objects.

Inoculation of microorganism cells from one medium to another, two tubes in the left hand for replanting - one has a nutrient medium (away from you), the other - has a culture of microorganisms (close to yourself), a bacteriological loop is taken in the right hand. The loop is sterilized in the flame of the burner, then the test tubes are opened by pressing the caps of both test tubes into the palm of the right hand with the little and ring fingerC. With a bacteriological loop, the cells of the microorganisms are hung, and the loop is carried to a sterile nutrient medium almost to the bottom of the test tube; The loop is run with zigzag or straight (bar) linear movements upwardC. Planting with a needle is done in the same way, except that the needle is sent vertically into the nutrient medium.

For planting in liquid nutrient media, the tubes are held almost vertically so that the plugs do not touch the liquid and they do not get wet. The loop is filled with the cells of the microorganism into the correct nutrient medium.

All of the above processes are performed as quickly as possible near the burner flame (not in the flame!). This prevents foreign microorganisms from entering the culture. Rapid movement makes it impossible to walk next to a person

planting microorganisms, as air movement can lead to contamination of the culture.

When inoculated into liquid nutrient media (milk, GPB), the test tube is held in the left hand as in the preparation of ointments; The loop (or pipette) with the right hand planting material and the stoppers of the test tubes are removed. A loop (or pipette) from which a drop of material is taken near the burner flame is lightly immersed in the sterile medium in the test tube. Cover the test tube with a stopper, the loop is fired, and a pasteurized pipette is filled with a disinfectant solution (carbolic acid, lysol, farmalin). During operation, the liquid must not touch or spill on the test tube stopper. Ready-planted nutrient media are placed in a thermostat.

Z diarrhea, food, environment ekganda food crops cultures and sterile environment (GPA) above the surface of the tubes in the left hand (if inclined) toward gridlock flame burners placed in italicC. Carefully insert a loop into the culture or other material solution opened near the burner flame and lightly touch the test material to obtain a smaller amount (one drop) and transfer to a sterile nutrient solution. The loop is brought to the bottom of the test tube, immersed in the condensate liquid and rubbed upwards from the surface of the oblique agar in a zigzag motion. The test tube is held horizontally when planted vertically in a dense environment. Seedlings (test tubes) are placed in a thermostat to grow. After 16-18, 24-48 hours, the result is taken into account and the cultural properties of the bacteria are studied.

The growth of microorganisms in a liquid nutrient medium is manifested by uniform turbidity, sedimentation (in which case the medium becomes clear) due to the proliferation of bacterial cellC. Some species of microorganisms have a high demand for atmospheric oxygen, which grows on the surface of the liquid medium, forming a film, in which the broth does not become cloudy. In some cases, bacterial cultures simultaneously blur the environment, ko ' p forms a precipitate and forms a ring on the test tube wall.

In dense nutrient media, cultural characteristics are determined by the nature of the growing colony. When large numbers of bacterial cells are planted on the surface of the environment, the microbe spreads and growC. When fewer cells are planted on a wide surface of the nutrient medium, a separate colony is formed due to the division and multiplication of each bacterial cell. Depending on the diameter of the colony, they are large, small. may be dewy.

Colonies of many bacteria, actinomycetes, and fungal species can be stained different colors when grown in different nutrient media. This is characterized by the formation of their dye - pigment. If the pigment is soluble, the medium is completely stained, if insoluble, only the colony is stained. Different types of microorganisms are characterized by the formation of clear colors - tlla rahg, blue-green, white, yellow, red and hkpigment. Pigment formation is best manifested in dense nutrient media. Temperature is also important; 25-30 ° C is the optimum for most specieC. Air oxygen and light rays are also affected to some extent.

The cultural properties of microorganisms are discussed in more detail in the following topics (determination of cultural, biochemical properties of bacteria).

Topic 5. IMMUNOFERMENT METHOD OF SEROLOGICAL INSPECTION (ELISA TEST)

The immunoenzyme method is used to detect and compare microorganisms and antibodieC. There are two types of immunoenzyme method: homogeneous and heterogeneous.

Heterogeneous method (ELISA test with immunosorbent) and antibody (or antigen) reaction (ENAR) marked by the enzyme adsorbed on the surface of water-insoluble polymerase materials.

The solid (dense) phase is not used in the *homogeneous immunoenzyme method* ; mainly used to detect low molecular weight antigens (hormones, drugs).

Components of the dense phase immunoenzyme method:

l. Special immunoglobulins (immune serum is precipitated with ammonium sulfate and then purified).

2. Anti-type globulins (hyperimmune serum precipitated with ammonium sulfate and then purified).

3. Protein *A* (golden color is derived from staphylococcus) or bovine serum albumin.

4. Antigen (prepared from the organs of infected animals). Predetermined positive and negative antigens.

5. Peroxidase enzyme (derived from horseradish).

6. Conjugates (peroxidase bound to an antibody or antigen by periodic oxidation).

7. Substrate mixture (5-aminosalicylic acid and hydrogen peroxide or orthophenylindiamine and hydrogen peroxide).

8. Detergent (surfactants: twin-20, -80, newt X-300, sorbital S-20).

9. Immunological tablet (made of transparent polystyrene).

10. Syringe - dispenser (for infusion of peak ingredients).

11. There are direct and indirect ways to set up a reaction .

In practice, the indirect method is mainly used.

Determination of antigen by enzyme-linked immunosorbent assay.

Prior to setting the reaction, the lyophilized components are dissolved in 0.01 M phosphate buffer solution or distilled water in the volume indicated on the label and made up to the volume of the working solution. The components to be added step by step to the tablet cavities are in equal volumes, 0.1 ml.

Reaction steps:

l.Sensing the tablet. The working solution indicated on the label of specific antibodies (immunoglobulins) is poured into the tablet cavitieC. The tablet is soaked in antibody for three hours at 37 ° C or 18 hours at 4 ° C. The tablets are then washed 3-4 times with a solution of twin phosphate buffer. The residue of the solution is rubbed several times on the filter paper tablet.

2.Antigen injection. Controlled positive and negative antigens and a diluted test sample in a ratio of 1:10 to 1: 1280 are injected into tablet cavities sensitized with specific antibodies and incubated for 1 hour at 37 ° C in a thermostat. After the incubation period, the antigens that do not bind to the antibody in the tablet cavities are washed three times and dried on filter paper.

3. Transfusion of anti-type perosidase conjugate into the diluents to aniolate the antigen + antibody complex . After pouring the conjugate, the tablets are placed in a thermostat at 37 ° C for 1 hour. The grooves are then washed and dried three times with a twin phosphate buffer.

4. Pour the substrate mixture. A substrate solution (an indicator of peroxidase) - orthophenyldiamine - is poured into the tablet cavities to show the reaction . Solution of antigen + antibody to identify a set of kon'yugat 3% hydrogen peroxide solution. Cover the tablet and leave for 15-30 minutes at room temperature in a dark place.

5. The reaction is accounted for visually or spectrophotometrically. When the reaction is evaluated visually, it is represented by the number of intersections:

++++ - intensively painted; +++ - carrots painted in color; ++ - light carrot colored; + - painted yellow.

A sample rated for two or more targets is considered positive. At the highest dilution in the reaction with a specific antibody, the intensity of the tablet is higher than the color of the control holes, and if the light carrot is stained (++), the antigen titer. It is a coefficient of specificity in spectrophotometric accounting of reaction resultC. It is the ratio of the controlled positive antigen (OZ1) optical density (OZ) of the reaction products in the pores to the ratio of the controlled negative antigen (OZ2) optical density of the substrate mixture in the pores.

If the specificity coefficient is not less than 2, 1, the peak is positive, and if it is less than 2.1, it is negative.

The technique of placing an enzyme-linked immunosorbent assay for the detection (or titration) of antibodies is performed in the same way as the detection and comparison of a microbial antigen, the difference being that the test serum is used as the material.

Topic 6. STUDY OF GENETICS OF BACTERIA.

Gene probes method. It is often used to compare bacteria. This method differs from ordinary DNA - DNA hybridization in that it uses a specific fragment (probe) that contains a specific gene (genetic marker) rather than total DNA.

A "gene bank" of pre-tested bacteria is created. For this purpose, the bacterium dissolves DNA with endonucleases, DNA fragments are separated by electrophoresis, their genetic properties are determined by transformation , the desired fragment of DNA is extracted and inserted into the plasmid, which serves as a vector using ligaseC. The plasmid, integrated with a specific gene, is introduced into a sufficiently easy and easily growing bacterial strain. A large amount of DNA-probing biomass is obtained. Plasmid DNA is isolated and identified by a radioactive isotope, which is then hybridized with the DNA of the bacterium being tested. The method of autoradiography determines the relative frequency of hybridization of the marker with the DNA being tested, and by this indicator the genetic closeness of the specific bacterium - the DNA donor and the bacterium being tested - is considered.

Polymerase chain reaction - PCR (*polymerase chain reaction -PCR).* The principle of the reaction is that DNA polymerase synthesizes (amplifies) many copies of a certain part of DNA *in vitro* .

PCR is a cyclic process, each cycle consists of three stages.

1. Denature the test DNA at room temperature (95 ° C). In this case, the hydrogen bonds that bind the double bases are broken and the DNA chains break up, meaning that single-stranded DNA is formed, making it easier for primers to enter DNA polymeraseC. The duration of the process is 1 minute.

2. Transfer of primers to complementary parts of two antiparallel strands of DNA (softening). Primers are two synthetic oligonucleotides consisting of 20 to 30 nucleotideC. Each of them is complementary to the opposite DNA strands in the part of the bounded segments of the selected DNA. Hence, primers limit the part of DNA that is specific to the pathogen. Primers are added to the reaction mixture more than necessary, allowing them to occupy their complementary parts before the single-stranded DNA binds to the two strands (renaturation). The duration of the phase is 1 - 2 minutes.

3. The process of elongation of the primer from deoxynucleoside triphosphates added to the peak mixture in the presence of DNA - polymerase. Typically, a thermostable DNA polymerase of the thermophilic bacterium *Thermus aquaticus (Tag* - polymerase) is used, which allows polymerization to be carried out at optimal temperatures of 70 - 75 ° C. In DNA synthesis, primers are included in its molecule. DNA synthesis using polymerase takes place only between primerC. At the same time, the number of copies of the same part of DNA doubleC. A DNA molecule synthesized using one primer can serve as a matrix for complementary DNA synthesis using another primer. The duration of this step is 1 -2 minutes.

At the end of the first cycle, the reaction is stopped and the DNA is denatured again with temperature. When cooled, the excess primers are again hybridized with primary and newly synthesized DNA strandC. DNA provides a second cycle of polymerization when polymerase is added. Thus it is possible to carry out several dozen cycles of enzymatic prolongation of primerC. As a result,

the number of DNA segments bounded by primers on both sides increases exponentially in each cycle: Hence, using the PCR method, the *in vitro* drug can be enriched a million or more times in a specific sequence by selecting a DNA fragment. An increase in the number of DNA fragments proves the presence of homologous DNA, i.e., an infectious agent, in the sample being examined.

Complementary and copy to the three ends of the chain that replicates the copy of the DNA matrix for practical use of PCR. it is necessary to synthesize primers that limit the DNA fragments to be obtained. They are selected on the basis of nucleotide sequences of the genome of the pathogen genome are pasteurized and genetically modified. For example, selected primers based on genes encoding the outer membrane protein or based on genes encoding 16s rRNA have been proposed for *C. psittaci* comparison. The primer for brucellosis comparison was selected based on the gene encoding the outer membrane protein at 31 KDa, and so on.

PCR - the following components are required for diagnostics: aqueous solutions of four different types of deoxythrophosphates (dATF, dTTF, Dstf, 10 mM, pH 7.0); first primer (5 mM); second primer (5 mM); *Taq* - polymerase enzyme (5 TB / μl); amplified DNA (- 1 μg) Mg^{+2} ions (25 mM) to support polymerase activity; buffered solution (10-fold concentrate), for example, triple hydrochloric acid (pH 6.8 - 7.7) with the addition of bovine albumin and non-ionic detergents.

These components are, for example, added to the test tubes in the following quantitative proportions: deoxynucleoside triphosphates - 8 μl, buffer - 10 μl, amplified DNA - 1 μg, primers - from 1 to 5 μl; polymerase - 0.5 μl, distilled water - up to 100 μl. Mineral oil is poured over the liquid in the solution to prevent evaporation. In the first stage of PCR, DNA is denatured, then polymerase is added to the reaction mixture containing deoxynucleoside triphosphate and placed in an amplifier or thermosystem (programmable thermostat). Amplification is carried out in a program given in thermos, for example: 90 ° C - 1 minute, 60 ° C - 1 minute, 72 ° C - 1 minute (5 cycles), 93 ° C - 1 minute, 57 ° C - 1 minute, 92 ° C - 1 minute (5 cycles), 93 ° C - 1 minute, 55 ° C - 1 minute 72 ° C - 3 minutes (25 cycles).

After amplification, the stage of detection of PCR products, ie amplifiers, comeC. DNA molecules and their fragments are separated by electrophoresis in the gel. Gelda DNA is stained with ethidium bromide. then the foregrams are analyzed under ultraviolet light, the image is taken. The specificity of the amplified DNA strands is confirmed by comparison with the identified fragments and standard DNA. In addition, the specificity of the amplifiers can be confirmed by hybridization with a special radioactive probe.

Excitatory culture in PCR,. The tissue that contains the pathogen may be the object of inspection. DNA is extracted from the material in one way or another. Depending on the nature of the material, the methods of processing it will be different.

The success of PCR-diagnostics is great in finding bacteria that are difficult to identify or grow, or in non-typical forms (L-forms), as well as in identifying genes that control a pathogenic factor of a microorganism.

In daily diagnostic practice, it is usually limited to detecting the pathogenicity of microorganisms; in the evaluation of biopreparations quantitative characteristics of the virulence of the microorganism obtained for animal harm are required.

Topic 7. METHODS OF MICROBIOLOGICAL INSPECTION OF ENVIRONMENTAL OBJECTS

In order to determine the epizootic safety, the sanitary-hygienic condition of various objects of the environment is assessed and sanitary-bacteriological inspections are carried out. They are difficult to detect directly because the amount of these microorganisms increases slowly as the amount of water in the soil decreaseC. Therefore, in the practice of sanitary-microbiology is used the method of detecting microbial contamination of a particular object and finding bacteria with sanitary indications.

Microbial contamination is characterized by the total number of microorganisms in a given volume and mass unit of the object under test (1 cm3 of water, 1 g of soil, 1 m3 of air), ie the number of microbes.

Bacteria with sanitary indicators in them are evaluated in titers and indiceC. These bacteria are said to be the minimum volume or mass titer found. 1 liter of liquid, 1 kg of soil, 1 m3 of air is called the index of the number of bacteria in the sanitary index.

Bacteria of the group of intestinal rods, which are considered a sanitary indicator, belong to different generations of the family Enterobacteriaceae.

Sampling of water for sanitary bacteriological examination . Water samples from open water basins are taken at a depth of 10-15 cm from the surface and 10-15 cm above the bottom. To take a sample from a water pipe, first turn on its tap, drain the water for 10-15 minutes, then turn off the water. The tip of the tap is burned in a flame, and then the water is taken into 0.5-liter vialC. A sample is taken from the bottom of the water basin with a batometer. Water samples from the well are taken in the morning before use and 10-12 hours after the cessation of water abstraction from the well. Once the water samples are taken into a sterile container, they are tightly closed with stoppers.

Before testing chlorinated water, Na_2should be neutralized with $HSO_3$by adding 10 ml to 1 liter of water.

The time from sampling to bacteriological examination should not exceed 2 hours (can be stored at 1-1.5 C for up to 6 hours).

Determination of the total amount of microbes in water. The water sample taken from the water pipe is 1 ml, and those taken from open water basins - 1.0; 0.1; Obtained in volumes of 0.01 ml. For planting, 0.1 and 0.01 ml of water is diluted with the water being tested. To do this, 1 ml of water sample is added to 9

ml of sterile water in a test tube by lowering the pipette 3 mm below the water level. Another sterile pipette is known, inflated, mixed, and 1 ml is taken and placed in a Petri dish (0.1 ml of water sample is taken). Take 1 ral from the first solution and add 9 ml of sterile water to the second solution. Take 1 ml of it and pour it into a Petri dish (0.01 ml of water sample is taken). Pour 10-12 ml of dissolved GPA cooled to 45-50 ° C on all samples in Petri dishes and mix well with circular motion. Once the GPA has hardened, the Petri dishes are inverted and the seedlings are grown at 37 ° C for 1-2 dayC. Samples taken from open basins are planted in two Petri disheC. One row is grown at 37 ° C for one day and the rest at 20 ° C for 2 dayC. Then the colonies grown on their surface and inside are counted and the total number of microblamps in the water, i.e. the number of microorganisms in 1 ml of water, is calculated.

The total amount of microorganisms in 1 ml of tap water should not exceed 100, and in open basin water - not more than 1000.

Determination of coli-titer and coli-index of water. The coli-titer of water is the smallest volume (ml) of water that the intestinal rod encounters, and the coli-index is the amount of intestinal rods in 1 liter of water. The titration method and membrane filter methods are used to determine the coli-titer.

Vibration method. Water samples of different volumes are inoculated into a glucosepeptone medium (1% peptone water, 0.5% glucose solution, 0.5% NaCl solution, Andrade, and a one-sided welded tube). For inoculation of large volume (100 and 10 ml) water samples, the components are used in concentrated form 10 timeC. Inoculate 100 ml of the test water in 10 ml of concentrated medium and 10 ml of water in 1 ml of concentrated medium.

Samples of open water basins are examined in volumes of 100, 10, 1 and 0.1 ml. 3 samples of 100 ml, 3 of 10 ml and 3 of 1 ml were inoculated to check the water samples taken from the water pipe. Seedlings are grown at 37 ° C for one day. The presence of gas bubbles in the tube indicates fermentation. Greases are prepared from smeared or turbid samples, stained by Gram method and oxidase test is performed. The oxidase test allows to distinguish bacteria belonging to the Esherichia, Citrobacter and Enterobacter genera from gram-negative bacteria belonging to the Pseudomonadaceae family found in water, as well as other oxidase-producing bacteria. To do this, 2-3 colonies are taken from the surface of the nutrient medium with a glass rod and transferred to the filter paper moistened with dimethyl-n -phenylenediamine in the form of barC. If the oxidase test is negative, the paper will not change color, if it is positive, it will turn blue in a minute.

Gram-negative rods that do not produce oxidase are tested in a recycling test - semi-liquid meat with 0.5% glucose is inoculated with peptone agar and grown for 1 day at 37 ° C.

The coli for tap water should not be less than 333, and for open water basins it should not be less than 111 ml.

Membrane filters method. A №3 membrane filter is placed in the Zeyts funnel, which is mounted on a Bunsen tube and connected to a vacuum pump. Membrane filters should be sterilized by boiling in distilled water.

Water pipes and artesian water samples are filtered in a volume of 333 ml. The fresh water sample taken from the open water basin is filtered in volumes of 100, 10, 1.0 and 0.1 ml. The relatively contaminated water sample should be diluted with sterile water before filtration. The filter is then placed on the surface of the Endo medium in a Petri dish and grown at 37 ° C for 1 day, counting the colonies that have grown.

Greases from 2 - 3 red colonies are prepared and stained by Gram method, oxidase test is performed. To do this, transfer the bacterial colonies in the filter to filter paper moistened with tweezers dimethyl - n - phenylenediamine. If oxidase is present, the indicator stains the colony blue. 2-3 colorless colonies are transplanted on 0.5% glucose semi-liquid agar. Seedlings are grown at 37 ° C for one day. If gas is formed, the coli-index is determined by counting the red colonies in the filter.

The coli-index of tap water is -3 (number of intestinal rods in 1 liter of water) and coli-titer is 333 (333 ml of water can contain one intestinal rod). The higher the coli-titer, the cleaner the water, and vice versa, the lower the quality, the poorer the water.

To convert a coli-titer to a coli-index, divide 1000 by the coli-titer index (1000: 333 = 3); To convert the coli-index to the coli-titer, it is necessary to divide 1000 by the coli-index index (1000: 3 = 333).

Air microflora. Methods of quantitative microbiological examination of air are based on the principles of sedimentation, aspiration or filtration.

Sedimentation method. If the meat is peptone, open two petri dishes and leave in the room for 5–10 minutes, then the seedlings are grown in a thermostat at 37 ° C. The result is evaluated by the sum of the number of colonies grown in both cups: if there are less than 250 colonies, the air is considered clean; 250-500 average polluted; More than 500 colonies were contaminated.

Aspiration method. The most reliable way to determine the number of microbes in the air. In this case, the sowing of air is carried out using equipment.

Krotov apparatuC. It is structured so that at a given speed, the air passes through a narrow slit in the plexiglass plate covering the face of the agar Petri dish. In this case, aerosol particles containing microorganisms fall uniformly on the surface of the nutrient medium, because the cup rotates uniformly under the slit.

The number of microbes is calculated after growing the seedlings in a thermostat (X)

$$X = \frac{Ax1000}{V}$$

A is the number of colonies growing in the cup;

Volume of air passing through V-equipment, dm^3;

1000 volume of air sought, dm^3.

To determine the number of microbes in the air is used meat agar with peptone, bloody agar if gensian violet added to separate hemolytic streptococci. Suspicious colonies are selected and replanted on bloody agar.

The composition of the nutrient medium. If gensian violet is bloody added: 2% food agar, 5-10% defibrinated (horse, rabbit or sheep) blood and gensian violet (1: 50,000). Egg yolk-salted agar: 2% food agar, 10% sodium chloride, 20% (by volume) egg yolk (1 egg yolk 200 ml of isotonic solution of sodium chloride).

Other equipment for air testing (Dyakov, Rechmen, Kiktenko, PAB-1-aerosol bacteriological sampling, POV-1-air sampling equipment, in which a certain volume of air is passed through a liquid or filter, and then dimensional inoculations into nutrient media will be done). These devices can detect large volumes of air and detect pathogenic bacteria and viruseC. The air of microbiological boxes, surgical, obstetric and gynecological and other rooms is checked to detect pathogenic, conditionally pathogenic bacteria-infectious agents (staphylococci, blue pus rods and other gram-negative bacteria).

Soil microflora. Sanitary-microbiological analysis of soil determines the number of microbes in it, coli-titer, perfringens-titer and titer of thermophilic bacteria. If necessary, the content of nitrifying and ammonium fixing bacteria, actinomycetes, fungi, cellulose and other microorganisms is checked.

To check the soil is taken from a depth of 10–15 cm with a sterile knife (not less than 10 samples from different parts of the inspected area) and placed in a sterile jar. Measure 30g of sampleC. is filled with water (270 ml) in a flask and mixed well. 101, 104, 105 dilutions are prepared from this suspension. Take 0.1 ml of the last two, mix 40ml of 0.7% thawed and chilled meat at 45 ° C with peptone agar, then pour over 2% GPA in a Petri dish. Ekmafar is grown at 37 ° C.

The number of microbes is then determined by counting the number of colonies that have grown

Determination of soil coli-titre, perfringens-titre and titer of thermophilic bacteria

Various dilutions of the soil suspension are inoculated into Keysler medium in test tubes and grown at 43 ° C for 48 h. The analysis is then continued according to the scheme used to determine the coli-titer of the water.

To determine the perfringens-titer, various dilutions of the soil suspension (1 ml) are inoculated into test tubes in sterile skimmed milk or extempore prepared iron sulfide Wilson-Blair medium. Inoculations are grown at 43 ° C for 24–48 h, and the result is accounted for by the coagulation of milk or the formation of black colonies of Clostridium perfrmgem in the Wilson-Blair medium. Greases are prepared from the colonies, stained by Gram method, viewed under a microscope and perfringens titer is determined.

To determine the titer of thermophilic bacteria, dilute the soil suspensions (lml) in a Petri dish, melt on top, and pour the chilled meat peptone agar. Seedlings are grown at 60 C during the day and count the number of colonies and calculate the amount in 1g of soil.

Sanitary-microbiological assessment of soil on complex indicatorC. Among them, the degree of contamination with feces is extremely important.

The composition of the nutrient medium. Keysler medium: 1% peptone, 5% bile fluid, 0.25% lactose, gensianviolet to stop the growth of gram-negative bacteria. Wilson-Blair medium with iron sulfide: 3% meat peptone agar, 1% glucose, 2% sodium sulfide, 0.08% ferric chloride.

Sanitary and bacteriological examination of milk and dairy productC. The sanitary-bacteriological condition of milk and dairy products is assessed by the number and coli-titer of microbes.

To determine the number of microbes, milk is diluted in an isotonic sterile solution of sodium chloride (1:10; 1: 100; 1: 1000); from each dilution (1ml) into sterile Petri disheC. Pour over melted and cooled. Seedlings are grown during the day at 37 ° C and the number of colonies is calculated.

To determine the coli-titer, 6 test tubes of milk are inoculated into the Kesler medium: 1 ml for 3 test tubes and 0.1 ml for the remaining three (1 ml of milk is diluted 10 times with sterile water). Seedlings are grown at 43 ° C throughout the day. In evaluating the result, only bacteria that digest glucose into acid and gas but do not grow in a nitrate Kozer environment are taken into account.

Kozer medium: distilled water, 0.15% ammonium sodium phosphate, 0.1% single-stage potassium phosphate (potassium dihydrogen phosphate), 0.02% magnesium sulfate, 0.25% sodium citrate, cream.

Dairy products are inspected in the same way. The coli-titer is determined and the product is evaluated according to the normative parameters.

Milk is cultured in elective and differential-diagnostic media to detect pathogenic bacteria, pure culture is isolated and compared.

Sanitary-bacteriological examination of meat and meat products.

Microscopic examination of the meat reveals the number of bacteria in the smears made from pieces of meat measuring 2x1.5x2.5 cm. Greases are stained by Gram method and viewed under a microscope. If up to 10 bacterial cells are detected in the field of view, the meat is considered fresh.

Bacteriological examination of sausages and meat products in accordance with the requirements of GOST includes the detection of the number of microbes, as well as bacteria belonging to the group of Escherichia coli, salmonella, listeria, clostridia.

The surface and depth of the product are analyzed no later than 4 hours after sampling. When the deep part is inspected, the product samples are treated with alcohol and passed through a fire.

Topic 8. Camels and people sick to the causative

The causative agent is Uersinia pestiC. Severe intoxication causes damage to the lymphatic system, an acute infectious disease characterized by a tendency to septicemia.

Plague is a naturally occurring disease, the causative agent of which is stored in natural conditions due to its circulation among more than 300 species of rodentC. Acute pathogens of healthy animals are primarily infected by fleaC. Camels from farm animals are extremely prone to plague. They are infected during periods of intensive epizootics of rodent plague and are a dangerous source of human infection .

The causative agent of the plague was discovered in 1884 during the plague epidemic in Hong Kong by C. Kitazato and A. Iersen, and pure culture was isolated. In honor of Iersen, the offspring was named "Yersinia."

Biochemical propertieC. The plague pathogen decomposes glucose, arabinose, alvulose, maltose, and mannitol without gaC. It usually does not break down lactose and sucrose, does not ferment milk, and its hemolytic activity is not constant. Hydrogen sulfide does not form indole. Does not break down urea, does not discolor methylene blue.

According to biochemical indicators, all strains of the plague pathogen are divided into two ecological-geographical forms - those from the Eurasian regions ("continental" strains), which do not ferment glycerin, and those that do not ferment in tropical countries ("oceanic" strains) are separated.

Durability. The resistance of the pathogen to physical and chemical factors is low. It dies quickly outside the body. Good resistance to low temperatures, does not die for 6 months at 0 ° C. It is stored for 5-6 months in clothes, in sterile soil and milk - 90 days, in grains and carcasses - 50, in water - 30, in bubonic pus - 20-30, in sputum - 10, in fruits and vegetables - 6-11, in bread - 4 dayC. . Four antibiotic-resistant strains of plague bacteria were identified simultaneously.

The plague pathogen is very sensitive to build up and high temperatureC. at boiling for 1 minute, at 60 ° C 5-10, 5% lysol solution kills after **2-10** minutes.

Pathogenicity. The virulence of different strains of the plague pathogen is not the same. It also depends on strains isolated from animals and humans.

The pathogen has been isolated from more than 160 species of rodentC. This microbe is pathogenic to camels, donkeys, cats, jackals, foxes, foxes, which can be damaged and infected under natural conditionC. Monkeys and humans are prone. In experiments, white mice, rats, guinea pigs, rabbits, martens, ants (a type of lizard), muskrats, water rats, and others can be infected. Because guinea pigs and white mice are highly susceptible to plague, they are used in biosynthesiC. Plague toxins: produce endo- and exotoxins; pathogenic enzymes fibrinolysin and hyaluronidase were detected in the exotoxin.

PathogenesiC. As a result of ectoparasite bites, the microbes enter the nearby regional lymph nodes through the lymphatic system, where they develop and multiply and form hemorrhagic periadenitis (bubonic). The microbes and their toxins pass from the affected lymph nodes into the bloodstream, causing septicemia and the animal dying. Sometimes when the disease is mild, the affected lymph nodes become purulent and ruptured.

When microbes enter through the airways, primary foci appear in the upper parts of the lungs, which combine to form extensive lesions of the lung with foci of hyperemia and hepatitis.

The pathogen enters the human body when it is treated with a harmful material through damaged skin (sometimes mucous membranes), when the skin of rodents is scratched. Plague bacteria in the form of lungs pass through the sputum when coughing and talking in an air-droplet way.

Antigen structure. About 10 antigens of the pathogen have been isolated. They are extremely important shell (capsule) thermolabile protein and O-antigen-somatic thermostable polysaccharideC. Both antigens are immunogenic. The antigenic system of virulent strain bacteria is the basis of virulence.

V-antigen - cell wall protein W-antigen - lipoprotein, released into the environment during growth. There is a special plague bacteriophage used to detect the microbe.

Immunity. After recovery, a strong and lasting immunity emergeC. Knowing this, the peoples of the various countries where the plague was observed in ancient times entrusted the healing of the sick to the care of the sick and the burial of the dead. Immunity is more characterized by phagocytic activity of cells of the lymphoid system. Protective antigen, which is the basis for the preparation of chemical vaccines against the plague, plays an important role in the emergence of immunity .

DiagnosiC. Because the plague is a highly contagious infection, tests are carried out in special laboratories in anti-plague clothing, strictly following the ruleC. For examination depending on the clinical form of the disease and the location of the pathogen - in the form of bubo, its substance, wounds in the form of skin, in the form of intestines - feces, in the form of lungs - mucus and sputum from the throat, blood in the form of septicemia, pathological material (organs, blood, lymph nodes, lungs), carcasses of rodents, fleas, water, nutrients, air, etc. The following checks are performed:

Microscopy - smears are fixed in a Nikiforov mixture, stained with methylene blue according to Gram and Leffler, and examined under a microscope.

The material being tested is grown in a nutrient medium: pure culture is isolated and identified. To 100 ml of meat peptone agar against co-occurring microflora is added 1 ml of an aqueous solution of 2.5% sodium sulfite and a saturated alcoholic solution of gensian violet diluted 1: 100 in distilled water. To neutralize plague phage, 0.1 ml of anti-phage serum is added to the culture before planting.

Biogiological testing - in guinea pigs is performed with isolated pure culture, as well as material that is difficult to separate from the culture. In this case, the material under test is applied in the form of a thick suspension to the part of the guinea pig's abdomen where the wool was obtained. In the case of plague bacteria, the animals die in 5-7 dayC. To expedite the diagnosis, infected guinea pigs are

killed for 2–3 days and a culture of the plague pathogen is isolated from their organs.

Plague bacteria are identified based on the results of phagotyping, determination of morphological, cultural, enzymatic propertieC. The isolated culture differs from the causative agent of pseudotuberculosis.

Biosinov is crucial in the diagnosis of plague.

A thermoprecipitation reaction is used to examine the rotten body of a rodent.

Given the importance of rapid detection of the disease, rapid methods of laboratory diagnosis of this disease have been developed.

BiopreparationC. Live and inactivated vaccines have been proposed for the prevention of human plague. A live vaccine made from the original EV strain is extremely widely used. Camels can also be vaccinated with this vaccine. The plague pathogen is sensitive to streptomycin and tetracycline, which is why these antibiotics effectively treat the bubonic and pulmonary forms of the plague.

LABORATORY DIAGNOSIS OF CAMELS AND HUMAN DISEASES

Camel **and human plague** (Y.pestis). ***Yersinia*** generation, ***Enterobacteriacae*** family.

Plague of camels and humans is a natural hearth disease. Under natural conditions, it is a reservoir of rodent pathogenC. Conductors of healthy animals are primarily affected by fleaC. Camels are more susceptible to disease than farm animalC. The disease is characterized by severe intoxication, damage to the lungs, lymphatic system, septicemia.

Pathological material. Pus from organs, rodent carcasses, buboes (swollen lymph nodes) for laboratory examination. sputum, blood is sent. Only special laboratories are allowed to work with plague material.

Microscopy. The ointments are stained by the Gram method, in the preparations the stimulus is in the form of an ovoid or rod, the cell size is 0.3-0.5x1-3 μm. One, two, sometimes in the form of a short chain. Cells are gram-negative, have no spores, do not form sporeC.

Bacteriology. The pathogen grows well in normal nutrient media, facultative anaerobic, optimal temperature 28-29 ° C, pH 7.2-7.4. After 24 hours when grown at 37 ° C in dense nutrient media forms a broad, wavy, central bulging yellow-brown colony. In GPB, a medium forms a membrane on the surface, from which the threads appear to hang (reminiscent of stalactite), and a granular precipitate forms at the bottom of the test tube.

Stimulating glucose, maltose, mannitol. decomposes galactose, arabinose, xylose to acids; does not dissolve gelatin, does not form indole, separates catalase.

From rodents obtained material on examination, should be distinguished from .*pseudotuberculosis* . They *differ in the* formation of urease from *Y. pestis* and the breakdown of ramnose.

In addition, the material under study has a rapid method of detection of the pathogen and its antigens: immunofluorescence, hemagglutination cessation reaction (GATR), indirect hemagglutination cessation reaction, phage titration reaction, diffuse precipitation reaction, etc.

Biosinov. It is used to separate pure culture from the material from which foreign microflora fallC. To do this, the material is sent under the skin of guinea pigs.

Material that is not contaminated with foreign bacteria is damaged by sending it into the abdominal cavity of guinea pigC. Rotten material

the guinea pig is rubbed into the hairless part of the skin of the abdomen. If the result is positive, the animal dies in 3–7 dayC. By tearing it, the internal organs are examined bacteriologically.

BiopreparationC. A live, dry plague vaccine made from an EV strain .

Chemical plague vaccine. Plague bacteriophage.

Topic 9. PEVEVDOTUBERCULOSIS CAUSED

The causative agent of *pseudotuberculosis* (K *pseudotuberculosis)* *is a* genus of *Yersinia* , belonging to the family Enterobacteriaceae.

Pseudotuberculosis (rodentiosis) is a common infectious disease in rodents and birds, characterized by parenchymatous lesions of the organs, forming nodules similar to those of tuberculosis.

Pathological material. The bodies of parenchymatous organs, lymph nodes, rodents and birds are sent to the laboratory for examination.

The morphology and properties tinktorial of *Y. pseudotuberculosis Y.pestis* it does not matter.

Bacteriology. *Y. Pseudotuberculosis* - facultative anaerobic. The optimum temperature for them is 28-30 C, pH *7.2-7A.* The characteristics of the pathogen depend on its growing temperature. Not demanding on food environments.

After 24 hours at 22–28 ° C in dense nutrient media, small (diameter 0.1–0.5 mm), round, convex, clear, grayish-yellow, centrally raised, glossy colonies are formed . Polymorphism may occur in colonies at 37 C. It is characterized by the formation of bulging, central brown and thin fibrous D-colonies at the edgeC. At low temperatures (22 ° C and below) it forms hivchins, thuC. *Unlike pestis* , it is immobile at 37 ° C. In GPB, uniform homogeneity creates a granular or sticky precipitate.

Biochemical properties are examined in order to determine the type. *Y. Pseudotuberculosis produces* urease, rheumatism, melibiosiC. Lysine - ornithine decarboxylase absent. does not dissolve gelatin, does not form indole. At 25 ^{0}, the Foges-Proskauer reaction is negative.

Serological tests are used to determine the serovariant of a particular pathogen culture. *Y. Pseudotuberculosis is* divided into 6 serological groups on thermostable antigens and 5 variants on hivchinii antigen.

Biosinov. White mice, guinea pigs, rabbits with patmaterial suspension or isolated culture are infected under the skin or in the abdominal cavity. As a positive result, white mice die in 2–4 days, guinea pigs and rabbits - in 2–35 days, depending on the virulence of the culture. To isolate the pathogen culture, the organs of dead animals are transplanted into nutrient media, ointments are prepared, and stained preparations are viewed under a microscope.

Topic 10. LABORATORY OF TULAREMIA DIAGNOSIS.

The causative **agent** of *tularemia* is *Francisella tularemiC.* Discovered by McCoy and Chepins (1912) in Tulyare County, California. Francis (1921) studied and expressed it fully, and named it after him in his honor. *Brusellaceae* caused by *Francisella generation of* the family belongs to. *Francisella tularemis* causes acute infectious disease in animals and humanC. Tularemia is septic, characterized by damage to the lymph nodes (swelling, cottage cheese change), fever.

Pathological material. The fetus (or fetal organs), urine, and feces are punctured from enlarged (soft) lymph nodes from sick animals; the carcasses of dead animals - liver, kidneys, spleen, swollen lymph nodes from large animals, rodents and other small animals are sent. It should be noted that the causative agent of tularemia can be found in branded drugs only when the material under test is severely damaged.

Microscopy. *Francisella tularemis is* a tiny, cocci-like bacterium in ointments made from culture, which appears as a thin rod in preparations made from organC. The size is 0.3 μm. Does not form sporeC. motionless Forms a thin capsule in the macroorganism. Gram-negative. In the Romanovsky-Gimza method, the pink-air color is often dyed bipolar.

Bacteriology. *Francisella tularemis* aerobic. Growth temperature 37 ^{0}C, pH 6.7-7.4. After 1–2 days in the blood-added nutrient medium appear small, round, bulging, smooth, smooth, shiny colonies with white, prone to air color. Grows poorly in liquid nutrient environmentC. It should be noted that in the cultivation of the pathogen there are Vi- and O- antigens for colonies, virulent and immunogenic smooth S -form. *Francisella* is the only O-antigen in the R-form of *tularensis* and is not virulent. Serological diagnosis takes into account the antigens of the bacterial cell that are common with brucellosiC. Special nutrient media are used to grow *Francisella tularemis* : McCoy medium, Francis chocolate agar, Yemelyanov's bloody medium, etc.

***McCoy** medium:* 40 parts sterile saline (pH 7.0-7.2) is added to 60 parts egg yolk. The medium for heating is heated to 80 ° C for 1 h. It is implanted in the medium by the method of stamping: the organ piece is caught in the fire, the cut side with sterile scissors is lightly pressed against the surface of the medium. Growth is observed after 18-24 hours, and after 2-3 days the maximum growth. Rare colonies can be seen in 3–6 days when the material is poorly planted.

Topic 11. LISTERIOSIS CAUSE AND LABORATORY DIAGNOSIS

The causative agent is *Listeria monocytogeneC. The family Corynebacteriaceae* belongs to the genus *Listeria* .

Listeriosis is a common zoonotic disease. It is registered in 44 countries, as well as in Uzbekistan, and causes disease in rodents, pigs, large and small horned animals, horses, some fur animals and poultry. People are prone too. The disease takes the form of septic, manifested by damage to the central nervous system, abortion, mastitis, septicemia. The importance of listeriosis, like rabies, is also related to the risk of infecting people. This is especially dangerous for pregnant women, their fetuses, newborns, and people with weakened immune systemC. In some forms of listeriosis, mortality reaches 90-100% despite treatment with active antibioticC. Morphology. *Listeria monocytogenes are* motile, polymorphic, non-spore-forming, twisted gram-negative rodC. Dimensions of listeria: length from 0.3 to 0.5 microns, width from 0.5 to -2 micronC. They are one, two, five or more rods placed together, in the form of a short chain or Roman numeral V.

The causative agent of listeriosis forms a capsule when the meat with glucose and glycerin is peptone liver and grown in broth. But so far there is no firm opinion about the capsule formation of this type of microorganism.

One of the features of Listeria is its mobility. Its mobility is best manifested in cultures grown for 4–12 hours at room temperature (20–22 ° C). Listeria is well stained with all aniline dyeC. Gram-positive 48 hours in young cultures and most cells gram-negative in older cultures.

Cultural featureC. Listeria grow under aerobic as well as anaerobic conditionC. The optimum growth temperature in normal nutrient media is 36-38 ° C, pH 7.2-7.4. Another feature of listeria is that it grows in a wide range of growth temperatures from 45 to 4 ° C, and survives even at lower temperatureC. pH ranges from 5 to 11.

Listeria grow in the form of dewy colonies after growing in a microanaerostat under vacuum at a pH of 7.2-7.41i bloody or normal meat peptone agar at a temperature of 37 ° C for 24 hourC. The virulence properties of microorganisms grown under aerobic and anaerobic conditions remain the same.

The growth of listeria under aerobic and anaerobic conditions leads to their widespread distribution in nature, increasing their resistance to the effects of the external environment. As a result, there are many ways in which the pathogen of listeriosis enters the animal and human body. Listeria grows well in environments with added glucose (1%) and glycerin (2-3%).

Flesh peptone agar forms round, convex, clear colonies with a diameter of 0.2-0.4 to 2mm. Meat peptone agar with methylene blue (1: 40000) forms l-3mm diameter, central air-colored green colonies.

Normal meat grows slowly in peptone broth. Only after 1-2 days there is a turbidity, a peculiar unpleasant, pungent odor. After 5–7 days, a mucous precipitate forms at the bottom of the test tube. When you touch it, it rises in a spiral in the form of a hair follicle.

If the semi-liquid 0.3% meat peptone agar, the listeria grow like cotton, spreading across the environment. When the meat is planted vertically on peptone gelatin, the microbe grows to form tumors on the sides.

S-shaped colonies are extremely characteristic for listeria. However, when stored for a long time in artificial nutrient media, listeria cultures undergo a change: through the intermediate SR and RS stages, the lattice takes on an R-shape. They are in the form of long threads in the grease, and when the meat is re-soaked in peptone broth, a lumpy precipitate forms at the bottom of the test tube. The biochemical properties of R-culture do not change much relative to S-cultures, only the virulence decreases and the agglutination capacity increases.

Listeria live 24-28 months at room temperature if the meat in the test tube is peptone, and 4.5-5 years when stored in the refrigerator in pipetteC. Meat with a pH of 7.2 can live 10-12 months without replanting on peptone agar. Lyophilized dried listeria cultures retain their pathogenic properties for 7 years.

The enzymatic properties of the listeria stored for many years do not change and other non-characteristic properties do not appear.

The broth culture of Listeria is killed after 3–5 min when heated to 100 ° C, after 20 min at 75–90 ° C, and after 30 min at 70 ° C.

Listeria at 18-20 ° C for 5 minutes under the influence of 2.5% phenol , 5% lysol or creolin in 10 minutes, 2.5% formalin or sodium hydroxide in 20 minutes, 45% ethyl spirit in 10 minutes, 70% and 96% in 5 minuteC. 1% potassium permanganate dies in 30 minutes and 2.5% lysate in 5 minutes.

Pathogenicity. Under natural conditions, sheep, goats, large horned animals, pigs, horses, rabbits, chickens, ducks, geese, turkeys, various species of rodents, voles, lizards, rats, mice, guinea pigs, water rats , foxes, raccoons, squirrels, cats, dogs, monkeys get sick. Rabbits and mice are very comfortable to study the disease experimentally, and even after sending them virulent listeria into a blood vessel or abdomen, and mice under the skin, they get sick and die. When injecting a culture of 0.000003 to 0.2 ml of sugar broth per day, these animals are killed after 1-5 days (sometimes 10-14). In order to cause disease in guinea pigs, it is necessary to send them listeria in large doseC. Listeria produce neurotoxins, hematoxins, and a number of disseminating factors.

Toxicity. Listeria secrete a lipolytic factor into the culture fluid that induces cytolysis of macrophage cultureC. It also secretes thermolyl hemolysin, which hemolyses erythrocytes of pigeons, rabbits, guinea pigs, and horses as a result of cysteine bifan activation. When a microbial cell breaks down, endotoxin is released, causing characteristic changes in animals and humans.

PathogenesiC. Listeria can enter the body in a variety of wayC. Under natural conditions, the pathogen enters the body more in the following ways - through the mucous membranes of the nasal and oral cavities, conjunctiva, digestive tract, respiratory tract and damaged skin.

A number of experiments have shown that the ways in which listeria are spread in the body, as well as the course of the disease, depend on the methods of

infection. Listeria can cause caries, lead to the development of local processes and sepsiC. The appearance of this or that form of the disease, on the one hand, depends on the virulence, dosage, route of infection of the microbe, on the other hand, through the damaged skin.

A number of experiments have shown that the ways in which listeria are spread in the body, as well as the course of the disease, depend on the methods of infection. Listeria can cause caries, local processes and the development of sepsiC. The emergence of this or that form of the disease, the virulence of microbes, on the one hand , the dose depends on the damage, on the other hand the nature of the animal's age, feeding and storing them in the Bering, along with rare diseaseC.

Listeria that enter the animal's body can become harmless, leave the body, or develop and spread throughout the body. There are different views on the ways in which listeria are spread throughout the body. In addition to the neurogenic pathway, listeria can also spread in the body through lymphogenic and hematogenous pathways.

Listeria are first located in the lymph nodes, vascular disorders, activation of mesenchymal cells are observed. The pathogen can then be isolated from the blood and parenchymal organC. They develop vascular injury and dystrophic changeC. Three days after injury, the hematoencephalic barrier is broken and the listeria enter the central nervous system.

The main place where listeria develops is blood. Meningoencephalitis is a manifestation of listeriosis that occurs after a septic process.

Some data suggest that the hematogenous spread of the pathogen, as well as its latentity in various organs as well as in muscles, requires consideration.

Listeriosis sepsis is rare in older animals due to the body's strong defenseC. In them, the central nervous system is more damaged, and the reproductive system is damaged during pregnancy. Due to the low general resistance in the body of young animals, they develop sepsis, followed by diffuse granulomatosiC. In some cases, the disease passes without clinical signs, in which case the animal remains a listerial carrier for a long time.

In recent times, soil is considered to be the primary natural source of listeria. From it falls on the plantC. The source of damage to the animal is the active development of listeria, long-term storage of nutrients, especially silage.

Infection of humans occurs as a result of consumption of contaminated vegetables, animal productC. As a result of our research, many of our scientists have found that rodents, birds, and other wild animals play an important role in conducting listeria. Listeria is found not only in warm-blooded animals, but also in amphibians and fish. In the process of studying this issue, the number of species carrying listeria , as well as birds, is increasing. Listeria are also found in most species of insects: mites, fleas, lice, mosquitoeC. The natural carrying capacity of listeria was determined in 8 species of ixoda canals, 5 species of lice, 1 species of galyus canals, 1 species of argas canals and 1 species of lice.

Free-living canals are a permanent part of the natural biocenosis, and they also live in the ecological environment in which listeria are found.

Inspections show that in a poor quality silo, there are a lot of free-living canalC. It is a good environment for canal development.

Antigen structure. There are two main serotypes of listeria: those found in rodents and those found in ruminantC. Both serotypes have O-somatic and H-hivchin antigenC. The O-antigen contains four thermolabile (I, II, III, IV) and variable *(III)* antigenC. Hivchin H-antigen contains A, B, C, D antigens.

Immunity. Animals that recover from listeriosis develop strong immunity.

AVSalivanov, GlGrinisina, OAKotilev (1971) obtained a vaccine strain of listeria "AUF" by exposing the epizootic strain of listeria to ultraviolet light. Regardless of the epizootic situation on the farm, a vaccine prepared from the AUF strain of listeria stopped enzootic outbreaks of listeriosis and prevented the recurrence of the disease for 10 months.

The immunogenicity of the AUF strain suggests that tissue-specific tissue immunity plays an important role in listeriosis.

DiagnosiC. Because the clinical manifestations of listeriosis vary, the exact diagnosis of the disease is made only in a complex way: based on epizootiological data, clinical signs, pathoanatomical and pathological histological changes, as well as the results of laboratory tests.

Knowledge of the main symptoms of the disease (clinical, pathoanatomical) allows to suspect listeriosis, and laboratory tests lead to a final diagnosis.

The body of a newly died small animal or parenchymatous organs and brain from large animals (horses, cattle, sheep) are sent to the laboratory for examination. In case of abortion - aborted fetus or its organs; in mastitis, milk samples are sent from the affected part of the udder. In the early stages of septic listeriosis, blood is drawn to isolate the hemoculture. *Bacteriological examination.* Stamped from pathological materials - drugs are prepared, stained in the gram method and viewed under a light microscope. Fluorescent microscopy is performed using fluorescent serum. Meat peptone agar, meat peptone broth, meat peptone liver broth, 1% glucose and 2-3% glycerin were added to Marten media for culture separation. . Guinea pigs, white mice and pigeons are affected.

Biosinov. White mice (18 g), guinea pigs and pigeons are prone to listeriosis . They are infected with a suspension prepared from subcutaneous culture or organ tissue (from pathological material brought to the laboratory). But to infect guinea pigs, a conjunctival specimen is placed: two drops of the test culture are instilled into the conjunctiva of the eye, then the eyelids are lightly massaged with cotton swabC. Virulent strains of listeria develop purulent keratoconjunctivitis in 2–4 dayC. In case of subcutaneous damage, the suspension of tissue organs is administered in a dose of 0.3 - 0.5 m. Of course brain suspension should be used. In a positive biosynthesis, the animals die after 2 to 6 dayC. For effective biosynthesis, cortisone 5 mg is injected into the abdomen 2 to 3 hours before infecting white mice. When cracked, many foci of necrosis are

found in the liver, spleen, kidneyC. The period of observation of infected animals is 8 days (if they have not died before).

Parenchymatous organs of dead animals are examined bacteriologically. Isolated pure culture is different. A serological method is also used to differentiate the culture - a special anti-listeriosis serum is diluted 1:50 with an agglutination reaction in the subject glasC. The serotype is distinguished by typospecific sera. The type of pathogen differs in ointments prepared from culture or pathological materials, treated with special fluorescent serums.

Serological examination. AR, CBR, precipitation, indirect hemagglutination reactions are used.

The result is positive:

Gram-positive, which breaks down maltose, rhamnose, salicylates, which produce catalase from pathological material , into a non-gaseous acid. polymorphic, moving rods separated; gives a positive result when sent between the conjunctiva and skin in guinea pigs and rabbits; if AR is positive with listeriosis serum; if it is pathogenic to laboratory animals and gives a positive result on luminescent microscopy.

BiopreparationC. In 1974, a dry vaccine made from the AUF strain against listeriosis of farm animals was proposed and approved for use. The AUF vaccine is a lyophilized dried culture of an attenuated strain of the first serotype listeria. The sterility, harmlessness, and immunogenicity of the vaccine are controlled in rabbits.

Diagnostic agglutination serum of listeriosis.

Fluorescent listeriosis serum.

Vaccines prepared from two serotypes of Listeria.

Two listeriosis anligen for AR; prepared from two serogroupC. Listeria suspension is inactivated by boiling in a water bath for 1.5 hours.

Listeriosis antigens for CBD.

The diagnostic kit of lyophilized listeriosis bacteriophages consists of two - L2A and L4A monophages.

Topic 12. Pathogens of infectious enterotoxemia and laboratory diagnosis.

The causative *agent* of infectious enterotoxicosis in sheep is spore-forming anaerobes, types C and D of *prefringens* , and type B of anaerobic dysentery in lambC. In other species, the disease is caused by *Cl. Types A, B, C,* D, *E, of perferengens are excited* . Infectious enterotoxemia is an acute infectious disease characterized by the development of inflammatory tumors, tissue necrosis and intoxication of all types of animalC. The following nosological units are represented: 1) anaerobic dysentery of lambs; 2) hemorrhagic enterotoxemia of sheep; 3) infectious enterotoxemia of sheep; 4) *Cl.* sheep enterotoxemia *caused by* type *A perfringens* ; 5) goat enterotoxemia; 6) enterotoxemia of large horned animals; 7) anaerobic enterotoxemia of adult pigs; 8) necrotic enteritis of

piglets; 9) equine enterotoxemia; 10) Enterotoxemia of camels; 11) enterotoxemia of zebras, bison, saigas; 12) enterotoxemia of birdC.

Anaerobic dysentery of lambs is an acute infectious toxic disease of newborn lambs, characterized by hemorrhagic enterotoxemia, diarrhea. Usually lambs get sick in the first five days of life, manifested by a high mortality rate. Disease *Cl.* calls type *B of perfringens* .

Currently, a concentrated polyvalent hydroxyalumine vaccine is being used for the prevention of lamb dysentery in sheep bradzot, infectious enterotoxemia, malignant tumors, and lamb dysentery. In unhealthy farms for lamb dysentery, pregnant sheep are vaccinated twice. After birth, lambs receive antibodies through the udder, which produce high amounts of beta and epsilon-antitoxins, which protect the animals from disease.

Serum for lamb dysentery and bivalent antitoxin serum for anaerobic dysentery in lambs and infectious enterotoxemia in sheep have been recommended for passive prevention and treatment. For prophylaxis in inpatient unhealthy herds of lambs dysentery, all lambs are injected subcutaneously at a dose of 50-100 AB once a day for 1 to 2 hours after birth, and immunity in animals is maintained for up to 14 dayC. Whey is produced in the biological industry, its activity is expressed in antitoxin units (AB).

Sheep hemorrhagic enterotoxemia is an acute transient disease of adult sheep that ends in sudden death. In this type of sheep enterotoxemia, hemorrhagic infiltrates are observed, which are suddenly manifested in the subcutaneous tissue of the chest, groin and elsewhere. Hemorrhagic inflammation of the mucous membrane of the small intestine, extensive bleeding, necrosis of tissues in places are also observed. There is almost no change in the kidneyC. Disease *Cl.* calls type *C of perfringens* . The main toxin of this type is a beta-toxin component. Due to the rapid progression of the disease, it is practically incurable.

Infectious enterotoxemia of sheep ("loose" kidney disease) is a **disease** that develops in sheep of all ages as a result of intestinal absorption of toxins synthesized by the pathogen. The disease can occur at lightning speed, acute and chronic. When lightning strikes, the disease suddenly appears and the animals die quickly. When they are ruptured after a few hours, one can see the characteristic loosening of one or both kidneyC. Disease ***Cl.*** type *D of perfringens.The* main toxin factor of this microbe is epsilon-toxin. Surviving ewes that recover from the disease develop immunity for 7-10 months.

Cl. enterotoxemia of sheep *caused by* type *A of perfringens* is manifested by various symptoms, almost always death in sheep is accompanied by cases of liver, spleen, heart, pericardial hypertrophy, renal pulposis, exudative pleurisy. *Cl in* intestinal mass . *Pregnant* mother pigs are immunized to protect the newborn piglets type *C* or *D of the perfhngens from the* disease. For this, FIKagan and VI, Solomatins (1973) *Cl. They* developed a method of preparing a concentrated formol vaccine from Perjringens type *C.* Due to the rapid progression of the disease, treatment of sick piglets is ineffective. *Injecting* piglets with antitoxin

serum *(the* antibeta-toxin of *Cl Perfringens*) in the first hours after birth can give a positive prophylactic result.

Enterotoxemia of other species of animals *Cl.* Different types of *perfringens* call. Diagnostic tests are performed like any other. There are only biopreparations for the prevention of enterotoxemia in goats and enterotoxemia in adult pigC. Pathogenesis of infectious anaerobic enterotoxemia. In the etiopathogenesis of anaerobic enterotoxemia, not only the entry of the pathogen into the susceptible organism, but also the creation of conditions for its proliferation and toxin formation in the intestine is very important. The disease can not cause. Good conditions for the active reproduction of the pathogen arise as a result of the violation of the existing ecological balance between the organism of the animal and its microorganisms of the gastrointestinal tract. In the gastrointestinal tract of animals undergo complex enzymatic processes of endogenous and bacterial nature, which ensure the digestion of food to the point where it can assimilate. When digestion is impaired, decarboxylation processes prevail over deamination processes, the protein is not completely broken down and the environment becomes alkaline. Under such conditions, due to the lack of amino acids, the intestinal microflora, which provides the acidity of the environment, does not develop. Conversely, an alkaline environment as well as incompletely degraded proteins lead to an intensive proliferation of clostridia because they assimilate large protein molecules.

Exotoxins produced by the pathogen in the intestines of infected animals play a major role in the pathogenesis of anaerobic enterotoxemia. They consist of more than 12 components that fit differently in each drive. In terms of biological properties, all components of toxins are enzymes or substances close to it, which have a specific effect on the organs and tissues of the body. Therefore, in the course of pathological processes, the specificity of each type of pathogen is observed.

In general, in anaerobic enterotoxemia of all species, the development of pathological processes is the same, regardless of the type of pathogen causing the disease. Toxins accumulated in the intestine damage the intestinal mucosa, resulting in blood and liver. Toxins cause profound changes in the mucous membrane. It fails to act as a barrier and enters the general bloodstream without damaging the blood. Toxins damage the endothelium of blood vesselC. They pass from the damaged vascular wall to the cells of the organism and cause general intoxication with beiges characteristic of anaerobic enterotoxemia.

Diagnosis is based on clinical, epizootiological, pathoanatomical data and the results of laboratory tests.

For examination, the carcass of a dead animal or the most damaged part of the small intestine is cut and sent to the laboratory, where both sides are enriched, as well as a piece of liver, spleen and kidney. Patmaterial is taken no later than 3-4 hours after the death of the animal.

Topic 13. DIAGNOSIS OF NECROBACTERIOSIS AND LABORATORY

The causative *agent of* necrobacteriosis is *Fusobacterium necrophorum Bacterioidaceae* family, belonging to the genus *Fusabacterium* .

Necrobacteriosis is an anthropozoonosis, an acute, contagious disease of all species of animals and birds, manifested by purulent necrosis of the skin and mucous membranes, muscle and connective tissue (usually in the lower part of the legs).

The microbe was isolated by R. Cox in 1881 from the wounded cornea of a sheep infested with smallpox, and in 1882 F. Lyoffler found it and fully proved it. Later, A. Schutz and MGTar were the first to separate the couture from B. Bang (1890) and I. Schmorl (1891).

Morphology and tinctorial featureC. Microbial polymorphic. Preparations prepared from pure culture and fresh necrosis foci are in the form of rods or granules of long (100-300 μm (may be shorter)) grainC. Other threads reach up to 400 μm. Some threads appear spherical and sausage-like expansion. The length of the individual bordered rods is 2-5 μm.

In ointments prepared from stale cultures and chronically damaged foci, especially those wrapped in a capsule, the necrosis bacterium causes a short spherical and sausage-like expansion of some filamentC. The length of the individually bound rods is 2–5 μm.

In ointments prepared from obsolete cultures and chronically damaged foci, especially those wrapped in capsules, the necrotic bacteria are in the form of rods with a short length of 0.7–4 μm and a width of 0.3–0.5 μm. They are not uniform, granular, often the ends are painted intensively (bipolar).

Coccyx forms are also found in such drugC. The bacterium is immobile, has no spores, and does not form spores or capsules.

In alcohol-aqueous solutions of aniline dyes do not stain evenly (intermittently), gram-negative. TB fuchsia, blue Lyoffler Romanov Gimzo and especially the way Muromsev painted.

Cultural featureC. Necrobacteriosis bacteria are strictly anaerobic. In its cultivation, Kit-Tarossi medium, Marten broth, liver agar, semi-liquid agar, brain media are used. When 10-20% fresh bull whey and 0.2-0.5% glucose are added to

the Kitt-Tarossi environment, the microbe grows more intensively and gas production increaseC. Optimum temperature 36-38 °C, ambient pH 7.4-7.6.

In the Kitt-Tarossi environment, turbidity occurs after 24-48 hours, and a lumpy precipitate forms in the liver fragments; The gas formation is weak, but is well manifested in some strainC. After 5–8 days, the environment begins to clear and precipitates, and when we stumble, the sediment disperses and becomes uniformly cloudy. After 4–5 days of sowing whey upright agar forms lentil-like, small, radial tumor colonies (Fig. 14).

Glucose-blooded agar appears on the face in a vacuum of 4–10 mm of mercury column, in 2–3rd day a small round or dewy, and on 4–5th day the size increaseC. Colonies are sometimes wrapped around a weak green hemolysis zone. The surface of the colonies is smooth, opaque.

When the culture is kept under aerobic conditions, the colonies continue to grow, but lose their clarity, becoming spacious.

The microbe grows well in the brain environment. When 0.05% ferrous sulfate (sernokislaya jelly) is added to it, it darkens due to the formation of hydrogen sulfide.

Biochemical propertieC. The causative agent of necrobacteriosis is arabinose, glucose, galactose, levulose, maltose, sucrose, salicylic acid, glycerin, dulsite, mannitol and inulin.

Weakens lactose. It does not dilute gelatin and whey, does not digest (does not like) egg protein, weakens milk and does not always peptonize, forms indole and hydrogen sulfide. Does not form ammonia. It does not return nitrates to nitrites.

Durability. The causative agent of necrobacteriosis is a relatively resistant microbe, but can be stored for a long time in various objects of the external environment . Life expectancy in feces - up to 50 days, in urine - up to 15 days, in grass-covered soil - up to 10 days, in summer - up to 15 days, in winter - up to 60 days, in tap water and distilled water - up to 15 days, in milk - up to 35 days, in saline - Can be stored up to 45 dayC. It dies after 12 hours under the influence of direct sunlight. Air-dried cultures die after 72 hourC. lyophils are stored for up to 15 months when dried and kept under anaerobic conditions, while in the frozen state bacterial cultures survive for 30-40 dayC. Bacteria die in 15 minutes when heated to 65 ° C, after 10 minutes in 70 C, and die immediately when boiled.

The causative agent of necrobacteriosis is sensitive to disinfectants: 5% sodium bicarbonate or potassium it after 10 minutes; Kills 2.5% creolin-20 minutes, 5% lysol-9 minutes, 2.5% formaldehyde-13 minutes, potassium permanganate 1: 1000-10 minutes.

The bacterium is very sensitive to the tetracycline series of antibioticC. penicillin, low sensitivity to streptomycins, resistant to miserin and colimycins.

Pathogenicity. In the wild, horses, large horned animals, buffalo, deer, sheep, goats, dogs, cats, chickens, geese, as well as wild animals - kosulya, Siberian goats, argali, deer, llama, zebra, begimot, water beavers,

marmots, muskrats, antC. People are also prone to necrobacteriosiC. Rabbits and squirrels are prone to laboratory animalC.

In horses, necrobacteriosis gangrenosis takes the form of a white (same wound). Diphtheric inflammation is observed in the distal parts of the legs, udder skin, mucous membranes of the vagina and uterus, and internal organs in adult cattle. Hoof necrobacteriosis (hoof disease) is characteristic of reindeer. Older pigs are less likely to become ill, but are more likely to be isolated from their mothers, with necrotic stomatitis, rhinitis, dermatitis, and enteritiC. In sheep, the hooves are often damaged. In dogs, phlegmonous and pustular dermatitis develops with subcutaneous abscesseC. Throat in chickens, the basis of the tongue. hiccups, redness, damage to internal organs.

PathogenesiC. Necrobacteria are post-traumatic infectionC. The causative agent of necrobacteriosis develops intensively in damaged tissues because they are not adequately supplied with oxygen due to disruption of the integrity of the capillarieC. This leads to the emergence of anaerobic conditionC. In normal oxygen-saturated healthy tissue, the pathogen does not develop. The conditions for the growth of bacteria are especially good in the blood of a hematoma.

Toxic components are synthesized in the body, which surround the intracellular enzyme system and cause necrosis of surrounding tissueC. The intensive development of capillaries complicates the process.

The microbe from the infected lesion can spread throughout the body in a hematogenous way, which is significantly aided by damage to the vascular wall and bacterial damage, rupture of thrombi. As a result, the process spreads to neighboring tissues, secondary foci appear in the skin, joints, boneC. Transmission of bacteria into the blood leads to the development of septicemia and the formation of metastases of foci of necrosis in the lungs, heart muscle, liver.

The disease is severe and often ends with the death of the animal.

Toxicity. The causative agent of necrobacteriosis, exotoxin, endotoxin is released when the microbe is grown in liquid nutrient media, the amount of which reaches a maximum in 24-36-year-old quail. It is synthesized more intensively in strains isolated from horseC. This toxin is unstable and decomposes at 55 ° C for 30 minutes and at 100 ° C for 5 minuteC. When 0.3% formalin is added to an exotoxin, it converts it to an anatoxin.

Hematoxin is produced intensively in environments with fresh meat peptone, 0.5% glucose, sodium phosphate, and less blood. It has thermolabile propertieC. After 15 minutes at 48 ° C, it is completely inactivated at 56 ° C and stored at 4 ° C for 2 **months** . Horses, large horned cattle, sheep, pigs, guinea pigs, rabbits and pigeons lyse erythrocytes.

Antigen structure. Experiments with adsorption of antibodies show that the necrobacteriosis pathogen has strains that are similar in antigenic relationshipC. In addition, it was found that there are different serological types that differ in antigen content. Common antigens have also been found for them in necrobacteriosis and fusobacteria.

Immunity. Animals that recover from the disease do not develop immunity, they can be re-infected with necrobacteriosiC. The development of artificial immunity is complicated.

When rabbits were immunized by intravenous administration with killed or live strains of the pathogen, precipitins, agglutinins, and complement-binding antibodies were found in their serum. The same antibodies were detected in the blood serum of sick animals and humanC. But their protective function is not great.

DiagnosiC. Fragments, small animals and poultry carcasses are sent to the bacteriological laboratory from the affected organs, from the junction of healthy and damaged tissue. From necrosis lesions, the substance can be pipetted and welded to the laboratory.

For a vital diagnosis, a mechanical debridement of the decayed tissue and pus is performed, followed by a scraping of the boundary between the dead and healthy tissue. At the same time from these places are taken several stamped greases on the subject windowC. In addition to the necrotic layer when the oral cavity is damaged, the saliva of the sick animal is also removed. The material is sent to the laboratory in a fresh state or in a sterile 30% glycerin solution.

Greases prepared from necrotic tissue are fixed with alcohol-ether for 10 minutes, Leffller blue (preferably heated for 3-4 minutes), stained by Muromsev, Romanovsky-Gimza, Gram methodC. In greases, granular stained or thin long gram-negative rods are found. Microscopic examinations are the only basis for making a tentative diagnosis.

Topic 14. BRADZOTNI LABORATORY DIAGNOSIS.

The purpose of the training: Rules of obtaining and sending to the laboratory; study of bacteriological examination methods.

Materials and **equipment:** test- *Cl septicum, Cl. oedematiens* cultures, ready-made greases, patmaterial, sterile Kitt-Tarossi, Seyssler nutrient media, sterile Pasteur pipettes, dyes, tables, biopreparations, posters.

Methodical instructions

The teacher explains the lesson and gives the students the task: to sow the patmaterials in nutrient media, to prepare ointments, to paint them by Gram method , to draw and record their appearance under a microscope .

Bradzot is a rapid and acute toxic infection in sheep, characterized by general intoxication of the animal , hemorrhagic inflammation of the mucous membranes of the duodenum , accumulation of gases in the gastrointestinal tract, death of almost all infected sheep and has properties such as very rapid decay of the dead .

The causative agent is anaerobic microorganisms - *Cl. septicum, Cl. oedematiens.*

Pathological material. For laboratory examination, parenchymal organs (the part of the liver with foci of necrosis), from the altered wall of the spleen. swollen tissue, bone marrow, 12-fingered intestinal segment enriched by

both, exudates of the thoracic and abdominal cavities, subcutaneous tissue infiltrate are sent. The material is taken only from the newly dead animal.

l.Microscopy. Greases are prepared from patmaterials and painted by Gram method. *Cl septicum*- thin. the ends are twisted. polymorphic, rod 2–10 m long and 0.8–1 μm wide. gram-positive rods located one by one. In grease made of serous layers - in the form of long threadC. Spores are located in the center or at the ends of the oval. Movable, does not form capsules.

Cl. oedematiens large, polymorphic, twisted at the ends, sometimes shorter than one

in the form of a chain. It is 5-10 microns long and 0.8-1.5 microns wide. Gram-negative does not form capsuleC. Spores are located in the center or at the ends of the oval. Harakatchan.

2. Bacteriology. Kitt-Tarossi from Patmalerial is planted in Seyssler environmentC. Seedlings are grown in a thermostat at 37-38 ° C for 24-48 hours . Crops should be in anaerobic conditions (microanaerostat).

Cl septicum- Kitt-Tarossi is characterized by intense homogeneous turbidity of the nutrient medium and the formation of many gaseC. Seissler grows on agar as thin, colorless, silken scarf edges are trimmed. The colony is surrounded by a zone of hemolysis.

Cl oedematiens -Kitt-Tarossi is intensively turbid under the test tube in the nutrient medium, after 18-24 hours the broth becomes clear and sedimentation occurC. Less gas is produced. Seyssler agar is broad, rooted, layered, the edges are truncated, the center bulges, darkens, forms a strong hemolysis.

3.Biosinov. The suspension made of patmaterial is administered subcutaneously to the skin of the abdomen of two guinea pigs weighing 350-450 g in a dose of 0.5-1 ml. Observed for 8 dayC.

If there is a pathogen in the material, they die after 16-48 hourC. They show the following pathological changes: in the material

Cl. in the case of *septicum* - the skin of guinea pigs is easily separated from the muscleC. At the site of delivery of the material, the muscles are light red in color, there is a significant amount of gas bubbles in the subcutaneous tissue, swollen intestines, a large amount of transudate in the chest cavity and the heart sac.

Cl. in the case of *oedematiens* - a swollen tumor at the site of delivery of the material to guinea pigs, a tumor of the connective tissue muscleC. -The swelling is yellowish to light pink, the muscles are bloodless, the parenchymal organs are unchanged.

From the place where the dead guinea pig patmaterial is sent, blood and liver from the heart are inoculated into nutrient media and ointments are prepared.

BiopreparationC. For vaccination, a concentrated polyvalent hydroxyaluminum vaccine against bradzot is used.

Topic 15. CAMPYLOBACTERIOSIS CAUSE AND LABORATORY DIAGNOSIS

Campiobacteriosis (vibriosis) is a chronic disease of cows, heifers, sheep, characterized by abortion, infertility, death of young animals, retention of the placenta, metritis, vaginitiC. In sheep, gross abortion is observed in the second half of pregnancy.

The causative agent of campylobacteriosis - *Campylobacter fetus (foetes), genus Campylobacter* , order *Spirochtaeles* , *belongs* to the family *Spirillaceae* . *The Campulobacter* family includes three species: *C. Sputorum, C.fecalis, C. fetuC.* The instigator was first discovered by McFedien and Stockman in 1913-1918. Three different pathogenic fetal vibrios have now been identified. That is, *C. fetus* is divided into three *subtypes* : *C. fetus, subsr. Fetus* is a large horned animal, pathogenic for guinea pig and chicken embryos; *C. fetus subsp. intestinalis* - occurs mainly in sporadic children in sheep, abortion in cows, rarely infects humans, develops in its intestine and gallbladder . C. fetus *C. Jejuni* - *causes* abortion in sheep, is found in the intestines of healthy large horned animals, pigs, birdC. In very rare cases, people are harmed.

Morphology and tinctorial featureC. Campylobacter occurs in young cultures in the form of commas, ie twists, length 3 - 7 microns, width 0.2 - 0.5 micronC. Greases made of pathological material are in the form of commas, flying squirrels, spirilla. They can gather and form vibrion threads, just like spiralC. At one end of the vibrio has a spike, very mobile, does not form spores and capsuleC. It stains well with aniline dyes, especially when dyed with carbolic fuchsia in the Romanovsky Gimza method, there are granules in the cell body.

Cultural featureC. *C. the fetus is a* microaerophilic, growing in culture with 10% CO_2. The optimum temperature is 37.5 ° C. Semi-liquid, dense nutrient media with the addition of blood or whey are used to isolate the primary culture. Semi-liquid liver 0.2% agar grows in the form of a grayish-white ring near the critical surface in 2–7 dayC. On 2 - 4% of meat-liver peptone agar 3–4 days appear small colonies or spreadC. Grows in the form of a thin cloud, in a bloody or whey broth. If the semi-liquid peptone agar, the culture is not stored for more than 10–20 dayC. To preserve it for a long time, it is replanted in a semi-liquid or Kitt-Tarossi environment and stored in the refrigerator.

A saffron-iron-novobiocin medium was also proposed to isolate the pathogen from the patmaterial.

Biochemical propertieC. *C.fetus does not* break down carbohydrates, does not change litmus milk, secretes catalase, does not grow in 3.5% *Nacl* li GPB. Vibrios isolated from sheep secrete weak hydrogen sulfide. Poisoning has not been identified.

Durability. The vibrating agent decomposes rapidly in moldy material and is not resistant to high temperatureC. Dies after 10 minutes at 55 ° C, when drying - after 3 hourC. Straw, manure, water at 18-20 ° C is stored in the soil for up to 20

days, at 6 ° C for up to a month. Resistant to low temperatureC. Usually a solution of gi disinfectants kills them after 5-10 minutes.

Pathogenicity . Under natural conditions, vibriosis infects large horned cattle and sheep regardless of breed. Sometimes goats get sick. Sheep, goats, guinea pigs, guinea pigs, and heifers are susceptible to artificial infestation with Vibrion culture. can cause damage. Campylobacter is also pathogenic for chicken embryoC. The microbe develops in the fetal ollontois fluid, killing it by 7-12 dayC.

PathogenesiC. Infected bull semen, prepusial sac, vibrios in sperm are stored for a long time (years). Vibrios fall into the vagina of a cow or heifer, develop rapidly and pass into the uteruC. Catarrhal vaginitis develops, endometritis, resulting in the death of the fertilized egg or embryo in the early stages of development. In some cases, pregnancy continues, but vibrios enter the maternal placenta, the fetal membranes, causing inflammatory processes and disrupt blood circulation in the placenta. This leads to abortion in the later stages of embryonic development.

Vibrios appear in the blood of sheep 3 to 4 days after alimentary infestation. They then pass into the fetal uterus and cause necrotic inflammatory processes, leading to abortion.

The structure of the antigen is not well studied. Pathogen strains isolated from large horned cattle were found to differ in antigenic structure from pathogenic strains isolated from sheep. Some scientists (March and Firegammer, 1958) believe that “there are four types of strains isolated from sheep that differ in antigenic structure, while cattle strains belong to the fifth type.

Immunity. There will be no re-abortion in animals that have recovered from vibriosiC. They are characterized by the formation of antibodies (AR, CBR, UVKBR).

DiagnosiC. In the laboratory, microscopic, pure culture of vibrio is examined by methods of separation, its differentiation, biosynthesis in heifers or laboratory animalC. Placenta from cows for laboratory examination, mucus from the cervix (taken sterile on the 3-4th day after weaning or during puberty); from pedigree bulls - prepusial mucus, semen, gonadal secretions; from animals killed for diagnostic purposes - the lymph nodes of the vagina, uterus, dusty cavity.

Topic 16. PATHOGENIC RICKETS AND CHLAMIDIA

Rickettsiae include a large group of microorganisms belonging to the genus *Rickettsiales* . The structure of the cell wall of the store, RNA and DNA, and a number of other features of this group of microorganisms bacteria and their representatives of the smallest one . The main difference from other bacteria is that they parasitize inside the cell.

There are many differences within the *Rickettsiales* series, so only species of the *Rickettsiaceae* family are true *rickettsiae* . These are typhoid fever, ductal fever, ku-fever and other rickettsial pathogenC. The rest of the representatives of this line should be called *rickettsiae* , and given the considerable difference between them, the *representatives of the Erlichia lineage should* be called *erlichia, the Cawdria lineage the caudria, and the Neoricketsia lineage the neoricketsia* .

Rickettsiales agents , including the *family of Rickettsiaceae* the first time, an American microbiologist Rikkets expressed by the (1909-1910). The microorganisms of the rickettsiae are so named in his honor. 12 species belonging to three genera of warm-blooded are known. The Rickettsiaceae family includes a group of obligate intracellular, gram-negative bacteria that infect humans, warm-blooded animals, birds, and arthropodC.

In most rickettsioses, the pathogens pass through the blood-sucking fleas that suffocate.

Rickettsiae are oval, coccygeal, rod-shaped, polymorphic microorganisms 0.3-1.2 in length. The rod-shaped forms have a diameter of μm (up to 2.5 μm), a diameter of 0.2–0.3 μm, a three-layered cytoplasmic membrane of the coccyx, and a peptidoglycan layer between them, which is also characteristic of gram-negative bacteria.

Only in living, dying tissues does it multiply by dividing. Contains DNA, protein, carbohydrates, lipids, lipopolysaccharideC. Sensitive to tetracycline antibioticC.

The biological properties of *pickets* (erythrocytes, caudria, neorickets, bartonellae, anaplasmas) differ significantly from the natural conductors and carriers of pathogens in terms of cytotropy.

Erythrocytes are small, polymorphic microorganisms that multiply in the cytoplasm of circulating leukocytes of susceptible animalC. Grammanfi, Romanovsky - Gimza is painted in blue .

Sensitive to tetracycline. Pathogens of diseases of large horned and small horned animals, horses, members of the dog family.

Codria are polymorphic, coccygeal or elliptical microorganisms with a transverse dimension of 0.2 to 0.5 μm. It multiplies in the cytoplasm of the endothelium of the vascular bed. Still, gram-negative, dyed blue in the Romanovsky-Gimza method with aniline dyeC. Does not grow in cell-free environmentC. Sensitive to sulfanilamides and tetracyclineC. *The* amblyomma generation passes through the iksoda canalC. It is not known whether the canvases are transvorial. Heart attack (serdechnaya vodyanka) - causes sepsis in African housewiveC. Virulent strains kill 20-95% of animalC.

Neorickets are small polymorphic organisms with a transverse dimension of 0.3-0.4 μm. more lymphoid tissue of the dog family is increased in the cytoplasm of reticular cellC. Gram-negative, motionlesC. Dyed blue with aniline dyeC. Does not grow in cell-free environments and chicken embryoC. Sensitive to

tetracycline. The conductor is the trematode. In the Midwest and the West Coast of the United States, it causes disease in animals belonging to the dog family.

Bartonellas are parasites of erythrocytes of humans and other vertebrateC. Round and elliptical in shape or thin, straight, curved or curved rods less than 3.5 μm in diameter, located inside or on the surface of erythrocyteC. It stains well with aniline dyes, especially after fixation with methyl spirit and stains well in the Gimza method. As a result, no eukaryotic nuclei are detected in them, allowing them to be distinguished from the simple ones that parasitize erythrocyteC. Gram-negative. It grows in environments where there are no living cellC. Representatives of the Bartonella genus have a cell shell. Multiplies by binary division. In cultures, hivchins appear at one end. People call it barteneiliosiC. It is also found in small mosquitoeC. The disease is known on the South American continent. *The Grachamella genus has* been identified only in mammalian erythrocyteC. Inactive, no strings, grammatical. Rodents cause grahamellosiC. Geographically widespread.

Anaplasmas are obligate parasites of erythrocytes of yu and wild vertebrateC. Rod-shaped, spherical, coccygeal or annular bodies with a diameter of 0.2-0.4 μm. It is dyed red in the Gimza method with aniline dyeC. Gram-negative.

Pathogenic chlamydia. Bacteriological examination. Identification of the pathogen by light and luminescent microscopy in the primary material, isolation of pure culture by biosinov method and identification of the pathogen by morphological properties.

Fragments from parenchymal organs to the laboratory from dead or forcibly slaughtered animals; at abortion - the fetus or its parenchymatous organs and stomach; live-ejaculate samples or frozen sperm are sent to the blood for serological testing. The material is removed within 2 hours after the death of the animal, or abortion, and placed in an ice thermos.

Microscopy. Greases prepared from pathological material for light microscopy are stained by Romonovsky-Gimza (chlamydia are red or blue-purple depending on the stage of development), Stemp methodC. Preparations for dyeing by the Stemp method are heated and hardened. It is stained for 15 minutes with a 1: 5 solution of tuberculosis fuchsin (pH 7.4) prepared in distilled water. It is then treated with a 0.05% sulfuric acid solution for 1 minute, washed with distilled water and stained for an additional 30 seconds with an l% aqueous solution of malachite green. Then washed with water and microscopes are considered:

Z.J.Shapulatova (1989) studied in young calves that were naturally ill and experimentally artificially infested.

Enzootic abortion of cows was first observed in California in 1923 by Trout and Hart. In 1956, the etiology of chlamydial abortion in cows was determined by serological and cytological examination in the Federal Republic of Germany.

The group of chlamydia includes common pathogens of human and animal diseases with similar antigenic properties and morphology as well as a number of biological features.

Attempts to determine the place of chlamydia in the system of microorganisms on the basis of certain taxonomic traits are of great difficulty.

In a number of respects they resemble rickettsiae: 1) have a shell; 2) contains DNA and RNA; 3) there is muramic acid in the cell wall; 4) the **path of** division into two increases in the wrist, at least at one stage; 5) sensitive to sulfonamides, penicillins and tetracyclines, probably due to the presence of folic acid; 6) Gram-negative, well painted in Castanedo and Machiavelli methods, has a distinctive color layout.

Perhaps on the basis of the above indications, in the official nomenclature of bacteria developed in accordance with the International Code of Bacterial Nomenclature in the Bergi Bacterial Determinant, chlamydia are included in organisms that develop within the obligate cell.

It should be noted that chlamydia and rickettsia have different symptomC. For example, rickettsial metabolism develops more intensively in weak cells, and the development of chlamydia requires a cell with a high level of metabolism. Unlike rickettsiae and bacteria, chlamydia does not have its own energy exchange and electron conduction system. All forms of development of rickettsiae are infectious (infectious), while in chlamydia only the elemental bodies are contagious, and the intermediate form of development (reticular bodies) is not contagiouC. Chlamydia *Chlamidiales* , such as *Chlamydiaceae* family, *Chlamidia* generation.

Classification. Chlamydia is a specific taxonomic group of microorganisms that are similar in antigenicity, similar in tinctorial and morphological propertieC. They cause infectious diseases with **different** acute and latent pathogenesis and clinical signs in animals . The specificity of these pathogens is characterized by the strange development cycle that occurs in them, as well as the specific characteristics characteristic of bacteria and viruseC. Diseases caused by chlamydia — chlamydia — affect almost all organs and tissueC. Together with other taxonomic groups (viruses, bacteria, soda animals) infectious diseases, they aggravate the course and consequences of a number of diseases.

Chlamydia is derived from the Greek word chlamyda -*mantle* because they form mantle-like inclusions in the affected cells.

Chlamydial pathogens *belong* to the family *Chlamydiaceae* , as *well* as *Chlamydeales* . One genus consists of *Chlamydia* and two species: *C, trachomatis* and *C. psittaei* . *C. trachomatis* is a pathogen for humans and mice. *C. psittaei is the* causative agent of ornithosis (psitacoosis). causes a number of infectious diseases in animals and poultry. The development of the pathological process depends on the location of the pathogen. Chlamydia mainly infects the respiratory organs and intestinal tract of poultry, lambs, calves, piglets; genitals of large and small horned animals; synovial tissue of calves, piglets, lambs,

heifers; large horned animals, pigs, sheep, cats, etc. damage the mucous membranes of the eyeC. The clinical manifestations of chlamydia are also different: diarrhea, pneumonia, conjunctivitis, polyarthritis, pericarditis, encephalitis, abortion, stillbirth, infertility, vaginitiC. endometritis and other symptomC. Wild and domestic birds (more than 130 species) are prone to C. *psittac* , more ducks, turkeys, geese, less-chickens, pigeons (ornithosis) than domestic birdC. Abortion with chlamydia poses a great risk to humans, especially those who are infected with ornithosis.

Morphology. In the development of chlamydia, initial bodies appear in the intermediate stage of development, followed by the formation of tiny elementary bodieC. Elemental and initial bodies vary in infectious activity, size, and density.

The cleaned elemental bodies have an infectious form with a diameter of 200 to 400 nm. Elemental bodies have a spherical shape, an electron-less dense central mass with less electron density, and a flat surface structure. The inner material that forms the nucleoid of the elementary particle appears to be away from the dense, bounding membrane. The nucleoid is homogeneous, eccentrically located, sometimes resembling a tightly wrapped fiber bundle. The rest of the body is composed of a dense substance made up of ribosomes.

Intermediate noninfectious forms of chlomidia are called reticular bodies and range in size from 500 to 1000 nm. Reticular bodies have a particle size of 1600 nm in diameter. In thin incisions, the reticular bodies are irregular or round in shape. The density of the inner part of the reticular bodies is moderate, reminiscent of a net.

Chemical composition. The shell is made up of about 35% protein, with the participation of all amino acids except arginine and histidine. Chlamydia in the form of phospholipidiar lecithin and neutral fats make up 35-40% of the dry masC. Chlamydia does not contain many carbohydrates, these microorganisms are rich in hexosamine. The bark contains muramic acid, which makes chlamydia sensitive to the effects of penicillin.

Chlamydia always contains DNA, and the amount of RNA varies depending on the stage of development of the microorganism and the method of preparation of the suspension of purified cells.

There are three types of RNA in the infectious parts of chlamydia, the size of which is 215, 165, 45 gateng.

Reproduction. When studying the adsorption and entry of the pathogen into the cell, it was observed that the elemental bodies of chlamydia touch the cell membrane. A bump is formed where the chlamydia adheres to the cell membrane, where the integrity of the chlamydia remains intact. The master-cell slowly swallows it. After 2–5 hours, they are located at different depths in the cytoplasm of the cell. Cell adsorption of chlamydia requires Ca^{+2} and Mg^{2+} ions in the medium for adsorption on temperature and pH . In well-adapted “chlamydia-cell-host” systems, adsorption and proliferation did not occur rapidly and efficiently.

Infectious particles of chlamydia retain their infectivity in the cytoplasmic vacuoles; in which small elementary bodies turn into reticular (lattice) shapes with large diameters up to 800 nm. Reticular forms are not considered infectious, they grow and multiply through binary division. Reticular forms are less resistant and are rapidly degraded during fixation, making it difficult to understand the morphological difference in chlamydial replication. But the application of improved methods of fixation makes it possible to observe the process of division of reticular forms: the contraction during division is reminiscent of the process of simple detachment.

In the second stage of the reconstruction, which includes intermediate forms, small, dense centers - bodies of chlamydia - appear. The larger ones do not appear as a flat one, so they store the particles that are at different stages of maturation in a single khit.

These multiplying forms of chlamydia accumulate in microcolonies and enter the matrix to form cytoplasmic inclusionC. The inserts are round and spherical in shape. their diameter is a few micrometers, and eventually the inclusions disperse, from which thousands of elementary bodies emerge.

Chlamydia easily adapt and multiply in cell cultureC. It is the only L-cell system that provides many chlamydiaes at specific stages of development suitable for reproduction in cell suspension. Many reports reported the presence of chlamydia in cell cultures, but did not provide information on its reproductive status, the infectivity of the strains, or the status of chlamydia in multiple transplants.

Durability. Infectiousness of chlamydia is maintained in bladder water, swimming pool water at room temperature for 2-3 dayC. Chlamydia is very sensitive to high temperatureC. Strains derived from birds lose their full infectivity within one day when stored at 43 ° C. Chlamydia is weakened in 5 minutes when heated to 56 °C in the form of a 20% turkey tissue suspension . Optimal pH 7.0-7.4. Chlamydia is slightly inactivated at high and low pH, as well as under the influence of 0.1% -formalin solution, 0.5% phenol solution and 2% chloramine solution.

When working with chlamydia, it is important to know the response of chlamydia to antibiotics, especially when growing them in cell cultures.

When separating chlamydia from pathological material (when working with chlamydia in general), they can be used to stop the growth of bacteria. Streptomycin, kanamycin, and mycostatins stop the growth of most bacteria, while they do not affect the growth of chlamydia.

For the treatment of chlamydial material, streptomycin is used in doses of 500 mcg and more per 1 ml of solvent. Streptomycin at doses higher than 10,000 mcg / ml as well as mycostatin at 500 TB / fetal dose do not affect chlamydia infection. but mycostatin 2000 Tbhomila slightly reduces the susceptibility of chlamydia.

Chlamydia is sensitive to penicillin to varying degreeC. Under its influence in the yellow sac of the chicken embryo develops large, irregularly shaped elemental bodies of chlamydia.

When penicillin is destroyed, these cells return to their normal shape again. Penicillin disrupts the development of intermediate and small forms of the pathogen. No increase in susceptibility was observed for 15 h when penicillin was added to the cell cultureC. It had no effect on infection when shipped 15 hours after infection. Tetracycline series antibiotics and chloramphenicol are good inhibitors in the proliferation of chlamydia . Tetracycline stops the replication of chlamydia in the early stages of development. Therefore, tetracycline is used in the treatment of chlamydia.

Antigen structure. Xlamidiyalarni the main two types: the first generation of Chlamydia antigens common to all pathogens, which complement binding reaction, reaction and indirect gemagglyutinasiya, agglyutinasiya reaction, gemaggiyutinasiya presipitatsiya gel into the skin, and gemagglyutinasiya reactions to testing. It is tightly bound to chlamydia, more precisely within the cell wall. It is detected throughout the entire development cycle, but more of it is detected a few hours before the infection reaches its peak.

The main feature of a group-specific antigen is its thermostability. It is resistant to boiling and autoclaving (135 C). The extraction of diagnostic antigens by boiling purified or partially purified chlamydia suspensions and extraction with sodium deoxy, acid, alkali, ether, water is based on this principle.

The group specific antigen has a carbon fraction in its composition. It has a lipid fraction. Its lipid fraction is soluble in ether and other fat solventC. The group-specific antigen is resistant to proteolytic enzymes, due to the absence or extreme deficiency of protein in its composition.

Specific antigen of chlamydia species is detected in neutralization, toxicity, indirect hemagglutination, precipitation and complement fixation reactionC. It differs in thermolability and resistance to lecithinase, phenol, acid and papoins.

Chlamydia are tightly bound to the cell wall. Antigen of the cell wall type antigen neutralizes toxin-neutralizing antibodies and corpuscular antigens in hyperimmune serum. capable of adsorption.

In addition to these two antigens, antigens specific to the causative agent of infection were found in the shell of chlamydial particleC. Chlamydia isolated during enzootic abortion in sheep has been shown to be antigenically different from the causative agents of sheep pneumonia and polyarthritis.

The causative agent of ornithosis.

The causative agent - Chlamydia psittaci belongs to the chlamydial family.

Ornithosis (psittacosis) is an infectious disease of birds, dangerous to humans and manifested by signs of respiratory damage.

Pathogenicity. Often infected are parrots and pigeons, which are spontaneous carriers of this microbe. Also wild

many species of birds (more than 100), from agriculture: ducks, chickens, turkeys, peacocks, geese are more prone to disease, especially the young. The main source of the pathogen is sick and diseased birds, which secrete chlamydia with nasal discharge and feces (carrier of the pathogen - up to 4 months). Respiratory tract infections, in rare cases, through food and water contamination. Ornithosis is sometimes accompanied by mycoplasmosis in chickens and sarmonellosis in ducks.

Durability. The pathogen dies in 10 minutes when heated to 70 C, stored in water for up to -17 days, and in feces for up to -4 monthC. Low temperatures preserve chlamydia and they can be stored for yearC. The pathogen is not resistant to chemicalC. 3% chloramine solution, 5% quenched chlorinated lime are good disinfectants.

Immunity. After recovering from ornithosis, he develops short-lived immunity. But special preventive measures have not yet been developed.

PathogenesiC. The pathogen enters the respiratory organs of birds and multiplies, then passes into the bloodstream and spreads throughout the body, causing septicemia. Asymptomatic infection usually develops asymptomatically.

DiagnosiC. In most cases, the issue of diagnosis of avian ornithosis arises in connection with human disease. In addition to epizootiological, kinetic and pathoanatomical data, the results of biosynthesis and continuous complement binding reaction are taken into account when diagnosing ornithosiC. For rapid diagnosis, branded smears prepared from organs or upper respiratory organs, air sacs, mucous membranes, and conjunctival exudates are viewed under a microscope (finding elemental bodies).

In the vital diagnosis of ornithosis in poultry, the proposed allergen is used for the allergic diagnosis of human ornithosis.

Topic 17. VARIABILITY AND HERITAGE OF MICROORGANISMS

The science of the variability and heredity of microorganisms is called geneticC. It is also necessary to know the variability of living organisms, the influence of external environmental factors on them. Often human life is not enough to determine the variability in each generation of animalC. Microorganisms, on the other hand, grow and multiply rapidly, and are sensitive to environmental influenceC. Therefore, the main object of genetic testing remains microorganisms.

Scientists have been dealing with the variability of microorganisms since the second half of the 19th century. The founders of Russian microbiology IIMechnikov, LSSenkovsky, SNVinogradsky and others are based on Darwin's teachings in the study of variability. LIMechnikov wrote: “It is in the field of microbiology that it has been proved that the variability of bacteria occurs through changes in external conditions, which can also lead to the development of strong hereditary variability.

Polymorphists (K. Negli, H. Buchner) believed that microorganisms could suddenly have permanent morphological, cultural, and other changeC. K. Negli denies the constant homogeneity of the microbial form. He even believes that one type of microbe can turn into another. According to polymorphists, a spherical microbial cell can take the form of a rod, a spiral, change its biological properties, and return to its previous state. Thus they deny the specific properties of microbeC. This is because it was not possible to isolate the pure culture due to the imperfection of the inspection methods at that time.

Monomorphists (F.Cohn, R.Cox) consider microbial species to be permanent. They denied the variability of the microbe under the influence of external environmental factorC. The idea of monomorphists was further strengthened after the discovery of infectious pathogens.

As a result, proponents of both currents have not been able to properly understand the cause and extent of variability in microbeC. This means that they have not been able to apply the laws of dialectical materialism correctly to microbes.

As science progressed, the development of methods for examining microbes revealed the isolation of their individual pure cultures and the degree to which each type of microbial external change, as well as the existence of certain laws of these changeC. Darwin's theory of evolution is of great importance in microbiology, as it is proven that the new features that emerge as a result of change are passed from generation to generation. proved to have. Subsequent examination revealed that with the change of critical conditions, organisms often develop new symptomC. They are temporary or permanent and are passed down from generation to generation. Microbes can lose their virulence. Remains resistant to drugC. An increase in the amount of products of vital activity may change the morphological, cultural and other characteristics.

Morphological change. Temperature chemicals phages, antibiotics and other factors can change the shape of microbeC. The rods can become round, longer and thicker, swollen. Such changes often occur in older cultureC. NFGamaleya called this state-heteromorphism.

Cultural change. Homogeneous microbes can have different cultural characteristics under the same conditionC. In a dense: q environment, form 5 (*smooth-smooth* from English *)* forms smooth, clear, marginally flat colonieC. *In the R*- shape (*rough- broad* from English) the *broad* is not clear, the surface forms layered colonieC. These forms include the intermediate O- and *M*- forms (intermediate and slimy).

Such cultures differ not only in shape (growth), but also in other characteristicC. For example, the S-form microbe is pathogenic, has good agglutination propertieC. There are no such signs from the R-shape and it often does not transition to the S-shape. It is based on a mutation.

Biological change. It has long been known that animals that have been exposed to microbes in the body are resistant to re-infection and do not get sick.

L. Pasteur weakened the chicken plague culture by keeping it in a thermostat for a long time. When injected into the body, such a culture did not infect the chicken, but created immunity. L. Pasteur studied in other microorganismC. The anthrax was able to weaken the culture by keeping the causative agent at temperatures above the optimum temperature (42, ° C) for 12–21 dayC. (1881) a vaccine was later prepared. Two years later (1883) LS Senkovsky developed an anthrax vaccine in Russia based on the work of L. Pasteur.

In 1885 L. Pasteur and E Ru. The latent period of the disease was shortened to 6-7 days as a result of repeated transmission of the rabies virus (133 times) to organisms, alkaline exposure to it, and transfer of one of the 133 rabbits to another brain to alter the viruC. The virus has been called a “virus fix” because it retains its acquired propertieC. The trigger was weak, though dangerouC. E.Ru suggested weakening the spinal cord, which is a viral fix in the composition. The virus-protective spinal cord is dried in KOH steam for 2 weekC. Such material did not show signs of disease when administered subcutaneously and is used to prepare the vaccine.

This means that the microorganism can change its biological properties by being affected by various factors.

Based on genetics, it has been determined that the first information of the genetic characteristics and traits of all organisms is located on the chromosomes of all cell nuclei. That is, the molecular basis of heredity is nucleic acid-DNA, and in some cases RNA. -

Nucleic acids are made up of nucleoproteins, which consist of phosphoric acid, a molecule of sugar - deoxyribose (ribose) and a nitrogenous base - thymine (uracil), guanine or cytosine.

The nucleus of bacteria, which consists mainly of DNA, is called the chromosome. The basic unit of heredity and variability is a specific part of the chromosome, which is the gene. On the chromosome, the bacterial cell's DNA is all in the form of a pair of spirals, the basic structural unit of which is the nucleotide. A bacterial cell has a single chromosome in which the codes of genetic markers are located in the same plane. They control the formation of one-by-one biochemical reactions in a certain order. That is, genes control the division of the resulting genetic markers (in cell division) into two correct parts.

The codon is a unit of information consisting of 3 nucleotides (tiriplets) encoding a single amino acid.

At the heart of heredity management is a set of genes based on genotype, which identifies genetic traits in organisms, including microblaming. But genotype change. the characters in it are realized by phenotype.

For living organisms, there is also the property of variability as opposed to genetic traits, a process in which genes change and these changes are passed down from generation to generation as a result of the development of organismC. Heredity and variability are two sides of the same phenomenon. In nature, the

change of organisms and the transmission of hereditary traits occur through legal processes.

Variability forms of microorganisms.

The variability and shape of microorganisms vary. The phenotype variability depends on the environmental conditions and does not pass from generation to generation even if stored for a long time. Genotypic variability is passed on from generation to generation.

Phenotype variability includes adaptation and modification. *Adaptation is* the adaptation to the critical conditions of microorganismC. This is not due to changes in the cell of the microorganism now, but to the fact that previously altered microbes develop and fail to adapt. For example, when microbes are exposed to antibiotics, adaptive cells develop and multiply, and the rest die. That is, natural selection emerges.

Modification is the change of organisms under the influence of environmental conditionC. Only the phenotype (external) characters - the shape and size of the microbe - change. For example, when calcium chloride is added to the medium, the intestinal rod becomes very short. If removed from the environment, it returns to its previous state. When glycerin or alanine is added to the medium, polymophysis occurs in the plague vibrio. Modification is observed under normal living conditions, physiological processes of the organism are not disrupted. Prolonged strong exposure to the microbial cell leads to deeper changes.

Genotype change is a genetic unit that consists of the genomic nucleic acid portion of a molecule (in DNA or RNA-storing viruses). Genomic nucleic acid not only stores genetic information, but also has the ability to pass it on to offspring. Protein biosynthesis takes place in two stages: the first is called DNA-m RNA transcription, and the second is called mRNA-protein-translation. H. Temin and D. Batimor discovered in 1970 that the transfer of reverse transcriptase genetic information using the enzyme revertase could take place in a different direction.

That is, from the RNA molecule to the DNA, where RNA becomes a matrix for DNA synthesis

Natural mutation. (spontaneous) is very rare, about one in 100. It is usually characterized by the variability and permanence of a single character.

Mutagenic mutations (induced) generations of microbes arise from the influence of environmental conditions: physical, chemical, biological, **radiation** . Under the influence of such factors, the metabolism of microbes changeC. Physical mutagens include various types of radiation: ultraviolet, X-ray, radioactive. They damage the genetic apparatus and alter the markings and properties of microbes.

Chemicals - strong active substances: poisons (mustard), drugs (iodine, hydrogen peroxide), acids (nitric acid) and others.

DNA is an example of a biological mutagen. For example, when Drosophila of some oncoviruses is sent to the embryonic cell, new symptoms appear in adulthood, a strange tumor, or pitting, initially appears, sometimes without eyes.

Vaccines of the virus and live viruses have been shown to have mutagenic effects in mammalC. They infect not only somatic but also the genetic apparatus of germ cellC. Certain effects of viruses are particularly evident during epizootics and epidemicC. The number of mutations increases with metabolic disorders and aging of organisms.

A variety of mutagens are used to generate beneficial traits of microorganismC. In this way, strains of highly active microorganisms that produce antibiotics and other substances are isolated. Radiation from penicellin-producing microorganisms resulted in 10 times more penicellin-producing strains than before. The same goes for those that produce vitamin B_2, B_{12}.

It is important to know that after mutagenesis, not only beneficial but also harmful symptoms appear. In addition to identifying thousands of culture strains to identify it, it is also necessary to study their propertieC. As a result of many years of work, the production of essential amino acids (lysine, gulitamine) has been increased several timeC. Under the influence of radioactive substances, profound changes occur in the genetic apparatus, but also resistant microorganisms appear. From the recombinant changes, the genetic material of two microbial cells that differ from each other in genetic traits is combined to form a modified offspring, in which the characteristics of the two mother cells are combined.

Combinatorial changes occur as a result of transformation, transduction, and conjugation.

Transformation is the transfer of genetic material (parts of DNA) from one microbial (donor) chromosome to another microbial (recipient) chromosome. In doing so, one sign of the microbe is exchanged with another, which was first identified in 1928 by the English microbiologist D. Griffith. He injected mice with two cultured cultures of pneumococci simultaneously, a non-pathogenic capsule-free (R-strain) and a capsular pathogen (S-strain) culture. All mice get sick and die. A capsular, virulent pneumococcal culture is isolated from their organC. This is because a heat-killed capsule pneumococcal culture caused transformation in the body of microbes without live capsuleC. As a result, they have the ability to form capsules, which remain pathogenic.

In 1944, a group of scientists (O. Every, K. McLeod, M. McCarthy) experimented with the Griffith experiment *in vitro* . They added DNA from an avirulent, capsule-free strain of pneumococcal culture to a virulent capsule-forming culture strain. As a result, pneumococci without avirulent capsules become virulent. Hence, DNA carried the virulence property.

The transformation process consists of 5 stages:

1) Adsorption of the transformed DNA into the microbial cell.

2) The entry of DNA into the recipient cell.

3) The fusion of DNA with the chromosomes of the recipient cell.

4) The incorporation of donor cell DNA into recipient chromosomes.

Changes in nucleotides as a result of subsequent splits can transform the synthesis properties of enzymes and other products of microbial susceptibility and

resistance to antibioticC. Transformation of DNA traits takes place under certain conditions in a certain physiological state of the cellC. Optimal temperature of transformation At temperatures above 29-32 ° C (80-100 ° C) chemicals (nitric acid) ultraviolet light, DNA - *the* enzyme DNA inhibits the transforming effect of DNA. Thus nucleic acids are carriers of genetic information.

Transduction In 1952, N.Sinder and Dj. Identified by Lederberg. In such variability, the genetic material is transferred from the donor cell to the recipient cell by a transductive phage. How is this going? During the reproduction of some phages, parts of the microbial cell's genetic material (DNA) enter the newly formed cell, transfer the genetic material of the donor cell to it, and subsequent recombination begins.

Three types of transduction are distinguished; general, specific, and abortive. In general transduction, different or more symptoms pass simultaneously. Specific transduction is characterized by the transmission of a specific signal. In abortive transduction, the DNA portion of the donor cell is phased into the recipient cell, does not enter the genome, and no new markers appear. Conjugation is a form of sexual process in which the inherited trait passes from a donor cell to a recipient cell through a cytoplasmic connection between them. This condition first appeared in the intestinal rod and was explained in 1946 by D. Lederberg and E. Teytim.

Fertility factors have been identified in microorganisms and play an important role in the exchange of genetic information. In addition, gram-negative microbes are sex-vorsinka, ie cytoplasmic tumors that carry hereditary material during conjugation.

Donor traits are called male cells because they contain proliferative (fertile F +) factors; recipient cells are called female cells (F-) because there is no multiplication factor in the uiar. In addition to the DNA of the central apparatus, the cytoplasmic DNA is also involved in the transmission of genetic markers from one cell to another. The genetic elements of the cytoplasm are called plasmids (episomes).

At present, methods for the preparation of live vaccines with reduced pathogenicity against many diseases have been found as a result of the targeted transformation of microbeC. Modifications of microbes using genetic methods are further expanding the ways in which artificial immunity is generated. Great strides have been made in the formation of protein and antibiotic-producing cultures of yeast and bacteria.

Therefore, the variability of microbes plays an important role in the daily practice of medicine, veterinary medicine and the national economy, as well as in the diagnosis of microbiology, preparation of vaccines, obtaining amino acids, vitamins, organic acids, proteins.

In addition to factor *F* , the plasmid also has R-factor resistance factor, *Urye*- factor *Hly* -factor hemolytic, and so on.

In intestinal rods, proteinaceous modes are formed under the control of plasmids, which are called colicinC. Such substances are adsorbed on the surface of sensitive cells, stopping metabolism and they die. Colicins not only kill a group of pathogenic intestinal rods but also help normalize intestinal biocinosiC. Plasmids are also present in other microbes, under the control of which the bacteriocin substance is produced, killing species close to it.

Thus the three forms of combinatorial variability (transformation, transduction, and conjugation) are different in form, but essentially the same. In transformation, the DNA fragment of the donor cell enters the recipient cell , in transduction the phage performs this function, and in conjugation the passage of genetic information takes place through the cytoplasmic bridge.

The importance of variability of microorganisms in practice.

Knowing the variability of microorganisms, it is possible to create beneficial properties by acting in the target direction. This is the case under the influence of mutagenic factorC. mutants were obtained, which is much higher than the previous one in terms of its effectivenesC. In this way, highly active microbial strains producing penicillin, erythromycin, tetrocycline and other antibiotics were obtained. Using the genetic method, microorganisms that produce large amounts of certain amino acids (glutamine, lysine), vitamins, organic acids, and other products have been isolated. A new field of molecular biology called genetic engineering is evolving. It deals with the construction, separation, and transfer of certain genes from one cell to another. As a result, the cells acquire new propertieC. They can be used in the national economy. For example, a gene that synthesizes insulin is isolated from the human body and transferred to the Escherichia coli genome. This bacterium produces a protein called insulin, a hormone secreted by pancreatic cells that is needed to treat diabeteC. When the Escherichia coli develops and multiplies, it is possible to get enough insulin. This will solve the problem of millions of people.

Observations show that the disease is atypical and difficult to diagnose by clinical and laboratory methods as a result of the emergence of infectious pathogens with reduced virulence, which can pass without characteristic symptoms in nature. Under the influence of mutagenic factors, microorganisms, in addition to beneficial properties, also develop properties that change their nature, resulting in the formation of latent and abortive forms of the disease. Awareness of such signs acquired by microorganisms allows the correct implementation of measures to combat infectious diseases of humans and animals.

Topic 18. MICROFLORA IN ANIMAL BODIES

The skin microflora is not constant, its composition depends on the living conditions of the animals, the environment (air. Bedding, separations) and so on. They are mainly staphylococci, diplococci, streptococci, sarcinaC. They live in the ducts of the sebaceous and skin glands in the wool sac, and when the animal's body is weakened, the skin is damaged, forming abscesses, boilC. Of the rod-

shaped bacteria, Escherichia coli, blue pus bacteria, hay bacilli, actinomycetes, molds, and yeast fungi are the most common. Depending on the purity of the animal's skin, there are tens of thousands to 2 billion microbes per 1 cm^2.

There are very few microbes in the mucous membrane of the **eye** and its type is also extremely rare, most often cocci are found, yeasts and molds are rare.

Germs in the respiratory tract There are no microbes in the respiratory tract of the newborn. As you begin to breathe, germs in the air enter the airwayC. In the nasal mucosa live cocci - more staphylococci, streptococci, micrococci, less sarcina, diplococci. Occasionally there are rod-shaped bacteria, yeasts, and moldC. Often in the hiccups of healthy animals are yellowish, dumb, pasteurellosis pathogens, which, with the weakening of the animal's organism, cause this microbial disease. The tubercle bacillus passes into the lungs and finds favorable conditions for its development.

The microflora of the oral cavity is diverse. Their quality and quantity depends on the type of food, the age and type of animal. More spherical and rod-shaped, less twisted-shaped microbes are found. For example, diplococci, sarcina, micrococci, acidophilus rods, vibrios, spirochetes, and the like. Sometimes the oral cavity also contains food-borne bacteria, yeasts, and molds.

Animals fed succulent foods have 10 times more microbes in their oral cavity than those fed with coarse food. Compared to other animals, pigs have a lot of germs in their oral cavity. Spirochetes can always be found in the oral cavity of older pigs, but these microbes are very rare in young pigC.

Microflora of the genitals and urinary tract. Even when an animal is fed under normal conditions, germs are present in its ovaries, sperm, uterus and bladder. The vaginal mucosa of females contains micrococci, streptococci, Escherichia coli bacteria, lactic acid bacteria, and acid-resistant rodC. Bact vaginale vulgare, a bacterium that lives permanently in the mucous membrane of the vagina of a female animal, has the property of resisting other types of bacteria.

Stomach - intestinal microflora. The intestines of newborn animals are free of germC. As soon as they are first fed, germs enter the stomach and gradually develop and multiply.

The quality and quantity of gastrointestinal microflora depends on the age, type, nutrition of the animal and the physicochemical conditions in the gastrointestinal tract. Bacteria, which produce mainly lactic acid, live in the intestines of the animal during lactation. The microflora of the digestive tract is divided into two: facultative microbes, ie microbes that change depending on the type of food, and obligate microbes, which include microbes that adapt to the conditions of the gastrointestinal tract and live there permanently. By giving antibiotics, the gastrointestinal microflora is maintained at a normal level. When antibiotics are used in large amounts, intestinal dysbacteriosis occurs, intestinal function is disrupted.

The digestive system of ruminants includes lactic acid-producing streptococci and rods, Escherichia coli bacteria, anaerobic and aerobic putrefactors,

starch and pectin fermenters, fiber-degrading bacteria, anaerobic bacilli, and actinomyceteC. Very few thermophilic bacteria, actinomycetes, mold fungi, and yeast spores are found. One-chamber gastric microflora is low. Very few microbes are stored in the acidic environment produced by gastric juice. Lactic acid bacteria, yeasts, mold fungi, some sarcina and basil are resistant to this environment. When the environment in the stomach is neutral, favorable conditions are created for putrefactive microbes.

The large abdomen of ruminants is rich in microbes, and there are mainly putrefactive bacteria, various yeast bacteria, facultative anaerobes that produce spores, and more than 30 species of infusoria. Bacteria and infusoria are involved in the breakdown of nutrients in the animal's large abdomen.

About 90% of the fiber in the body is broken down by microbes to form glucose. In fiber metabolism, microbes ferment fiber and carbohydrates to form amber, vinegar, formic acid, lactic acid, ethyl alcohol, hydrogen, and carbon dioxide. 70% of fiber is broken down in the large abdomen, 17% in the appendix, and 13% in the ileum.

Half of the facultative anaerobes in the large intestine break down urea and other substances into ammonia, which the microbial cell assimilateC. In a stomach of 75 liters, 450 g of protein is produced per day. It synthesizes another 10 amino acidC. Streptococci break down starch and glucose to form lactic acid. Bacteria of the genus Propionibacterium are involved in the formation of propionic acid, especially B_{12} in the synthesis of vitamins .

During the life of bifidobacteria, they produce milk, vinegar and other acidC. Synthesizes amino acids as well as many vitamins (thiamine, riboflavin, pyrodoxin, cyanocobalamin, etc.).

Germs are rare in the small **intestine** . Its mucous membrane juice has bactericidal properties and inhibits the growth of microbeC. Escherichia coli, enterococci, and some soil bacilli are common in the small intestine.

Colon and rectal microflora. There are too many germs in the colon and rectum. In this part of the intestine can be found microorganisms of all groups: rod-shaped bacteria, cocci, vibrio, spirochete, actinomycetes, molds, yeasts, viruses and simple animalC. Along with saprophytic microbes, pathogenic microbes (salmonellosis, brucellosis, tetanus, anaerobic pathogens) are found in the colon of animalC. Therefore, the feces of healthy animals can be a source of disease.

3.5 Glossary of science (in Uzbek, Russian, English)

Uzbek language	English	Russian	Meaning
Mikrobiologiya	Microbiology	Микробиология	The science that studies the morphology, physiology, genetics, ecology of very tiny organisms - microbes - and their role and importance in the lives of animals, plants and humanC. The name of this science was proposed by E. Duclos, from the Greek word for micros - small, bios - life, logos - science .
Umumiy mikrobiologiya	General microbiology	Общая микробиология	Explores the general laws of life of microorganisms and their role in nature.
Xususiy mikrobiologiya	Private microbiology	Частная микробиология	Individual representatives of the microbial world are studied by private microbiology.
Veterinariya mikrobiologiyasi	Veterinary microbiology	Ветеринарная микробиология	Studies the pathogens of diseases common to agriculture, domestic and wild animals, humans and animals, as well as microorganisms that play an important role in the production of animal feed and food products .
Qishloq ho'jalik mikrobiologiyasi	Agricultural microbiology	Сельскохозяйственная микробиология	Learns how to use microorganisms in the decomposition and mineralization of organic matter, enriching the soil with fertilizers, increasing soil fertility, plant productivity.
Texnik (sanoat) mikrobiologiyasi	Technical (industrial) microbiology	Техническая (промышленная) микробиология	It has now become a strong production capacity. With the help of microorganisms in the microbiological industry enterprises receive a large amount of biological synthesis products.
Sanitar mikroblar	sanitary microbes	Санитарные микроби	They clean the earth, water from plant debris, rotting animal carcasseC. At present, great attention is paid to water purification.
Immunologiya	immunology	иммунология	The science of testing immunity.
Sistematika	Taxonomy	систематика	A special branch of biological science that deals with the grouping of living organisms by common similarities.
Klassifikasiya	Classification	Классификация	The process of characterizing and identifying systematic groups

Nomenklatura	Nomenclature	Номенклатура	Methods of naming systematic groups.
Prokariot	Prokaryotes	Прокариот	Non-root organisms include: blue-green algae, bacteria, rickettsiae, actinomycetes, mycoplasmaC. Prokaryotic cells have a nuclear membrane, no reticulum within the cytoplasm, and have ridges .
Eukariot	Eukaryotes	Эукариот	Core organisms include: simple animals, fungi, plant and animal cellC. It is the nuclear membrane.
Tur	View	Вид	A collection of genera of microorganisms of common origin and similar properties.
Kultura	Artistic	Култура	Microorganisms grown in nutrient media from animal, human, plant or external environmental substrates.
Shtamm	Strain	Штамм	A culture that belongs to the same species but is separated from different animals and substrates and differs with less variation in their mutual properties.
Klon	Clone	Клон	Culture of microorganisms isolated from a single cell.
Bakteriya	Bacterium	Бактерия	They are single-celled microorganisms that differ in shape, size, and some biological properties, and are spherical (cocci), rod-shaped (bacteria, bacilli, and clostridia), and twisted (vibrion, spirillas, spirochetes). The bacterial cell consists of a shell, a cytoplasm, and a stem apparatus.
Sitoplazma	Cytoplasm	Ситоплазма	It is a complex colloidal system composed of water, protein, carbohydrates, fats, nucleic acids, various organic and inorganic substances.
O’zak (nukleoid)	kernel (nucleoid)	ядро (нуклеоид)	It consists of a DNA molecule belonging to a single chromosome located in the nucleus vacuole. It has no membrane, that is, the cortex that separates it from the cytoplasm. A DNA molecule is a strand made up of nucleoid chromatin strands.
Qobiq	Shell	оболочка	It consists of a thin membrane that surrounds the bacterial cell. The shell gives the bacteria a certain shape, through which various substances necessary for the vital activity of the cell pass and protect the bacteria from various harmful effects of the external environment.
Bakteriyaning hujayra devori	The cell wall of bacteria	Клеточной стенки бактерий	It consists of three layers - the outer lipoprotein, the middle lipopolysaccharide and the regid layer consisting of the inner mucopolymers .

Kokklar	Cocci	кокки	(Latin - coccuc - spherical) are spherical bacteria with a diameter of 1-2 μm.
Mikrometr (mkm), nanometr (nm)	Micrometer (Microns) A nanometer (nm)	Микрометр (мкм), Нанометр (нм)	Micrometer (μm), nanometer (nm), - Unit of measurement of microorganisms.1mkm = 10^{-6} m, 1 mm = 1000mkm, 1 μm - 1000 nm, 1nm = 10^{-9} m
Peptidoglikan	peptidoglycan	Пептидогликан	The regid layer, which forms in bacteria and gives density to the shell, is not the same in different microbeC. Gram staining of bacteria depends on the amount of peptidoglycan in the cell wall.
Basilla	Bacillus	Бацилла	Spore-forming rod-shaped bacteria. The spore is not larger than the diameter of the bacterium that formed it.
Klostridiyalar	Clostridia	Клостридий	The spores are larger than the transverse surface of the rod-shaped bacterium.
Protoplastlar	Protoplasts	Протопласты	Bacteria without a cell wall (mycoplasmas, L-shaped bacteria).
Spora va spora hosil qilish	Spora and dispute formations	Спора и спора образований	The spore is a round or oval shaped 1-2 μm x 0.1 μm long crop.
Kapsula	Capsule	Капсула	A separate mucous sheath that surrounds the body of the bacterium, mucousizes the cell wall.
Xivchinlar	Flagella	Жгутики	Many species of bacteria act independently and with the help of hives formed from the ectoplasm of the cell .
Fimbriyalar va pili	Fimbriae and drinking	Фимбри и пили	That is, hairs (vorsinka). In addition to the hives, bacterial cells also have long, thin, straight, filamentous fimbriae
Rikketsiyalar	Rickettsia	Риккетсии	Single-celled, immobile, polymorphic, gram-negative organisms located between bacteria and viruses.
Xlamidiyalar	Chlamydia	Хламидии	A specific taxonomic group of microorganisms that are similar in antigenicity, related, tinctorial, and morphologically similar.
Mikoplazmalar	Mycoplasma	Микоплазмы	They are polymorphic microorganisms that pass through filters of 100-150 nm, do not form spores, capsules, gram-negative inactive microorganismC. It grows in nutrient media that

			do not contain living tissue cellC. Propagated by division. There are mycoplasmas that occur in the form of saprophytes, as well as those that cause disease in humans, animals and plants.
Aktinomisetlar	Aktinomisety	Актиномисеты	(Greek - *actis* - light, *mykes* - fungus) - nursimon fungi. Single-celled gram-positive microorganismC. Eight families of this group *belong to the* family *Actinomucetales* .
Spiroxetlar	Spirochetes	спирохеты	They are motile microorganisms that are thin and spiral in shape with many tiny folds.
Zamburug'lar	Mushrooms	Грибы	(*Fungi*) are chlorophyll-free organisms that enter the plant world and enter eukaryoteC. They live on the surface of various substrates.
Viruslar	Viruses	Вирусы	They are cell-free microorganisms that parasitize all types of organisms - animals, humans, plants, insects, bacteria, fungi, and simple animal cells.
Oqsil	Protein	Белок	Among organic matter, it is the most important vital substance of the cell. Pathogenic microbes make up more than half of the dry matter in the body and up to 80% in others.
Uglevodlar	Carbohydrates	Углеводы	It is represented by polysaccharides in the microbial cell. In the cytoplasm, carbohydrates are present in the form of starch and glycogen granuleC. They mainly serve as energy material and make up about 12 to 18% of the microbial cell.
Lipidlar.	Lipids	Липиды	Their amount ranges from 3.8 to 40%. Lipids support the specific structure of the cytoplasm and are part of the cytoplasmic membrane. Lipids are not evenly distributed in the microbial cell.
Galozoy	Galozoy	Галозой	The method of feeding is specific to animals (high and simple). In this case, the animal swallows the food and the food is digested in the digestive tract.
Golofit	Golofit	Голофит	The method of nutrition is specific to plants and microorganismC. They consume the aqueous solution of nutrients in the form of small

			molecules with their whole body through the shell at the expense of bilateral osmotic event and diffusion.
Metobolizm	Metobolism	Метоболизм	Assimilation (anobolism) and dissimilation (catobolism) occur. The mechanism of this phenomenon is based on the difference in osmotic pressure of the concentration of soluble substances in the cell and in the external environment. The concentration of solutes is higher in the cell and lower in the surrounding environment.
Autotrof	Autotrophs	Аутотроф	Microorganisms (chemolithotrophs, photolithotrophs) derive carbon from atmospheric carbon dioxide - i.e., a source of CO_2 carbon, inorganic salts (ammonia salts, nitric acids) and water. It uses energy generated during the oxidation (chemosynthesis) of some mineral compounds or solar energy (photosynthesis).
Geterotroflar	Heterotrophs	Гетеротрофы	(chemorganotrophs) - obtains carbon for nutrition from ready-made complex organic compounds (nitrogen compounds - protein, ammonia, some minerals - macro and microelements, vitamins).
Metatroflar	Metatrofy	Метатрофы	(saprophytes) feed on dead tissues of animals and plants (putrefactive bacteria, yeasts).
Paratroflar	Paratrofy	Паратрофы	(parasites) feed on living organisms, i.e., organic compounds present in the body of humans, animals, and plants, and live as parasites (infectious pathogens).
Fotoorganotroflar	Fotoorganotrofy	Фотоорганотрофы	(sulfur-free purpura bacteria) are facultative anaerobes that thrive in both light and dark. They get the energy they need not only from the sun, but also from the oxidation of organic matter .
Proteolitiklar	Proteolitiki	Протеолитики	They break down protein peptides, amino acids, and assimilate nitrogen.
Dezaminlovchilar	Dezaminidazi	Дезаминидази	Breaks down amino acids
Mikroorganizmlarning nafas olishi	Breathing microorganisms	Дыхание микроорганизмов	The metabolic processes that take place in a microbial cell require a certain amount of energy, during biochemical processes the energy required for microbial cells is released and is called their respiration.
Aerob	Aerobic	Аэробные	They absorb oxygen from the atmosphere,

mikroblar	microorganisms	микроорганизмы	biologically oxidize organic and inorganic substances, and release a certain amount of energy.
Anaerob mikroblar	Anaerobic microorganisms	Анаэробные микроорганизмы	It is done by decomposing oxygen-free, nitrogen-free organic compoundC. In this process, the enzymes that break down sugars act on hydrocarbons to produce oxygen and energy.
Fakultativ anaerob	Facultative anaerobic	Факультативные анаэробы	Breathing goes in a mixed round.
Mikroaerofillar	Mikroaerofily	Микроаерофилы	(bovine brucellosis, lep-tospirosis induction) - requires a small amount of molecular oxygen (about 1%) in the first stage of reproduction.
Obligat aerob mikroblar	Oblige aerobic microbes	Облигатние аэробние микробби	(anthrax, tuberculosis rods) develop only when there is enough molecular oxygen.
Obligat anaeroblar	Obligate anaerobes	Облигатные анаэробы	It develops only under anaerobic conditions.
Mikroorganizmlarning fermentlari	Enzymes and microorganisms	Ферменты микроорганизмов	It is synthesized by microbial cells and has a complex structure. Microbial enzymes are divided into endo and exoenzymeC. Enzymes involved in metabolism are present in the body's cells and are called endo enzymeC. The cell of a microorganism releases some enzymes into the external environment, which are called exoenzymes.
Mikroorganizmlarning toksinlari.	Microorganisms and toxins.	Токсины Микрооргранизмов	Many pathogenic microbes - toxins - produce toxins . Toxins are broken down into exotoxins that microbes produce in the external environment and endotoxins that bind to the microbial cell body . Exotoxins can be isolated by filtering broth cultures of toxin-producing microbeC.
Mikroorganizmlarning ko’payishi	Proliferation of microorganisms	Рост микроорганизмов	Their spontaneous multiplication (division) is said to increase the number of microbial cellC. (Division) of bacteria through sexual kopulyasiya increase.
Tuproq mikroflorasi	Soil microflora	Микрофлора почвы	Spore aerobes, spore anaerobes, thermophilic bacteria, pigment generators, cocci are common in the soil . Soil nitrification, denitrification, nitrogen accumulation, sulfur bacteria, fiber breaker; mold fungi, yeasts, simple animals, and

			microscopic algae.
Antogonist bakteriyalar	Antagonistic bacteria	Антагонистические бактерии	in nature, it is important in the processes that take place in the soil, especially in the fight against disease-causing microbes.
Aktivator mikroblar	Microbial activators	Микробны активаторы	Accelerates the growth and development of plants with the products they produce during the life cycle.
Patogen mikroblar	Pathogens	Патогенные микробы	The animal falls to the ground with its carcass, its various separations, contaminated runoff, and various wastes.
Suv mikroflorasi	The microflora of water	Микрофлора воды	It has its own microbes that live in water, adapted to its conditions, and there are microbes that come from outside.
Mikroblar soni	Number of microbes	Число микробов	This is the number of sprouted colonies when 1 ml of water was sown in meat peptone agar in Petri dishes (GPA) and grown for 24 hours at 37 °C.
Koli-titr	Koli – titer	Коли – титр	The amount of intestinal rod in the least amount of water (ml).
Koli-indeks	Koli - index	Коли – индэкс	1 l is the amount of intestinal rod in water.
Havo mikroflorasi	Air microflora	Микрофлора воздуха	The amount and types of microbes in the air vary. The conditions for the survival and growth of microorganisms in the air are unfavorable. Therefore, most microbes live less in the air.
Mikroorganizmlarning tabiatda moddalar almashinuvidagi roli	Role in the metabolism of microorganisms in nature	Роль в метаболизме микроорганизмов в природе	Microorganisms use their enzymes to break down a variety of complex organic substances, synthesizing new compounds that are essential for the formation of plant and animal protein.
Azotning aylanishi.	nitrogen cycle	Круговорот азота	Nitrogen in free and accumulated air must first be converted by microorganisms into a form that can be consumed by plants and animalC. The conversion of organic nitrogen to mineral nitrogen, mineral nitrogen to organic nitrogen takes place in several stages.
Ammonifikasiya (oqsillarning chirishi)	Ammonification (protein decomposition)	Аммонификация (разложение белка)	It is carried out by putrefactive microbes (amonifiers). They break down the protein to form intermediates (albumin, peptone, amide, amino acids), foul-smelling substances (indole, hydrogen sulfide, volatile fatty acids) and ammonia.

Mochevina	Urea	Мочевина	It accumulates in the animal's body as a result of protein metabolism and is excreted in the urine.
Nitrifikasiya	Nitrification	Нитрификация	In the process of nitrifying microbes nitrite ammonia and ammonium salts oxidizes to salts.
Denitrifikasiya	Denitrification	Денитрификация	It is the opposite process of nitrification. At the same time, under the influence of denitrifying microorganisms, nitric acid salts are returned to the molecular nitrogen and blown into the air, resulting in a decrease in soil fertility.
Azot to'plovchi bakteriyalar	Nitrogen prefabricated bacteria	Азота сборние бактерии	By fixing molecular nitrogen in the atmosphere, it forms compounds suitable for plantC. Nitrogen-fixing bacteria include azotobacter, clostridium, and endogenous bacteria.
Uglerod aylanishi.	The carbon cycle	Углеродный цикл	Carbon is present in atmospheric air as 0.03% in the form of carbon dioxide. Carbon dioxide is absorbed by plants and undergoes complex changes, resulting in the release of oxygen into the air.
Spirtli bijg'ish	Alcoholic fermentation	Спиртовое брожение	Under the action of the enzyme *zimaza of* yeast fungi (*Sacchoromyces)* , sugar is broken down to ethyl alcohol and carbon dioxide. It includes beer, bread, wine, kefir yeast.
Sirka kislotali bijg'ish	Fermentation Acetic acid	Ферментация уксусная кислота	Due to the activity of acetic acid-forming bacteria, ethyl alcohol is oxidized to acetic aldehyde, which in turn becomes acetic acid. Acetic acid bacteria - *Acetobacter* - *ferment* grape wine and beer.
Moy kislotali bijg'ish	Fatty acid fermentation	Жирно кислотное брожения	Spores belonging to the group of clostridia are characterized by the decomposition of carbohydrates, fats and proteins into fatty acids, carbon dioxide and hydrogen under the influence of anaerobic microbes.
Sut kislotali bijg'ish	Lactic acid fermentation	Кисломолочной ферментации	In the process, sugar is broken down into two molecules of lactic acid. Lactic acid bacteria are widely used in dairy products, butter, cheese, sauerkraut, cucumbers and silage - they are called typical lactic acid microbes.
Kletchatkaning bijg'ishi	Celyulozn oe fermentation	Селюлозное брожение	It is the breakdown of plant cellulose and the release of carbon. Microorganisms that break down cellulose secrete the cellulose enzyme.
Pektinli	Pectin fermentati	Пектиновое	The substance that *binds* plant cells together is called *pectin* , which is an intercellular substance

bijg’ish.	on	брожение	that strengthens plant cells and transforms them into tissues.
Fosfor aylanishi.	Fosforovy cycle	Фосфоровий цикл	Soil is rich in phosphorus in proteins and lipidC. When organic matter decomposes, phosphoric acid is formed and combines with potassium, magnesium, and iron salts in the soil.
Oltingugurt almashinishi.	Exchange sulfur	Обмен серы	Sulfur is a major component of animal and plant protein, mostly organic and inorganic compoundC. It falls to the ground with plant and animal remainC. When the residue decomposes, sulfur is released in the form of hydrogen sulfide. Hydrogen sulfide oxidizes in the presence of sulfur bacteria to form sulfuric acid and water.
Temir birikmalarining almashinishi.	Exchange of iron compounds	Обмен соединений железа	Iron is a component of hemoglobin protein in erythrocyteC. It is important in human and animal respiration. Iron bacteria *Leptothrix, Crenotrix, Chlamydothrix* , etc. *oxidize* iron in their cell and accumulate it on the surface of the body.
Harorat	Temperature	Температура	There are three types of microbial effects: optimal-favorable for microbes, maximum-excess and minimum-insufficient. Depending on the adaptation of microorganisms to temperature, they are divided into three physiological groups in nature. 1. Psychrophiles (Greek "psychros" - cold and "filo" I love) are microbes that have learned to live at low temperatureC. They live at temperatures of +15 - 8 ^{0} C. 2. Mesophylls (Greek “mesos” - average) Bacteria accustomed to moderate temperatures thrive at temperatures between 20 ^{0} C and 40 ^{0} C. 3. Thermophiles (Greek “thermos” hot) require a high temperature of 40 ^{0} to 80 ^{0} C for development.
Mikroblarga yuqori haroratning ta’siri.	Antimicrobial effects of high Temperatures	Противомикробные эффекты высоких Температур	Vegetative forms of the microbe are more susceptible to high temperatures . The higher the temperature, the more destructive the microbeC.
Mikroblarga past haroratning ta’siri.	The antimicrobial effect of low temperatures	Противомикробное действие низких температур	Low temperatures usually do not kill germs, but stop them from growing and multiplying. Microorganisms can be stored in an anabiotic state for up to 12,000 years.
Mikroblarga quritish va	The antimicrob	Противомикробное	As a result of drying, the moisture in the microbial cell is lost, the vital activity of the

vakuum ta’siri.	ial action of drying and vacuum	действие сушки и вакуума	microbe is reduced and it becomes anabiotic. In this case, especially in a vacuum, the microbial cells are stored for 10 yearC.
Mikroblarga yorug’liknin g ta’siri.	The antimicrob ial action of light	Противомикр обное действие света	Properly exposed sunlight has a detrimental effect on most microorganisms . The bactericidal effect of light depends on its wavelength, the shorter it is, the stronger the effect. Under the influence of direct sunlight, many pathogenic microbes die (tuberculosis pathogen 3 - 5, protein virus within 2 hours).
Mikroblarga rentgen nurlarining ta’siri.		Противоми кробные эффекты рентгеновски х лучей	Young cells are more exposed to radiation, especially during division and development. The bactericidal effect of radiation is widely used in practice. Bactericidal, boxed under the influence of ultraviolet rays of quartz lamps, is used to sterilize the air in the operating rooms (lit 2-3 hours). Various radioactive vaccines exposed to ionizing radiation are currently being used.
Mikroblarga ultratovushni ng ta’siri.	The antimicrob ial action of ultrasound	Противомикр обное действие ультразвука	Under the influence of ultrasound waves, the microbial culture causes a large difference in pressure, damaging the cell. Some microbes die quickly, while others are subjected to strong mechanical vibrations, resulting in disruption of physiological processeC.
Mikroblarga elektor tokining ta’siri.	The antimicrob ial action of an electric	Противомикр обное действие электрически м током .	Constant and alternating electric power has little effect on microbeC. High-wave electricity kills germC. In this case, the microbe dies as a result of the vibration of the cell molecules.
Mikroorgani zmlarga magnit maydonining ta’siri.	Effect of Magnetic Field microorga nism	Влияние магнитного поля микроорганиз мом	Like other living things, magnetotropism has been identified in microbeC. Microbes are sensitive to any force of the geomagnetic field.
Mikroblarga gidrostatik bosimining ta’siri.	The antimicrob ial effect of hydrostati c pressure	Противомикр обное действие гидростатичес кого давления	Pressures above 108-110 a denature the protein, inactivate enzymes, enhance electrolytic dissociation, increase the elongation of fluids , and sometimes kill microbeC.
Mikroblarga silkinishning	The antimicrob ial action	Противомикр обное действие	The effects of concussions often kill bacteria (not just viruses). If the bacterial culture is shaken in a container with a glass bubble, the cells will

ta’siri.	of shaking	встряхивании	mechanically disintegrate after some time. This process is faster if the bacteria are frozen first.
Mikroblarga muallaqlik ta’siri.	The antimicrobial action of balance	Противомикробное действие взвешенности	In the age of space exploration, it is necessary to study the effects of suspended conditions not only on macro but also on microorganismC. We know that macroorganisms in space conduct suspension largely unchanged.
Musbat xemotaksis	Positive chemotaxis	Положительный хемотаксис	Under the influence of certain chemicals, the microbe approaches the substance. For example, meat extract, microbes begin to approach the peptone.
Manfiy xemotaksis	Negative chemotaxis	Отрицательный хемотаксис	Antimicrobial chemicals when they run away from germC. For example, microbes move away from highly toxic toxins (acids, alkalis).
Xemotaksis	Chemotaxis	хемотаксис	In the event, some microbes can also accumulate in toxic chemicals, but instead move away from certain nutrients.
Simbioz	Symbiosis	Симбиоз	In this case, two or more types of microbes live and multiply in the same environment without interfering with each other. For example, aerobic and anaerobic microorganisms live in the same environment .
Kommensalizm	Commensalism	Комменсализм	It is a relationship between two organisms in which one organism benefits from its separation or nourishment without harming the other. Examples of commensals are the normal microflora of animals that live on the skin of the gastrointestinal tract, respiratory tract.
Metobioz	Metobioz	Метобиоз	In this case, the same type of microorganism creates favorable conditions for the growth and development of another microorganism in its life activitieC. For example, many saprophytes prepare food for nitrifying bacteria, as exemplified by the relationship between cellulose-degrading and nitrogen-fixing bacteria.
Sattelizm	Sattelizm	Саттелизм	It is the growth, development, growth, and coexistence of one microbe under the influence of another microbial product.
Sinergizm	synergism	Синергизм	It is the fact that two or more species of microbes contribute to each other. For example azotobacter and *Bac. Mycoides* together form heteroaU.X.in substances that make plants grow well.
Antogonizm	antagonism	Антогонизм	In an environment where one type of microbe develops, another type of microbe cannot develop. For example: putrefactive microbes, blue pus rod inhibit the growth of anthrax rod.

Parazitizm	Parasitism	Паразитизм	This is such a relationship between microbes that the parasite takes advantage of this relationship and harms its host, causing it to die. The relationship between microbes of different structure and size - phage - is important. This is the relationship between viruses and bacteria, actinomycetes, green algae.
Antibiotik	Antibiotic	Антибиотик	The term was introduced to science by ZAVaksman (1942) (*anti*- resistance , *bios*- life) Antibiotics are produced by microorganisms (actinomycetes, fungi, bacilli, bacteria), plant and animal organismC.
Fitonsidlar.	Fitonsidy	Фитонсиды	The scientist VPTokin was the first to prove the existence of antibiotic-like substances in plants in 1928-1930 , calling them phytoncideC. Phytoncides are found in plant leaves, flowers, roots, fruitC. Phytoncides are mainly used in the local treatment of purulent processeC.
Bakteriofaglar	Bacterial virus	Бактериофагы	It is a parasite of bacteria and the dissolution of bacteria under the influence of phage is called bacteriophage. Bacteriophages are used to identify the type of microorganisms, diagnose diseases and treat infectious diseaseC.
Dezinfeksiya.	Dezinfektsiya	Дезинфекция	It is performed by mechanical, physical, chemical and biological methodC. Unlike sterilization, disinfection kills only pathogenic microbes, while sterilization kills all germs in a product.
Antiseptika	Antiseptika	Антисептика	It consists of killing germs in wounds and other objects with chemical disinfectants.
Aseptika	Aseptika	Асептика	Focuses on the entry of microbes into wounds Asepsis is performed by the complete destruction of microbes in objects that come into contact with wounds (instruments, dressings and sutures, hands of surgeons, etc.).
Infeksiya	Infection	Инфекция	(*infectio* from Latin) means to infect. Infection is a complex biological process that occurs between an animal organism and a pathogenic microbial pathogen in the external environment.
Infeksion kasallik	Infectious disease	Инфекционное заболевание	The most pronounced form of interaction between the organism and microbeC. This is a condition of the body in which certain pathological processes develop in response to the stimulus.
Patogenlik	Pathogenicity	Патогенность	The ability of a microbe to cause a specific infectious disease under certain conditionC. It is a typical, variable sign of a microbial type.
Virulentlik	Virulence	Вирулентность	The degree of pathogenicity of a microbe, i.e., virulence, is an individual marker of the microbe

			and varies under different conditions.
Invazivlik	Invasiveness	Инвазивность	One of the traits that causes virulence is the ability of microorganisms to enter, spread, and multiply in the tissues of macroorganismC. The effect of substances secreted by some microorganisms - reduces the protective forces of the macro-organism, mainly phagocytosis.
Toksinlar	Toxins	Токсины	They are harmful substances produced by microorganisms, one of the properties that cause virulence. Toxins (toxins, botulism, diphtheria poisons) lose their toxicity when exposed to 0.3-0.4% formalin at a temperature of 38-39 ^{o}C for a month , but the immunogenicity is preserved.
Ekzotoksinlar	Exotoxins	Экзотоксины	(protein) The microbe is excreted from its body during life or after death.
Endotolksinlar	Endotolksiny	Эндотолксины	The bacterium is firmly attached to the cell, especially its wall. Therefore, it separates only after the microbe dieC.
Intoksikasiya	Intoxication	Интоксикация	Poisoning of the body with toxins.
Toksigenlik	Toxigenicity	Токсигенность	The ability of a microbe to produce toxins.
Kapsula hosil qilish	Capsule education	Капсула оброзование	One of the traits that causes virulence is that it causes germs to become aggressive.
Infeksiya darvozasi	Infection gates	Ворота инфекции	Ways of entry of microbes into the body. Under natural conditions, the pathogen is often transmitted to the body through the alimentary tract (feed, water), aerogenous - through the respiratory tract, in contact with each other, by insect bites, by injection with a nosteril needle passes.
Gematogen yo'l	Gemotogenny path	Гемотогенный путь	The spread of pathogenic microbes throughout the body through the blood.
Limfogen yo'l	Lymphogenous path	Лимфогенный путь	The spread of pathogenic microbes throughout the body through the lymph.
Neyrogen	Neurogeni	Нейрогенный	The spread of pathogenic microbes throughout the body through nerve fibers.

yo’l	c way	путь	
Bakteremiya	Bacteremia	Бактериемия	The microbe stays in the blood for a very short time and spreads to all organs through the bloodstream without multiplying.
Septisemiya	Septicemia	Септицемия	The microbe multiplies in the blood and spreads through the blood to the whole organism. It passes very quickly and usually ends in death.
Toksemiya	Toxemia	Токсемия	Microbes multiply at the site of injury (tissue), the resulting toxin enters the bloodstream and poisons the whole organism.
Ekzogen infeksiya	Heteroinfection	Экзогенная инфекция	Pathogens enter the animal's body from the external environment.
Endogen infeksiya	Endogenous infection	Эндогенная инфекция	The pathogens are usually present in the body itself and develop the disease only when the condition of the organism worsenC. These include conditionally pathogenic microbes, latent viruses, and the like.
Oddiy infeksiya	Simple infection	Простая инфекция	A type of inflammatory disease.
Aralash infeksiya	mixed infection	смешанная инфекция	A disease caused by the entry of two or more types of pathogenC. Mixed infections are severe.
Reinfeksiya	reinfection	Реинфекция	Sometimes, when an animal recovers from an illness, it becomes immune again without being immune.
Superinfeksiya	superimposed infection	Суперинфекция	During the development of the infection, there is a balance between the organism and the pathogen . But when an additional amount of the pathogen enters such an organism, the disease intensifies again.
Resediv	relapse	Рецидив	Sometimes, even after the disappearance of clinical symptoms, the organism is not free of the pathogen, and under certain conditions, the disease re-exacerbates and clinical signs of the disease appear.
Inkubasion davr	Inkubasionny stage	Инкубасионний период	That is, the latent period is the first stage in the development of the infectious process in the body. It includes the time from the time the microbe enters the body until the first clinical signs of the disease appear, passing without clinical signs.

Prodromal davr	prodromal stage	продромальный период	It is characterized by the appearance of general symptoms, specific to certain infectionC. For example, fever, fatigue, loss of appetite and animal productivity. Such symptoms can occur in any disease.
Daraklovchi davr	Predromalny period	Предромалний период	The period in which specific clinical signs of a developing disease appear . This is of great importance in practice in diagnosing the disease.
Pasayish davri	period of decline	период упадка	In the fourth stage, the clinical signs and functional disorders gradually disappear.
Rekonvolissensiya		Реконволиссенция	Healing period. In this case, sick animals recover, but they can still retain the pathogen in the body.
Zonooz	Zonooz	Зонооз	Diseases specific to animals only.
Antroponoz	Anthroponosis	Антропоноз	Diseases specific to humans only.
Zooatroponoz		Зооатропоноз	Diseases that infect humans by infecting animals.
Antropozoonoz	Anthropozoonosis	Антропозооноз	diseases that have the ability to harm each other by infecting animals and humans.
Immunitet	Immunity	Иммунитет	(Latin *immununias* - to be free, get rid of) The body's resistance to pathogenic microbes or toxins.
Infeksion immunitet	Infectious immunity	Инфекционный иммунитет	The emergence of resistance to infectious diseases.
Noinfeksion immunitet	Non-infectious immunity	Неинфекционный иммунитет	Application of the laws of immunology to animal proteins and cellC. Such immunity becomes the basis of the doctrine of tissue incompatibility (nesovmestimost).
Nomaxsus immunitet	Nonspecific immunity	Неспецифические иммунитет	Infectious immunity is a natural, innate resistance of the organism to various environmental conditions: mechanical, physical, biological factors .
Absolyut tabiiy tug'ma immunitet	Absolute natural innate immunity	Абсолютный естественный врожденный иммунитет	Under no circumstances will a particular type of animal develop the disease at any dose of harmful material. Since horses have absolute immunity to the plague of large horned animals, they will not get sick with it under any circumstances.
Nisbiy turga	Specific	Конкретные	For example, a pigeon is resistant to anthrax

xos immunitet	types of immunity	виды иммунитета	under natural conditions, but if it is pre-poisoned with alcohol, it becomes infected with anthrax.
Organizmning nomaxsus rezistetlik faktorlari	Non-specific factors rezistetnosti organism	Неспецифические факторы резистетности организма	The human and animal organism has a number of natural protective anatomical and physiological factors - features that prevent the entry of a pathogenic microbe, kill it or quickly expel it from the body.
Fagositoz	Phagocytosis	Фагоцитоз	Phagacytosis plays an important role in the doctrine of immunity. First, Mechnikov II gave a detailed account of phagocytosis and its importance.
Maxsus immunitet	Specific immunity	специфический иммунитет	It is formed as a result of the entry of certain protein cells (microbes, toxins, tissues) into the body, which produce special protective agents (antibodies or immunoglobulins) against them. It can be acquired naturally or artificially.
Tabiiy orttirilgan immunitet	Naturally priobretennoy immunity	Естественно приобретенний иммунитета	It is formed as a result of a person or animal experiencing a particular infection. In doing so, the body develops immunity against the microbe that caused the disease. Naturally acquired immunity lasts a long time. From some diseases sung is preserved for life. For example, once horses are infected with mango, humans with measles, rubella, and dogs are infected with the disease, they retain their immunity for the rest of their liveC.
Sun'iy orttirilgan immunitet	Iskustvinny Acquired immunity	Искуственний Приобретенный иммунитет	It is formed after the introduction of specific biopreparations - vaccines (microbes or their toxins). Acquired immunity is divided into active and passive immunity, respectively.
Aktiv immunitet	Active immunity	Активный иммунитет	Occurs as a result of an infectious disease or vaccination, in which the organism is actively involved. The more severely the body becomes ill, the longer the natural active immunity lasts.
Sun'iy passiv immunitet	seroimmunity	Пассивный иммунитет	It is formed as a result of the delivery of a ready-made immune substance - antibodies to the body. Antibodies are naturally present in the serum of animals that have been cured or vaccinated.
Tabiiy passiv immunitet	Natural passive	Естественный пассивный	It is passed from mother to child through the placenta or through breast milk. If a salmonellosis vaccine is given one month before birth, the

	immunity	иммунитет	newborn calf will be more resistant to the disease. This means that the antibodies in the mother are passed on to the calf.
Steril immunitet	Sterilizing immunity	Стерильный иммунитет	When it appears, the pathogen is completely eliminated from the body and the organism is not re-infected with it.
Nosteril immunitet	Premuniti on	Нестерильны й иммунитет	Occurs only when there is a pathogen in the body, if the microbe disappears from the body, then the immunity is also lost (in tuberculosis, brucellosis, mango, diseases).
Antigenlar	Antigens	Антигены	(Greek *anti-against* , *genes*- type). When administered parenterally, substances that produce an immune substance against themselves are called antigenC.
Mikroblarini ng antigenlari.	Microbial antigens	Микробные Антигены	The microbial cell contains various capsules, hives, and somatic antigens . They differ in composition, properties and effects.
Antitela.	Antibody	Антитела	These are special proteins - immunoglobulins, which are formed in the animal's body under the influence of antigens.
Monoklonal antitelolar.	Monoclon al antibodies	Моноклональ ные антитела	The normal immune system produces millions of different antibodies.
Antigen va antitelolarnin g o'zaro munosabatlar i.	Interaction of antigens and antibodies	Взаимодейств ие антигенов и антител	Antigens and antibodies, like molecules, interact without changing their shape or structure.
Immunitetnin g paydo bo'lishida limfoid sistemasi hujayralari va organlarning roli.	The role of the cells and organs in the lymphoid sistembi obrozovan ie immunity	Роль клеток И органов лимфоидной системби в оброзовании иммунитета.	It is now believed that immunity occurs in the organs of the lymphoid system in the immunocomponent and other cells of the body.
Taloq.	Spleen	Селезенка	When cut, the red and white pulp of the organ is visible. The red pulp contains a large number of erythrocytes, lymphoid tissue in the stream. Lymphatic tissue of the spleen is involved in humoral immune reactionC.
Allergiya	Allergy	Аллергия	This is an increase in the body's sensitivity to allergens (microbial protein, toxin, drugs, etc.). Allergic reactions can be rapid or slow. In

			the fast phase, the reaction occurs after a few minutes (15-30), and in the slow phase after a few hours (24-72).
Anafilaksiya	Anafilaktsiya	анафилакция	("Greek *" , "filaksiya"* means of protection). Increased hypersensitivity of the body to foreign protein (serum, antibiotics) as a result of repeated parenteral administration is called anaphylaxiC. The substances that cause anaphylaxis are called anophyloctogens.
Idiosinkraziya	Idiotsinkraziya	Идиоцинкразия	Oqsilli yoki oqsilsiz harakterdagi har xil zararsiz moddalarga gul yoki unsimon chang, kimyoviy preparatlarning zaharsiz dozalarga (margimush, simob, ximin),hayvon va o'simliklardan tayyorlangan oziq-ovqat mahsulotlari va boshqalarga nisbatan organizm sezuvchanligining ortishidir.

Questions for attestations in science:
4.1 Oral questions for 1 OB (120)

1. What does microbiology teach?
2. What are the branches of microbiology?
3. The importance of microbiology in the national economy.
4. Use of microbiological advances in industry and agriculture?
5. Tell a brief history of the development of microbiology?
6. Morphological, physiological periods of microbiology.
7. Use the achievements of microbiology
8. State the use of microbes in metallurgy
9. Explain general and specific microbiology
10. Name the heuristic and morphological periods of microbiology.
11. Tell us about the physiological period of microbiology and the work of scientists who contributed to it.
12. Tell about the immunological period of microbiology and the work of scientists who contributed to it.
13. Tell about veterinary and agricultural microbiology.
14. The heuristic era of microbiology and the scientists who contributed to it

15. Tell about the imorphological period of microbiology and the work of scientists who contributed to it.
16. The structure of the shell of bacteria
17. Capsule formation and its function
18. Microorganisms found in soil
19. The effect of high temperature on microbes
20. The effect of low temperature on microbes.
21. Drying and vacuum effects on microbes
22. The effect of X-rays on microbes
23. The effect of ultrasound on microbes.
24. Types of chemotaxis
25. Types of toxins
26. Name the main groups of microorganisms found in nature .
27. Give an idea of culture, strain, colony, clones.
28. What is the systematics, classification, nomenclature, give an idea.
29. What does the classification of microorganisms depend on?
30. Interactions of antigens and antibodies
31. Microbiology of surface waters
32. Microbiology of groundwater
33. The structure of the bacterium ; capsule, spore, hivchin, fimbriae and their ionC.
34. Describe the morphology and structure of spirochete, actinomycetes, plasma, rickettsiae
read
35. Explain pathogenic and conditionally pathogenic microorganisms
36. Transient forms of infectious diseases
37. Microflora of the digestive organs
38. II Mechnikov's contribution to the development of science
39. L. Pasteur's contributions to the development of science
40. Infectious and non-infectious immunity
41. State the classification, morphology, structure of fungi .
42. State viruses, their structure, form, classification.
43. State the structure and morphology of microorganisms
44. Explain the process of spore and spore formation
45. Explain autotrophs and heterotrophs
46. What is included in the physiology of microorganisms?
47. What is the chemical composition of microorganisms?
48. Name the methods of nutrition of microorganisms.
49. What do you mean by respiration of microorganisms?
50. Importance and types of enzymes of microorganisms.
51. Explain the toxin, pigment formation, reproduction and growth of organisms .
52. Differentiation of microorganisms in relation to molecular oxygen.
53. Sanitation of soil microflora and its microbiological examination

tell me the importance?
54. Coli-titre, coli-index, how to determine the number of microbes in water.
55. What are the methods of determining the water microflora and its sanitary s?
56. Give an idea about the air microflora, the spread of pathogenic microbes air?
57. What are the microflora of the animal body and their benefits and harms? 58. Phagocytosis and its phases
59. What are the methods of determining the air microflora?
60. Introduction to the procedure for sampling from different water bodies
61. Explain the types of active and passive immunity
62. Describe superinfection, reinfection, simple and mixed infections.
63. Explain the sequence of reproduction stages of microorganisms in nce
64. Toxins of microorganisms
65. The role of prokaryotes and eukaryotes in animal pathology .
66. State the role of microorganisms in metabolism in nature.
67. What is the essence of the nitrogen cycle in nature?
68. Give an idea of ammonification, nitrification, denitrification.
69. Importance of carbon cycle in light industry?
70. Explain the cycle of sulfur, phosphorus, iron in nature.
71. Alcohol fermentation and microorganisms involved in it,
72. Acetic acid fermentation and microorganisms involved in it,
73. Name the periodic stages of the infectious process.
74. Fatty acid fermentation and microorganisms involved in it,
75. Lactic acid fermentation and microorganisms involved in it,
76. You know what physical factors affect microorganisms .
77. Describe the effect of chemical factors on microorganismC.
78. State the relationship of microorganisms in the biocenosis.
79. State the effect of antibiotics, phages, phytoncides on microorganisms.
80. Understand disinfection, asepsis, antiseptics.
81. What are antibiotics? How do they affect bacteria?
82. The essence of the immunofluorescence reaction
83. Methods of immunofluorescence reaction
84. What properties of microorganisms are studied in identification.
85. State the biological properties of microorganisms
86. Methods of preparation of drugs for fluorochromization
7. Explain the preparation of a drug for IFR
8. Explain the essence of the direct method of IFR
9. Explain the essence of the indirect method of IFR
0. Use of luminescent microscopy
1. Explain the fluorochromization process
2. Storage of conjugates
3. Name the nutrient media used to grow anaerobic microbes
4. Techniques of making broth
95. Ways of entry and exit of infection into the body

96. State the difference between the concepts of infection and infectious ses
97. What microbes are called pathogenic microbes.
98. Explain the concepts of pathogenicity and virulence.
99. What is the course of infectious diseases.
100. What is the difference between a latent infection and a microbial ion.
101. State the types and classification of infection.
102. What is immunity, tell the types of immunity, explain its essence.
103. Name the properties that cause virulence (invasiveness, toxins, capsule).
104. What are antigens and antibodies, explain.
105. Explain the specific and specific factors of immunity.
106. Allergy, anaphylaxis, idiosyncrasy, their essence and significance.
107. Explain the application of the doctrine of immunity in practice.
108. Give an idea of the variability of microorganisms.
109. Phenotype, genotype variability.
110. Opinions of different currents on the variability of microorganisms.
111. Mutational (spontaneous, induced) and combinatorial (transformation, duction, conjugation) changes.
112. Understand morphological, biological and cultural changeC.
113. State the peculiarities of infectious disease
114. Periodic stages of the infectious process.
115. Classification of infectious diseases
116. Importance, development, history of the science of immunology.
117. Tell about the types of special immunity
118. Explain the types of non-specific immunity
119. Non-specific resistance factors of the organism.
120. Tell about the body's immune response

4.2. 2 Oral questions for OB (120)

1. State the properties of staphylococci.
2. Understand the classification of staphylococci.
3. Laboratory diagnosis of diseases caused by staphylococci.
4. Characteristics of the causative agent of infectious mastitis and laboratory osis.
5. Morphological and cultural characteristics of the causative agent of ious mastitis
6. Biological properties of the causative agent of infectious mastitis
7. Resistance and biochemical properties of infectious mastitis pathogen
8. Pathogenesis and pathogenesis of infectious mastitis
9. Characteristics of the mute pathogen and laboratory diagnosis.
10. Morphology and cultural characteristics of the mute pathogen
11. Give an idea of the pathogenesis and pathogenesis of the mute pathogen
12. Characteristics of the pathogen of diplococcal infection and laboratory osis.
13. Cultural and biochemical properties of the causative agent of diplococcal ion
14. Explain the pathogenesis and pathogenesis of diplococcal infection

15. Str. Morphology, resistance and cultural characteristics of pneumoniaeni
16. Biopreparations used in staphylococcal and streptococcal ionC.
17. State the characteristics of the causative agent of Saramas.
18. What materials are sent to the laboratory for testing for Saramas and in what ways it is checked.
19. State the characteristics of the causative agent of pasteurellosis.
20. Explain the pathogenesis and pathogenesis of the causative agent of urellosis
21. Morphological and cultural features of P.multocida
22. State the cultural and biochemical properties of P.multocida
23. P.multocida resistance, antigenic structure, immunity.
24. State the biological properties of P.multocida.
25. Morphological and cultural features of Erysipelothrix rhusiopathiaening
26. Biological features of Erysipelothrix rhusiopathiaening
27. Give an idea of the pathogenesis and pathogenesis of Erysipelothrix rhusiopathiaening
28. What materials are sent to the laboratory for testing for pasteurellosis
29. What is the laboratory diagnosis of pasteurellosis.
30. What biopreparations are used in Saramas
31. Describe the serological method of diagnosing Saramas disease
32. Describe the methods of laboratory testing in Saramas.
33. Resistance, immunity and diagnosis of Saramas pathogen.
34. State the cultural characteristics of the Saramas pathogen
35. When is Saramas considered diagnosed :
36. Biopreparations used in pasteurellosis.
37. Morphological and cultural features of E. coli
38. E. coli resistance, antigenic structure, immunity.
39. State the biological properties of E. coli
40. What serological test is used in the diagnosis of colibacillosis.
41. Explain the pathogenesis and pathogenesis of E. coli
42. State the characteristics of the causative agent of colibacillosis.
43. What are the methods of laboratory testing for colibacillosis ?
44. Biopreparations used in colibacillosis.
45. Name the biopreparations against colibacillosis in Uzbekistan.
46. What materials are obtained for testing in colibacillosis.
47. State the characteristics of salmonellosis pathogens.
48. What are the methods of testing for salmonellosis in the laboratory?
49. What is the difference between colibacillosis and salmonellosis?
50. Name the types of Salmonella.
51. State the characteristics of the anthrax pathogen.
52. What are the methods of diagnosing anthrax in the laboratory?
53. What is the final diagnosis of anthrax?

54. Majon test and phagocytosis in the identification of anthrax.
55. Biopreparations used in anthrax.
56. The use of PR in the diagnosis of anthrax
57. Phagotyping method of anthrax examination
58. What materials are obtained for testing for anthrax.
59. State the morphological and cultural characteristics of Bac.anthracis
60. State the resistance and biochemical properties of Bac.anthracis
61. Explain the pathogenesis and pathogenesis of anthrax
62. Antigenic structure and resistance of Bac.anthracis
63. Cultural characteristics of anthrax
64. Explain the evaluation of test results in anthrax
65. Identification of anthrax pathogen (identification)
66. Bacteriological examination in anthrax
67. What is the final diagnosis of anthrax?
68. Explain the classification of mycobacteria
69. State the characteristics of the causative agent of tuberculosis
70. Cultural characteristics of tuberculosis pathogens
71. Resistance and morphological properties of tuberculosis pathogens
72. Serological and allergic methods of diagnosing tuberculosis
73. What methods are used to diagnose tuberculosis in the laboratory?
74. How do the types of mycobacteria differ.
75. Morphological features of brussels sprouts
76. Morphological and cultural features of Brussels sprouts
77. Cultural characteristics of brussels sprouts
78. Tell about the pathogenesis and pathogenesis of brucellosis
79. Name the types of brussels sprouts
80. Application of AR in the detection of brucellosis
81. Explain pathogenic anaerobes.
82. State the characteristics of the causative agent of black spot.
83. State the cultural characteristics of Cl.chauvoe
84. Explain the biological properties of Cl.chauvoe
85. Morphology and durability of Cl.chauvoe
86. Explain the pathogenesis and pathogenesis of Cl.chauvoe
87. What patmaterials are obtained for inspection of blackberries.
88. State the laboratory diagnosis of blackheads.
9. Biopreparations used in blackberry.
0. State the properties of the alloy driver.
1. State the morphological features of Cl.tetani
2. State the cultural properties of Cl.tetani
3. State the resistance and biochemical properties of Cl.tetani
4. State the pathogenesis and pathogenesis of Cl.tetani
95. Laboratory diagnosis of gas gangrene.
96. Cl. Pathogenesis and pathogenesis features of botulinum

97. Explain the preparation of material suspected of botulism for examination
98. Explain the technique of separation of botulism toxin
99. Explain the technique of isolation of botulism culture
100. State the general characteristics of Bradzot pathogens.
101. Morphological features of the Bradzot pathogen
102. State the biological properties of the pathogen Trichophytia
103. State the pathogenesis and pathogenesis of the pathogen Trichophytia
104. State the morphological features of the microspore pathogen
105. What is the difference between the pathogens of trichophytia, sporia .
6. Obtaining patm material for examination for dermatomycoses.
107. Candidiasis, aspergillosis pathogens, their cultivation.
108. Morphological, tinctorial cultural features of the causative agent of spirosis.
109. The rule of obtaining patmaterial for testing for leptospirosis and sending it to the laboratory.
110. Biopreparations used in leptospirosis
111. State the classification of mycoplasmas
112. Morphology and tinctorial properties of mycoplasmaC.
113. Cultural and biochemical properties of mycoplasmaC.
114. The concept of pathogenicity of mycoplasmas
115. What is the diagnosis of mycological diseases of fish?
116. Give examples of bacteriological diseases of fish
117. What is the diagnosis of bacteriological diseases of fish ?
118. Give examples of bacteriological diseases of bees
119. Give examples of mycological diseases of bees
120. What is the diagnosis of mycological diseases of bees?

4.3. Oral questions for GP (300)

1. What does microbiology teach?
2. What are the branches of microbiology?
3. The importance of microbiology in the national economy.
4. Use of microbiological advances in industry and agriculture?
5. Tell a brief history of the development of microbiology?
6. Morphological, physiological periods of microbiology.
7. Use the achievements of microbiology
8. State the use of microbes in metallurgy
9. Explain general and specific microbiology
10. Name the heuristic and morphological periods of microbiology.
11. Tell us about the physiological period of microbiology and the work of scientists who contributed to it.
12. Tell about the immunological period of microbiology and the work of scientists who contributed to it.

13. Tell about veterinary and agricultural microbiology.
14. The heuristic era of microbiology and the scientists who contributed to it
15. Tell about the imorphological period of microbiology and the work of scientists who contributed to it.
16. The structure of the shell of bacteria
17. Capsule formation and its function
18. Microorganisms found in soil
19. The effect of high temperature on microbes
20. The effect of low temperature on microbes.
21. Drying and vacuum effects on microbes
22. The effect of X-rays on microbes
23. The effect of ultrasound on microbes.
24. Types of chemotaxis
25. Types of toxins
26. Name the main groups of microorganisms found in nature .
27. Give an idea of culture, strain, colony, clones.
28. What is the systematics, classification, nomenclature, give an idea.
29. What does the classification of microorganisms depend on?
30. Interactions of antigens and antibodies
31. Microbiology of surface waters
32. Microbiology of groundwater
33. The structure of the bacterium ; capsule, spore, hivchin, fimbriae and their ionC.
34. Describe the morphology and structure of spirochete, actinomycetes, plasma, rickettsiae
read
35. Explain pathogenic and conditionally pathogenic microorganisms
36. Transient forms of infectious diseases
37. Microflora of the digestive organs
38. II Mechnikov's contribution to the development of science
39. L. Pasteur's contributions to the development of science
40. Infectious and non-infectious immunity
41. State the classification, morphology, structure of fungi .
42. State viruses, their structure, form, classification.
43. State the structure and morphology of microorganisms
44. Explain the process of spore and spore formation
45. Explain autotrophs and heterotrophs
46. What is included in the physiology of microorganisms?
47. What is the chemical composition of microorganisms?
48. Name the methods of nutrition of microorganisms.
49. What do you mean by respiration of microorganisms?
50. Importance and types of enzymes of microorganisms.
51. Explain the toxin, pigment formation, reproduction and growth of organisms .

52. Differentiation of microorganisms in relation to molecular oxygen.
53. Sanitation of soil microflora and its microbiological examination
tell me the importance?
54. Coli-titre, coli-index, how to determine the number of microbes in water.
55. What are the methods of determining the water microflora and its sanitary s?
56. Give an idea about the air microflora, the spread of pathogenic microbes air?
57. What are the microflora of the animal body and their benefits and harms? 58. Phagocytosis and its phases
59. What are the methods of determining the air microflora?
60. Introduction to the procedure for sampling from different water bodies
61. Explain the types of active and passive immunity
62. Describe superinfection, reinfection, simple and mixed infections.
63. Explain the sequence of reproduction stages of microorganisms in nce
64. Toxins of microorganisms
65. The role of prokaryotes and eukaryotes in animal pathology .
66. State the role of microorganisms in metabolism in nature.
67. What is the essence of the nitrogen cycle in nature?
68. Give an idea of ammonification, nitrification, denitrification.
69. Importance of carbon cycle in light industry?
70. Explain the cycle of sulfur, phosphorus, iron in nature.
71. Alcohol fermentation and microorganisms involved in it,
72. Acetic acid fermentation and microorganisms involved in it,
73. Name the periodic stages of the infectious process.
74. Fatty acid fermentation and microorganisms involved in it,
75. Lactic acid fermentation and microorganisms involved in it,
76. You know what physical factors affect microorganisms .
77. Describe the effect of chemical factors on microorganismC.
78. State the relationship of microorganisms in the biocenosis.
79. State the effect of antibiotics, phages, phytoncides on microorganisms.
80. Understand disinfection, asepsis, antiseptics.
81. What are antibiotics? How do they affect bacteria?
82. The essence of the immunofluorescence reaction
83. Methods of immunofluorescence reaction
84. What properties of microorganisms are studied in identification.
85. State the biological properties of microorganisms
86. Methods of preparation of drugs for fluorochromization
7. Explain the preparation of a drug for IFR
8. Explain the essence of the direct method of IFR
9. Explain the essence of the indirect method of IFR
0. Use of luminescent microscopy
1. Explain the fluorochromization process
2. Storage of conjugates
3. Name the nutrient media used to grow anaerobic microbes

4. Techniques of making broth
95. Ways of entry and exit of infection into the body
96. State the difference between the concepts of infection and infectious ses
97. What microbes are called pathogenic microbes.
98. Explain the concepts of pathogenicity and virulence.
99. What is the course of infectious diseases.
100. What is the difference between a latent infection and a microbial ion.
101. State the types and classification of infection.
102. What is immunity, tell the types of immunity, explain its essence.
103. Name the properties that cause virulence (invasiveness, toxins, capsule).
104. What are antigens and antibodies, explain.
105. Explain the specific and specific factors of immunity.
106. Allergy, anaphylaxis, idiosyncrasy, their essence and significance.
107. Explain the application of the doctrine of immunity in practice.
108. Give an idea of the variability of microorganisms.
109. Phenotype, genotype variability.
110. Opinions of different currents on the variability of microorganisms.
111. Mutation (spontaneous, induced) and combinatorial (transformation, duction, conjugation) changes.
112. Understand morphological, biological and cultural changeC.
113. State the peculiarities of infectious disease
114. Periodic stages of the infectious process.
115. Classification of infectious diseases
116. Importance, development, history of the science of immunology.
117. Tell about the types of special immunity
118. Explain the types of non-specific immunity
119. Non-specific resistance factors of the organism.
120. Tell about the body's immune response
121. State the peculiarities of infectious disease
122. Periodic stages of the infectious process.
123. Classification of infectious diseases
124. Importance, development, history of the science of immunology.
125. Tell about the types of special immunity
126. Explain the types of natural and artificial immunity
127. The concept of sterile and nostril immunity
128. Explain the types of non-specific immunity
129. Non-specific resistance factors of an organism.
130. Tell about the body's immune response
131. Explain the preparation of meat peptone broth
132. Explain the preparation of meat peptone agar
133. Preparation of Kitt-Tarossi nutrient medium
134. Soak in the preparation of liver broth
135. Technique of preparation of glucose-blood Seyssler agar

136. Preparation of whey-glucose agar
137. Explain bacteriophages
138. Explain serological reactions
139. What is immunoprophylaxis and immunotherapy.
140. What is seroprophylaxis and serotherapy
141. Comparison of bacteria using phages.
142. Techniques of sowing microbes.
143. Equipment used for inoculation of microbes
144. Types of thermostats
145. Cultivation of microorganisms
146. Techniques of culture of microorganisms in different nutrient media
147. Immunoenzyme method of serological testing (ELISA)
148. Explain the method of homogeneous immunoenzyme
149. Skin microflora
150. Microflora in the animal body
151. State the properties of staphylococci.
152. Give an idea about the classification of staphylococci.
153. Laboratory diagnosis of diseases caused by staphylococci.
154. Characteristics of the causative agent of infectious mastitis and atory diagnosis.
155. Morphological and cultural characteristics of the causative agent of ious mastitis
156. Biological properties of the causative agent of infectious mastitis
157. Resistance and biochemical properties of infectious mastitis pathogen
158. Pathogenicity and pathogenesis of infectious mastitis
159. Characteristics of the mute pathogen and laboratory diagnosis.
160. Morphology and cultural characteristics of the mute pathogen
161. Give an idea of the pathogenesis and pathogenesis of the mute pathogen
162. Characteristics of the pathogen of diplococcal infection and laboratory diagnosis.
163. Cultural and biochemical properties of the pathogen of diplococcal ion
164. Explain the pathogenesis and pathogenesis of diplococcal infection
165. Str. Morphology, resistance and cultural characteristics of pneumoniaeni
166. Biopreparations used in staphylococcal and streptococcal ionC.
167. State the characteristics of the Saramas pathogen.
168. What materials are sent to the laboratory for testing in Saramas
and in what ways it is checked.
169. State the characteristics of the causative agent of pasteurellosis.
170. Explain the pathogenesis and pathogenesis of the causative agent of urellosis
171. Morphological and cultural features of P.multocida
172. State the cultural and biochemical properties of P.multocida
173. Resistance, antigenic structure, immunity of P.multocida.

174. State the biological properties of P.multocida.
175. Morphological and cultural features of Erysipelothrix rhusiopathiaening
176. Biological features of Erysipelothrix rhusiopathiaening
177. Give an idea of the pathogenesis and pathogenesis of Erysipelothrix rhusiopathiaening
178. What materials are sent to the laboratory for testing for pasteurellosis
179. What is the laboratory diagnosis of pasteurellosis.
180. What biopreparations are used in Saramas
181. Describe the serological method of diagnosing Saramas disease
182. Describe the methods of laboratory testing in Saramas.
183. Resistance, immunity and diagnosis of Saramas pathogen.
184. State the cultural characteristics of the Saramas pathogen
185. When is Saramas considered diagnosed :
186. Biopreparations used in pasteurellosis.
187. Morphological and cultural features of E. coli
188. Resistance of E. coli, antigenic structure, immunity.
189. State the biological properties of E. coli
190. What serological test is used in the diagnosis of colibacillosis.
91. Explain the pathogenicity and pathogenesis of E. coli
92. State the characteristics of the causative agent of colibacillosis.
93. Describe the methods of laboratory testing for colibacillosis .
94. Biopreparations used in colibacillosis.
95. Name the biopreparations against colibacillosis in Uzbekistan.
196. What materials are obtained for testing in colibacillosis.
197. State the characteristics of salmonellosis pathogens.
198. Describe the methods of laboratory testing for salmonellosis.
199. What is the difference between colibacillosis and salmonellosis?
200. Name the types of Salmonella.
201. State the characteristics of the anthrax pathogen.
202. What are the methods of diagnosing anthrax in the laboratory?
203. What is the final diagnosis of anthrax?
204. Majon test and phagocytosis in the identification of anthrax.
205. Biopreparations used in anthrax.
205. The use of PR in the diagnosis of anthrax
207. Phagotyping method of anthrax examination
208. What materials are obtained for testing for anthrax.
209. State the morphological and cultural characteristics of Bac.anthracis
210. State the durability and biochemical properties of Bac.anthracis
211. Explain the pathogenesis and pathogenesis of anthrax
212. Antigenic structure and resistance of Bac.anthracis
213. Cultural characteristics of the anthrax pathogen
214. Explain the evaluation of test results in anthrax

215. Identification of anthrax pathogen (identification)
216. Bacteriological examination in anthrax
217. What is the final diagnosis of anthrax?
218. Explain the classification of mycobacteria
219. State the characteristics of the causative agent of tuberculosis
220. Cultural characteristics of tuberculosis pathogens
221. Resistance and morphological properties of tuberculosis pathogens
222. Serological and allergic methods of diagnosing tuberculosis
223. What methods are used to diagnose tuberculosis in the laboratory?
224. How do the types of mycobacteria differ.
225. Morphological features of Brussels sprouts
226. Morphological and cultural features of Brussels sprouts
227. Cultural characteristics of Brussels sprouts
228. Tell about the pathogenesis and pathogenesis of Brucella
229. Name the types of brussels sprouts
230. Application of AR in the detection of brucellosis
231. Give an idea of pathogenic anaerobes.
232. State the characteristics of the black causative agent.
233. State the cultural characteristics of Cl.chauvoe
234. Explain the biological properties of Cl.chauvoe
235. Morphology and durability of Cl.chauvoe
236. Explain the pathogenesis and pathogenesis of Cl.chauvoe
237. What patmaterials are taken for inspection of blackberries.
238. State the laboratory diagnosis of blackheads.
239. Biopreparations used in blackberry.
240. State the properties of a compound drive.
241. State the morphological properties of Cl.tetani
242. State the cultural properties of Cl.tetani
243. State the resistance and biochemical properties of Cl.tetani
244. State the pathogenesis and pathogenesis of Cl.tetani
245. Laboratory diagnosis of gas gangrene.
246. Cl. Pathogenesis and pathogenesis features of botulinum
247. Explain the preparation of material suspected of botulism for examination
248. Explain the technique of separation of botulism toxin
249. Explain the technique of isolating the culture of botulism
250. State the general characteristics of Bradzot pathogens.
251. Morphological features of Bradzot pathogen
252. State the biological properties of the pathogen Trichophytia
253. State the pathogenesis and pathogenesis of the pathogen Trichophytia
254. State the morphological features of the microsporidia pathogen
255. What is the difference between the pathogens of trichophytia, sporia .
6. Obtaining patm material for examination for dermatomycoses.
257. Candidiasis, pathogens of aspergillosis, their cultivation.

258. Morphological, tinctorial cultural features of the causative agent of spirosis.
259. Rules for obtaining and sending to the laboratory patmaterial for testing for leptospirosis.
260. Biopreparations used in leptospirosis
261. State the classification of mycoplasmas
262. Morphology and tinctorial properties of mycoplasmaC.
263. Cultural and biochemical properties of mycoplasmaC.
264. The concept of pathogenicity of mycoplasmas
265. What is the diagnosis of mycological diseases of fish?
266. Give examples of bacteriological diseases of fish
267. What is the diagnosis of bacteriological diseases of fish ?
268. Give examples of bacteriological diseases of bees
269. Give examples of mycological diseases of bees
270. What is the diagnosis of mycological diseases of bees?
271. Cl. Cultural properties of botulinum
272. Cl. Biological properties of botulinum
273. Explain the cultural characteristics of the Bradzot pathogen.
274. Explain the biological properties of the pathogen Bardzot
275. Cl. Explain the pathogenicity and pathogenesis of septicum
276. State the laboratory diagnosis of Bradzot.
277. Biological drugs used in Bradzot.
278. State the characteristics of the causative agent of trichophytia and laboratory diagnosis.
279. State the morphological features of the pathogen Trichophytia
280. State the cultural characteristics of the pathogen Trichophytia
281. State the general characteristics of pathogenic mycoplasmaC.
282. Give information about spirochetes
283. State the characteristics of the causative agent of leptospirosis and laboratory diagnosis.
284. State the morphological characteristics of the causative agent of spirosis
285. State the cultural characteristics of the causative agent of leptospirosis
286. State the biological properties of the causative agent of leptospirosis
287. State the pathogenesis and pathogenesis of the pathogen Leptospirosis
288. Name the types of pathogens of leptospirosis
289. Explain serological testing for leptospirosis
290. State the cultural characteristics of the pathogen Favus (parsha)
291. State the biological properties of the pathogen Favus (parsha)
292. What is the pathogenesis and pathogenesis of the pathogen Favus ha)?
293. Tell about aspergillosis
294. Candidiasis, pathogens of aspergillosis, their cultivation.
295. In what cases is a diagnosis made:
296. State the laboratory diagnosis of botulism.
297. Biopreparations used in botulism.

298. State the cultural characteristics of the microsporidia pathogen
299. State the biological properties of the microspore pathogen
300. State the pathogenesis and pathogenesis of the microsporia pathogen

4.4. Written work questions for 1 OB (150)

1. What does microbiology teach?
2. What are the branches of microbiology?
3. The importance of microbiology in the national economy.
4. Use of microbiological advances in industry and agriculture?
5. Tell a brief history of the development of microbiology?
6. Morphological, physiological periods of microbiology.
7. Use the achievements of microbiology
8. State the use of microbes in metallurgy
9. Explain general and specific microbiology
10. Name the heuristic and morphological periods of microbiology.
11. Tell us about the physiological period of microbiology and the work of scientists who contributed to it.
12. Tell about the immunological period of microbiology and the work of scientists who contributed to it.
13. Tell about veterinary and agricultural microbiology.
14. The heuristic era of microbiology and the scientists who contributed to it
15. Tell about the imorphological period of microbiology and the work of scientists who contributed to it.
16. The structure of the shell of bacteria
17. Capsule formation and its function
18. Microorganisms found in soil
19. The effect of high temperature on microbes
20. The effect of low temperature on microbes.
21. Drying and vacuum effects on microbes
22. The effect of X-rays on microbes
23. The effect of ultrasound on microbes.
24. Types of chemotaxis
25. Types of toxins
26. Name the main groups of microorganisms found in nature .
27. Give an idea of culture, strain, colony, clones.
28. What is the systematics, classification, nomenclature, give an idea.
29. What does the classification of microorganisms depend on?
30. Interactions of antigens and antibodies
31. Microbiology of surface waters
32. Microbiology of groundwater

33. The structure of the bacterium ; capsule, spore, hivchin, fimbriae and their ionC.
34. Describe the morphology and structure of spirochete, actinomycetes, plasma, rickettsiae
read
35. Explain pathogenic and conditionally pathogenic microorganisms
36. Transient forms of infectious diseases
37. Microflora of the digestive organs
38. II Mechnikov's contribution to the development of science
39. L. Pasteur's contributions to the development of science
40. Infectious and non-infectious immunity
41. State the classification, morphology, structure of fungi .
42. State viruses, their structure, form, classification.
43. State the structure and morphology of microorganisms
44. Explain the process of spore and spore formation
45. Explain autotrophs and heterotrophs
46. What is included in the physiology of microorganisms?
47. What is the chemical composition of microorganisms?
48. Name the methods of nutrition of microorganisms.
49. What do you mean by respiration of microorganisms?
50. Importance and types of enzymes of microorganisms.
51. Explain the toxin, pigment formation, reproduction and growth of organisms .
52. Differentiation of microorganisms in relation to molecular oxygen.
53. Sanitation of soil microflora and its microbiological examination
tell me the importance?
54. Coli-titre, coli-index, how to determine the number of microbes in water.
55. What are the methods of determining the water microflora and its sanitary s?
56. Give an idea about the air microflora, the spread of pathogenic microbes air?
57. What are the microflora of the animal body and their benefits and harms? 58. Phagocytosis and its phases
59. What are the methods of determining the air microflora?
60. Introduction to the procedure for sampling from different water bodies
61. Explain the types of active and passive immunity
62. Describe superinfection, reinfection, simple and mixed infections.
63. Explain the sequence of reproduction stages of microorganisms in nce
64. Toxins of microorganisms
65. The role of prokaryotes and eukaryotes in animal pathology .
66. State the role of microorganisms in metabolism in nature.
67. What is the essence of the nitrogen cycle in nature?
68. Give an idea of ammonification, nitrification, denitrification.
69. Importance of carbon cycle in light industry?
70. Explain the cycle of sulfur, phosphorus, iron in nature.
71. Alcohol fermentation and microorganisms involved in it,

72. Acetic acid fermentation and microorganisms involved in it,
73. Name the periodic stages of the infectious process.
74. Fatty acid fermentation and microorganisms involved in it,
75. Lactic acid fermentation and microorganisms involved in it,
76. You know what physical factors affect microorganisms .
77. Describe the effect of chemical factors on microorganismC.
78. State the relationship of microorganisms in the biocenosis.
79. State the effect of antibiotics, phages, phytoncides on microorganisms.
80. Understand disinfection, asepsis, antiseptics.
81. What are antibiotics? How do they affect bacteria?
82. The essence of the immunofluorescence reaction
83. Methods of immunofluorescence reaction
84. What properties of microorganisms are studied in identification.
85. State the biological properties of microorganisms
86. Methods of preparation of drugs for fluorochromization
7. Explain the preparation of a drug for IFR
8. Explain the essence of the direct method of IFR
9. Explain the essence of the indirect method of IFR
0. Use of luminescent microscopy
1. Explain the fluorochromization process
2. Storage of conjugates
3. Name the nutrient media used to grow anaerobic microbes
4. Techniques of making broth
95. Ways of entry and exit of infection into the body
96. State the difference between the concepts of infection and infectious ses
97. What microbes are called pathogenic microbes.
98. Explain the concepts of pathogenicity and virulence.
99. What is the course of infectious diseases.
100. What is the difference between a latent infection and a microbial ion.
101. State the types and classification of infection.
102. What is immunity, tell the types of immunity, explain its essence.
103. Name the properties that cause virulence (invasiveness, toxins, capsule).
104. What are antigens and antibodies, explain.
105. Explain the specific and specific factors of immunity.
106. Allergy, anaphylaxis, idiosyncrasy, their essence and significance.
107. Explain the application of the doctrine of immunity in practice.
108. Give an idea of the variability of microorganisms.
109. Phenotype, genotype variability.
110. Opinions of different currents on the variability of microorganisms.
111. Mutation (spontaneous, induced) and combinatorial (transformation, duction, conjugation) changes.
112. Understand morphological, biological and cultural changeC.
113. State the peculiarities of infectious disease

114. Periodic stages of the infectious process.
115. Classification of infectious diseases
116. Importance, development, history of the science of immunology.
117. Tell about the types of special immunity
118. Explain the types of non-specific immunity
119. Non-specific resistance factors of the organism.
120. Tell about the body's immune response
121. State the peculiarities of infectious disease
122. Periodic stages of the infectious process.
123. Classification of infectious diseases
124. Importance, development, history of the science of immunology.
125. Tell about the types of special immunity
126. Explain the types of natural and artificial immunity
127. The concept of sterile and nostril immunity
128. Explain the types of non-specific immunity
129. Non-specific resistance factors of an organism.
130. Tell about the body's immune response
131. Explain the preparation of meat peptone broth
132. Explain the preparation of meat peptone agar
133. Preparation of Kitt-Tarossi nutrient medium
134. Soak in the preparation of liver broth
135. Technique of preparation of glucose-blood Seyssler agar
136. Preparation of whey-glucose agar
137. Explain bacteriophages
138. Explain serological reactions
139. What is immunoprophylaxis and immunotherapy.
140. What is seroprophylaxis and serotherapy
141. Comparison of bacteria using phages.
142. Techniques of sowing microbes.
143. Equipment used for inoculation of microbes
144. Types of thermostats
145. Cultivation of microorganisms
146. Techniques of culture of microorganisms in different nutrient media
147. Immunoenzyme method of serological testing (ELISA)
148. Explain the method of homogeneous immunoenzyme
149. Skin microflora
150. Microflora in the animal body

4.5. Written work questions for 2 OB (150)

1. State the properties of staphylococci.
2. Understand the classification of staphylococci.
3. Laboratory diagnosis of diseases caused by staphylococci.
4. Characteristics of the causative agent of infectious mastitis and laboratory osis.
5. Morphological and cultural characteristics of the causative agent of ious mastitis
6. Biological properties of the causative agent of infectious mastitis
7. Resistance and biochemical properties of infectious mastitis pathogen
8. Pathogenesis and pathogenesis of infectious mastitis
9. Characteristics of the mute pathogen and laboratory diagnosis.
10. Morphology and cultural characteristics of the mute pathogen
11. Give an idea of the pathogenesis and pathogenesis of the mute pathogen
12. Characteristics of the pathogen of diplococcal infection and laboratory osis.
13. Cultural and biochemical properties of the causative agent of diplococcal ion
14. Explain the pathogenesis and pathogenesis of diplococcal infection
15. Str. Morphology, resistance and cultural characteristics of pneumoniaeni
16. Biopreparations used in staphylococcal and streptococcal ionC.
17. State the characteristics of the causative agent of Saramas.
18. What materials are sent to the laboratory for testing for Saramas
and in what ways it is checked.
19. State the characteristics of the causative agent of pasteurellosis.
20. Explain the pathogenesis and pathogenesis of the causative agent of urellosis
21. Morphological and cultural features of P.multocida
22. State the cultural and biochemical properties of P.multocida
23. P.multocida resistance, antigenic structure, immunity.
24. State the biological properties of P.multocida.
25. Morphological and cultural features of Erysipelothrix rhusiopathiaening
26. Biological features of Erysipelothrix rhusiopathiaening
27. Give an idea of the pathogenesis and pathogenesis of Erysipelothrix rhusiopathiaening
28. What materials are sent to the laboratory for testing for pasteurellosis
29. What is the laboratory diagnosis of pasteurellosis.
30. What biopreparations are used in Saramas
31. Describe the serological method of diagnosing Saramas disease
32. Describe the methods of laboratory testing in Saramas.
33. Resistance, immunity and diagnosis of Saramas pathogen.
34. State the cultural characteristics of the Saramas pathogen
35. When is Saramas considered diagnosed :
36. Biopreparations used in pasteurellosis.
37. Morphological and cultural features of E. coli
38. E. coli resistance, antigenic structure, immunity.
39. State the biological properties of E. coli

40. What serological test is used in the diagnosis of colibacillosis.
41. Explain the pathogenesis and pathogenesis of E. coli
42. State the characteristics of the causative agent of colibacillosis.
43. What are the methods of laboratory testing for colibacillosis ?
44. Biopreparations used in colibacillosis.
45. Name the biopreparations against colibacillosis in Uzbekistan.
46. What materials are obtained for testing in colibacillosis.
47. State the characteristics of salmonellosis pathogens.
48. What are the methods of testing for salmonellosis in the laboratory?
49. What is the difference between colibacillosis and salmonellosis?
50. Name the types of Salmonella.
51. State the characteristics of the anthrax pathogen.
52. What are the methods of diagnosing anthrax in the laboratory?
53. What is the final diagnosis of anthrax?
54. Majon test and phagocytosis in the identification of anthrax.
55. Biopreparations used in anthrax.
56. The use of PR in the diagnosis of anthrax
57. Phagotyping method of anthrax examination
58. What materials are obtained for testing for anthrax.
59. State the morphological and cultural characteristics of Bac.anthracis
60. State the resistance and biochemical properties of Bac.anthracis
61. Explain the pathogenesis and pathogenesis of anthrax
62. Antigenic structure and resistance of Bac.anthracis
63. Cultural characteristics of anthrax
64. Explain the evaluation of test results in anthrax
65. Identification of anthrax pathogen (identification)
66. Bacteriological examination in anthrax
67. What is the final diagnosis of anthrax?
68. Explain the classification of mycobacteria
69. State the characteristics of the causative agent of tuberculosis
70. Cultural characteristics of tuberculosis pathogens
71. Resistance and morphological properties of tuberculosis pathogens
72. Serological and allergic methods of diagnosing tuberculosis
73. What methods are used to diagnose tuberculosis in the laboratory?
74. How do the types of mycobacteria differ.
75. Morphological features of brussels sprouts
76. Morphological and cultural features of Brussels sprouts
77. Cultural characteristics of brussels sprouts
78. Tell about the pathogenesis and pathogenesis of brucellosis
79. Name the types of brussels sprouts
80. Application of AR in the detection of brucellosis
81. Explain pathogenic anaerobes.

82. State the characteristics of the causative agent of black spot.
83. State the cultural characteristics of Cl.chauvoe
84. Explain the biological properties of Cl.chauvoe
85. Morphology and durability of Cl.chauvoe
86. Explain the pathogenesis and pathogenesis of Cl.chauvoe
87. What patmaterials are obtained for inspection of blackberries.
88. State the laboratory diagnosis of blackheads.
9. Biopreparations used in blackberry.
0. State the properties of the alloy driver.
1. State the morphological features of Cl.tetani
2. State the cultural properties of Cl.tetani
3. State the resistance and biochemical properties of Cl.tetani
4. State the pathogenesis and pathogenesis of Cl.tetani
95. Laboratory diagnosis of gas gangrene.
96. Cl. Pathogenesis and pathogenesis features of botulinum
97. Explain the preparation of material suspected of botulism for examination
98. Explain the technique of separation of botulism toxin
99. Explain the technique of isolation of botulism culture
100. State the general characteristics of Bradzot pathogens.
101. Morphological features of the Bradzot pathogen
102. State the biological properties of the pathogen Trichophytia
103. State the pathogenesis and pathogenesis of the pathogen Trichophytia
104. State the morphological features of the microspore pathogen
105. What is the difference between the pathogens of trichophytia, sporia .
6. Obtaining patm material for examination for dermatomycoses.
107. Candidiasis, aspergillosis pathogens, their cultivation.
108. Morphological, tinctorial cultural features of the causative agent of spirosis.
109. The rule of obtaining patmaterial for testing for leptospirosis and sending it to the laboratory.
110. Biopreparations used in leptospirosis
111. State the classification of mycoplasmas
112. Morphology and tinctorial properties of mycoplasmaC.
113. Cultural and biochemical properties of mycoplasmaC.
114. The concept of pathogenicity of mycoplasmas
115. What is the diagnosis of mycological diseases of fish?
116. Give examples of bacteriological diseases of fish
117. What is the diagnosis of bacteriological diseases of fish ?
118. Give examples of bacteriological diseases of bees
119. Give examples of mycological diseases of bees
120. What is the diagnosis of mycological diseases of bees?
121. Cl. Cultural properties of botulinum
122. Cl. Biological properties of botulinum
123. Explain the cultural characteristics of the Bradzot pathogen.

124. Explain the biological properties of the Bardzot pathogen
125. Cl. Explain the pathogenicity and pathogenesis of septicum
126. State the laboratory diagnosis of Bradzot.
127. Biological drugs used in Bradzot.
128. State the characteristics of the causative agent of trichophytosis and atory diagnosis.
129. State the morphological features of the pathogen Trichophytia
130. State the cultural characteristics of the pathogen Trichophytia
131. State the general characteristics of pathogenic mycoplasmaC.
132. Give information about spirochetes
133. State the characteristics of the causative agent of leptospirosis and laboratory diagnosis.
134. State the morphological characteristics of the causative agent of spirosis
135. State the cultural characteristics of the causative agent of leptospirosis
136. State the biological properties of the causative agent of leptospirosis
137. State the pathogenicity and pathogenesis of the pathogen Leptospirosis
138. Name the types of pathogens of leptospirosis
139. Explain serological testing for leptospirosis
140. State the cultural characteristics of the pathogen Favus (parsha)
141. State the biological properties of the pathogen Favus (parsha)
142. What is the pathogenesis and pathogenesis of the pathogen Favus ha)?
143. Tell about aspergillosis
144. Candidiasis, aspergillosis pathogens, their cultivation.
145. In what cases is a diagnosis made:
146. State the laboratory diagnosis of botulism.
147. Biopreparations used in botulism.
148. State the cultural characteristics of the microsporidia pathogen
149. State the biological properties of the microspores pathogen
150. State the pathogenesis and pathogenesis of the microsporia pathogen

4.6. Written work questions for GP (500)

1. What does microbiology teach?
2. What are the branches of microbiology?

3. The importance of microbiology in the national economy.
4. Use of microbiological advances in industry and agriculture?
5. Tell a brief history of the development of microbiology?
6. Morphological, physiological periods of microbiology.
7. Use the achievements of microbiology
8. State the use of microbes in metallurgy
9. Explain general and specific microbiology
10. Name the heuristic and morphological periods of microbiology.
11. Tell us about the physiological period of microbiology and the work of scientists who contributed to it.
12. Tell about the immunological period of microbiology and the work of scientists who contributed to it.
13. Tell about veterinary and agricultural microbiology.
14. The heuristic era of microbiology and the scientists who contributed to it
15. Tell about the imorphological period of microbiology and the work of scientists who contributed to it.
16. Explain the state of metochromasia.
17. Explain the methods of crushed drop and suspended drop.
18. Explain aerobic and anaerobic microorganisms and give examples
19. .What pathological materials are obtained for bacteriological examination.
20. Simple food environments and techniques of their preparation
21. Explain the physical and chemical methods of sterilization
22. Describe the technique of biological methods of separation of pure culture
23. Antigenic and pathogenic properties of microorganisms
24. The difference between pure culture separation from aerobic and anaerobic microorganisms
25. Name the types and methods of storage of laboratory animals
26. Explain the morphological, cultural and tinctorial properties of microorganisms
27. Name the methods of subcutaneous, intercutaneous and subcutaneous infection of laboratory animals
28. Describe the methods of infecting laboratory animals with blood vessels and the abdominal cavity
29. The structure of the shell of bacteria
30. Capsule formation and its function
31. Microorganisms found in soil
32. The effect of high temperature on microbes
33. The effect of low temperature on microbes.
34. Drying and vacuum effects on microbes
35. The effect of X-rays on microbes
36. The effect of ultrasound on microbes.
37. Types of chemotaxis
38. Types of toxins
39. Name the main groups of microorganisms found in nature .

40. Give an idea of culture, strain, colony, clones.
41. What is the systematics, classification, nomenclature, give an idea.
42. What depends on the classification of microorganisms.
43. Interactions of antigens and antibodies
44. Microbiology of surface waters
45. Microbiology of groundwater
46. The structure of the bacterium ; capsule, spore, hivchin, fimbriae and their functionC.
47. Morphology and structure of spirochete, actinomycetes, mycoplasma, rickettsiae
read
48. Explain pathogenic and conditionally pathogenic microorganisms
49. Transient forms of infectious diseases
50. Microflora of the digestive organs
51. II Mechnikov's contribution to the development of science
52. L. Pasteur's contributions to the development of science
53. Infectious and non-infectious immunity
54. State the classification, morphology, structure of fungi .
55. State viruses, their structure, form, classification.
56. State the structure and morphology of microorganisms
57. Explain the process of spore and spore formation
58. Explain autotrophs and heterotrophs
59. What is included in the physiology of microorganisms?
60. What is the chemical composition of microorganisms?
61. Name the methods of nutrition of microorganisms.
62. What do you mean by respiration of microorganisms?
63. Importance and types of enzymes of microorganisms.
64. Explain the formation of toxins, pigments, reproduction and growth of microorganisms .
65. Differentiation of microorganisms in relation to molecular oxygen.
66. Sanitation of soil microflora and its microbiological examination tell me the importance?
67. How to determine the coli-titre, coli-index, the number of microbes in water.
68. What are the methods of determining the water microflora and its sanitary status?
69. What is the concept of air microflora, the spread of pathogenic microbes in the air?
70. What are the microflora of the animal body and their benefits and harms? 58. Phagocytosis and its phases
71. What are the methods of determining the air microflora?
72. Introduction to the procedure for sampling from different water bodies
73. Explain the types of active and passive immunity
74. Describe superinfection, reinfection, simple and mixed infections.

75. Explain the sequence of reproduction stages of microorganisms in sequence
76. Toxins of microorganisms
77. The role of prokaryotes and eukaryotes in animal pathology .
78. State the role of microorganisms in metabolism in nature.
79. What is the essence of the nitrogen cycle in nature?
80. Understand ammonification, nitrification, denitrification.
81. The importance of the carbon cycle in the light industry?
82. Explain the cycle of sulfur, phosphorus, iron in nature.
83. Alcohol fermentation and microorganisms involved in it,
83. Acetic acid fermentation and microorganisms involved in it,
84. Name the periodic stages of the infectious process.
85. Fatty acid fermentation and microorganisms involved in it,
86. Lactic acid fermentation and microorganisms involved in it,
87. Do you know the effect of physical factors on microorganisms .
88. Describe the effect of chemical factors on microorganismC.
89. State the relationship of microorganisms in the biocenosis.
90. Describe the effect of antibiotics, phages, phytoncides on microorganisms.
91. Understand disinfection, asepsis, antiseptics.
92. What are antibiotics? How do they affect bacteria?
93. The essence of the immunofluorescence reaction
94. Methods of immunofluorescence reaction
95. What properties of microorganisms are studied in identification.
96. State the biological properties of microorganisms
97. Methods of preparation of drugs for fluorochromization
98. Explain the preparation of a drug for IFR
99. Explain the essence of the direct method of IFR
100. Explain the essence of the indirect method of IFR
101. Use of luminescent microscopy
102. Explain the fluorochromization process
103. Storage of conjugates
104. Name the nutrient media used to grow anaerobic microbes
105. Techniques of making broth
106. Ways of entry and exit of infection into the body
107. State the difference between the concepts of infection and infectious diseases
108. What microbes are called pathogenic microbes.
109. Explain the concepts of pathogenicity and virulence.
110. What is the course of infectious diseases.
110. What is the difference between a latent infection and a microbial infection?
111. State the types and classification of infection.
112. What is immunity, tell the types of immunity, explain its essence.
113. Name the properties that cause virulence (invasiveness, toxins, capsule).
114. What are antigens and antibodies, explain.
115. Explain the specific and specific factors of immunity.

116. Explain allergies, anaphylaxis, idiosyncrasy, their essence and significance.
117. Explain the application of the doctrine of immunity in practice.
118. Give an idea of the variability of microorganisms.
119. Phenotype, genotype variability.
120. Opinions of different currents on the variability of microorganisms.
121. Mutation (spontaneous, induced) and combinatorial (transformation, transduction,
conjugation) changes.
122. Understand morphological, biological and cultural changeC.
123. State the peculiarities of infectious disease
124. Periodic stages of the infectious process.
125. Classification of infectious diseases
126. Importance, development, history of the science of immunology.
127. Tell about the types of special immunity
128. Explain the types of non-specific immunity
129. Non-specific resistance factors of an organism.
130. Tell about the body's immune response
131. State the peculiarities of infectious disease
132. Periodic stages of the infectious process.
133. Classification of infectious diseases
134. Importance, development, history of the science of immunology.
135. Tell about the types of special immunity
136. Explain the types of natural and artificial immunity
137. The concept of sterile and nostril immunity
138. Explain the types of non-specific immunity
139. Non-specific resistance factors of the organism.
140. Tell about the body's immune response
141. Explain the preparation of meat peptone broth
142. Explain the preparation of meat peptone agar
143. Preparation of Kitt-Tarossi nutrient medium
144. Soak in the preparation of liver broth
145. Technique of preparation of glucose-blood Seyssler agar
146. Preparation of whey-glucose agar
147. Explain bacteriophages
148. Explain serological reactions
149. What is immunoprophylaxis and immunotherapy.
150. What is seroprophylaxis and serotherapy
151. Comparison of bacteria using phages.
152. Techniques of sowing microbes.
153. Equipment used for inoculation of microbes
154. Types of thermostats
155. Cultivation of microorganisms
156. Techniques of culture of microorganisms in different nutrient media

157. Immunoenzyme method of serological testing (ELISA)
158. Explain the method of homogeneous immunoenzyme
159. Skin microflora
160. Microflora in the animal body
161. State the properties of staphylococci.
162. Give an idea about the classification of staphylococci.
163. Laboratory diagnosis of diseases caused by staphylococci.
164. Characteristics and laboratory diagnosis of the causative agent of infectious mastitis.
165. Morphological and cultural characteristics of the causative agent of infectious mastitis
166. Biological properties of the causative agent of infectious mastitis
167. Resistance and biochemical properties of infectious mastitis pathogen
168. Pathogenesis and pathogenesis of infectious mastitis
169. Characteristics of the mute pathogen and laboratory diagnosis.
170. Morphology and cultural characteristics of the mute pathogen
171. Give an idea of the pathogenesis and pathogenesis of the mute pathogen
172. Characteristics of the pathogen of diplococcal infection and laboratory diagnosis.
173. Cultural and biochemical properties of the pathogen of diplococcal infection
174. Explain the pathogenesis and pathogenesis of diplococcal infection
175. Str. Morphology, resistance and cultural characteristics of pneumoniaeni
176. Biopreparations used in staphylococcal and streptococcal infectionC.
177. State the characteristics of the causative agent of Saramas.
178. What materials are sent to the laboratory for testing of Saramas
and in what ways it is checked.
179. State the characteristics of the causative agent of pasteurellosis.
180. Explain the pathogenesis and pathogenesis of the causative agent of pasteurellosis
181. Morphological and cultural features of P.multocida
182. State the cultural and biochemical properties of P.multocida
183. Resistance, antigenic structure, immunity of P.multocida.
184. State the biological properties of P.multocida.
185. Morphological and cultural features of Erysipelothrix rhusiopathiaening
186. Biological features of Erysipelothrix rhusiopathiaening
187. Give an idea of the pathogenesis and pathogenesis of Erysipelothrix rhusiopathiaening
188. What materials are sent to the laboratory for testing for pasteurellosis
189. What is the laboratory diagnosis of pasteurellosis.
190. What biopreparations are used in Saramas
191. Describe the serological method of diagnosing Saramas disease
192. Describe the methods of laboratory testing in Saramas.

193. Resistance, immunity and diagnosis of Saramas pathogen.
194. State the cultural characteristics of the Saramas pathogen
195. When is Saramas considered diagnosed :
196. Biopreparations used in pasteurellosis.
197. Morphological and cultural features of E. coli
198. E. coli resistance, antigenic structure, immunity.
199. State the biological properties of E. coli
200. What serological test is used in the diagnosis of colibacillosis.
201. Explain the pathogenicity and pathogenesis of E. coli
202. State the characteristics of the causative agent of colibacillosis.
203. What are the methods of laboratory testing for colibacillosis ?
204. Biopreparations used in colibacillosis.
205. Name the biopreparations against colibacillosis in Uzbekistan.
206. What materials are obtained for testing in colibacillosis.
207. State the characteristics of salmonellosis pathogens.
208. What are the methods of laboratory testing for salmonellosis?
209. Pathogenicity and pathogenesis of Salmonella
210. Resistance and biochemical properties of Salmonella
211. Morphological and cultural characteristics of Salmonella
212. Method of serological examination in salonellosis
213. Name the bacteriological examination in salmonellosis
214. Biopreparations used in salmonellosis.
215. What patmaterials are obtained for examination in salmonellosiC.
216. What is the difference between colibacillosis and salmonellosis?
217. Name the species of Salmonella.
218. State the characteristics of the anthrax pathogen.
219. What are the methods of diagnosis of anthrax in the laboratory?
220. What is the final diagnosis of anthrax?
221. Majon test and phagocytosis in the identification of anthrax.
222. Biopreparations used in anthrax.
223. The use of PR in the diagnosis of anthrax
224. Phagotyping method of anthrax examination
225. What materials are obtained for the examination of anthrax.
226. State the morphological and cultural characteristics of Bac.anthracis
227. State the resistance and biochemical properties of Bac.anthracis
228. Explain the pathogenesis and pathogenesis of anthrax
229. Antigenic structure and resistance of Bac.anthracis
230. Cultural characteristics of anthrax
231. Explain the evaluation of test results in anthrax
232. Identification of anthrax pathogen (identification)
233. Bacteriological examination in anthrax
234. What is the final diagnosis of anthrax?

235. Explain the classification of mycobacteria
236. State the characteristics of the causative agent of tuberculosis
237. Cultural characteristics of tuberculosis pathogens
238. Resistance and morphological properties of tuberculosis pathogens
239. Serological and allergic methods of diagnosis of tuberculosis
240. What methods are used to diagnose tuberculosis in the laboratory?
241. How do the types of mycobacteria differ.
242. What is the final diagnosis of tuberculosis?
243. What are the methods of processing patmaterial in tuberculosis?
244. What materials are obtained for testing for tuberculosis?
245. What is the method of biosynthesis of tuberculosis?
246. State the characteristics of the causative agent of brucellosis.
247. Application of milk ring agglutination reaction in the diagnosis of brucellosis
248. What methods are tested for brucellosis in the laboratory?
249. What is the final diagnosis of brucellosis?
250. Serological diagnosis of brucellosiC.
251. What materials are obtained for testing for brucellosis.
252. What is the method of biosynthesis of brucellosis?
253. Morphological features of Brussels sprouts
254. Morphological and cultural features of Brussels sprouts
255. Cultural characteristics of brussels sprouts
256. Tell about the pathogenesis and pathogenesis of Brucella
257. Name the types of brussels sprouts
258. Application of AR in the detection of brucellosis
259. Give an idea of pathogenic anaerobes.
260. State the characteristics of the black causative agent.
261. State the cultural characteristics of Cl.chauvoe
262. Explain the biological properties of Cl.chauvoe
263. Morphology and endurance of Cl.chauvoe
264. Explain the pathogenesis and pathogenesis of Cl.chauvoe
265. What patmaterials are taken for inspection of blackberries.
266. State the laboratory diagnosis of blackheads.
267. Biopreparations used in blackberry.
268. State the properties of the alloy driver.
269. State the morphological features of Cl.tetani
270. State the cultural properties of Cl.tetani
271. State the resistance and biochemical properties of Cl.tetani
272. State the pathogenesis and pathogenesis of Cl.tetani
273. Laboratory diagnosis of gas gangrene.
274. Tell about the causative agents of gas gangrene
275. Morphological features of gas gangrene pathogens
276. Cultural characteristics of gas gangrene pathogens
277. Biological properties of gas gangrene pathogens

278. Biopreparations used for gas gangrene
279. State the laboratory diagnosis of the coating
280. Explain the procedure for the separation of toxins in coronary heart disease
281. Explain the procedure for culture separation in coronary heart disease
282. Biopreparations used in the alloy.
283. In what cases it is considered that the diagnosis is made :
284. Antigenic structure and immunity of the causative agent
285. State the characteristics of the causative agent of botulism.
286. Cl. Morphological features of botulinum
287. Cl. Pathogenesis and pathogenesis features of botulinum
288. Explain the preparation of material suspected of botulism for examination
289. Explain the technique of separation of botulism toxin
290. Explain the technique of separating the culture of botulism
291. State the general characteristics of Bradzot pathogens.
292. Morphological features of Bradzot pathogen
293. State the biological properties of the pathogen Trichophytia
294. State the pathogenesis and pathogenesis of the pathogen Trichophytia
295. State the morphological features of the microsporidia pathogen
296. What is the difference between the pathogens of trichophytia, microsporia.
297. Obtaining patm material for examination for dermatomycoseC.
298. Candidiasis, aspergillosis pathogens, their cultivation.
299. Morphological, tinctorial cultural features of the causative agent of leptospirosis.
300. Rules for obtaining and sending to the laboratory patmaterial for testing for leptospirosis.
301. Biopreparations used in leptospirosis
302. State the classification of mycoplasmas
303. Morphology and tinctorial properties of mycoplasmaC.
304. Cultural and biochemical properties of mycoplasmaC.
305. The concept of pathogenicity of mycoplasmas
306. What is the diagnosis of mycological diseases of fish?
307. Give examples of bacteriological diseases of fish
308. What is the diagnosis of bacteriological diseases of fish ?
309. Give examples of bacteriological diseases of bees
310. Give examples of mycological diseases of bees
311. What is the diagnosis of mycological diseases of bees?
312. Cl. Cultural properties of botulinum
313. Cl. Biological properties of botulinum
314. Explain the cultural characteristics of the Bradzot pathogen.
315. Explain the biological properties of the Bardzot pathogen
316. Cl. Explain the pathogenicity and pathogenesis of septicum
317. State the laboratory diagnosis of Bradzot.
318. Biological drugs used in Bradzot.

319. State the characteristics of the causative agent of trichophytia and laboratory diagnosis.
320. State the morphological features of the pathogen Trichophytia
321. State the cultural characteristics of the pathogen Trichophytia
322. State the general characteristics of pathogenic mycoplasmaC.
323. Give information about spirochetes
324. State the characteristics of the causative agent of leptospirosis and laboratory diagnosis.
325. State the morphological characteristics of the causative agent of leptospirosis
326. State the cultural characteristics of the causative agent of leptospirosis
327. State the biological properties of the causative agent of leptospirosis
328. State the pathogenesis and pathogenesis of the pathogen Leptospirosis
329. Name the types of pathogens of leptospirosis
330. Explain serological testing for leptospirosis
331. State the cultural characteristics of the pathogen Favus (parsha)
332. State the biological properties of the pathogen Favus (parsha)
333. What is the pathogenesis and pathogenesis of the pathogen Favus (parsha)?
334. Tell about aspergillosis
335. Candidiasis, aspergillosis pathogens, their cultivation.
336. In what cases is a diagnosis made:
337. State the laboratory diagnosis of botulism.
338. Biopreparations used in botulism.
339. State the cultural characteristics of the microsporidia pathogen
340. State the biological properties of the microspore pathogen
341. State the pathogenesis and pathogenesis of the microsporia pathogen
342. Morphology and tinctorial features of the causative agent of peripneumonia in large horned animals.
343. Cultural characteristics of the causative agent of peripneumonia in large horned animals.
344. Biological properties of the causative agent of peripneumonia in large horned animals
345. Give examples of mycological diseases of fish
346. .Tell the characteristics of the microsporia pathogen and the laboratory diagnosis.
347. Morphology of Favus (parsha) pathogen
348. State the characteristics of the pathogen Favus (parsha) and laboratory diagnosis.
349. State the morphological features of the pathogen Favus (parsha)
350. Explain mucormycosis
351. Name the types of bacteriological dyes
352. State the rules of working with a biological microscope.
353. Name the mechanical and optical systems of the microscope
354. Name the methods of examination in the laboratory of microbiology

355. Departments of Microbiology Laboratory
356. State the rules of structure and operation of the laboratory of microbiology.
357. Give an idea of dyes and their working solutions used in the practice of microbiology
358. Explain the technique of preparation of the drug
359. State the essence and technique of gram staining method
360. Explain simple and complex painting methods.
361. Describe the methods of staining spores
362. Describe the methods of dyeing the capsule
363. Explain the methods of staining acid-resistant bacteria
364. Tell about the permanent parts of a microbial cell
365. Tell about non-permanent parts of a microbial cell
366. Explain the basic forms of bacteria.
367. Explain the technique of preparation of various drugs
368. Name the types of spherical bacteria
369. Name the types of rod-shaped bacteria
370. Give an idea about the morphology of fungi
371. Name the methods of studying the movement of bacteria.
372. Explain the types and location of hives
373. State the nutrient media and their classification
374. Explain the classification of nutrient media by origin
375. Classification of nutrient media by use
376. Classification of nutrient media according to consistency
377. Name the methods of sterilization
378. Physical methods of sterilization
379. The concept of sterilization and disinfection
380. Explain the Pasteur and Cox methods of pure culture separation
381. State the physical and chemical methods of separation of pure culture
382. Name the methods of isolation of pure culture
383. Methods for determining the sensitivity of microorganisms to antibiotics
384. What are antibiotics? How do they affect bacteria?
385. Describe the method of diffusion of agar.
386. A method of diluting a series of antibiotics in liquid or dense nutrient media
387. Methods of infecting laboratory animals
388. What is the difference between diagnosticum, vaccine and therapeutic serum?
389. Explain the use of biopreparations in veterinary practice.
390. What indicators are used to check the quality of biologicals?
391. Agglutination reaction and its types
392. Technique of placement of drip and blood droplet AR
393. State the technique of placing AR
394. Describe the technique of putting ring PR.
395. Precipitation reaction and its types

396. Explain the technique of putting PR
397. Describe the systems and installation techniques of CBR
398. Components of test AR, placement technique and accounting
lish.
399. Explain the technique of putting the milk ring reaction.
400. Differences of antigens in precipitation and agglutination reactions.
401. Explain the technique of setting the ring precipitation reaction.
402. Name the components of the ring precipitation reaction.
403. Putting a diffuse precipitation reaction, its essence.
404. Explain the consideration of the result of the compliment binding reaction.
405. Explain the method and purpose of bacteriological examination of the body
406. What are the rules for obtaining and sending to the laboratory?
407. What information should be in the referral.
408. Explain the purposes for which bacteriophages are used
409. Use of bacteriophages for diagnostic purposes
410. Separation of phages
411. Equipment for the cultivation of microorganisms
412. Cultivation of microbes in a dense nutrient medium
413. Planting in liquid nutrient medium
414. Growth of microorganisms in a liquid nutrient medium
415. Determination of antigen by enzyme-linked immunosorbent assay.
416. Stages of ELISA
417. Calculate the result of ELISA
418. 4. Genital microflora
419. Microflora of the respiratory organs
420. The causative agent of camel and human plague
421. The causative agent of camel and human plague
422. Laboratory diagnosis of the causative agent of camel and human plague
423. Morphological and cultural characteristics of the causative agent of camel and human plague
424. Resistance, antigenic structure, immunity of camel and human plague pathogens.
425. State the biological characteristics of the causative agent of plague in camels and humans
426. Explain the pathogenesis and pathogenesis of the causative agent of camel and human plague
427. State the characteristics of the causative agent of plague in camels and humans.
428. Describe the methods of laboratory testing for the causative agent of camel and human plague.
429. Biopreparations used in camel and human plague .

430. What patmaterials are obtained for testing for the causative agent of camel and human plague.
431. The causative agent of pseudotuberculosis
432. Laboratory diagnosis of pseudotuberculosis pathogen
433. Properties of the causative agent of pseudotuberculosis
434. Morphological and tinctorial features of the causative agent of pseudotuberculosis
435. Biological properties of the causative agent of pseudotuberculosis
436. Cultural characteristics of the causative agent of pseudotuberculosis
437. What pathogens are obtained for testing for the causative agent of pseudotuberculosis.
438. What are the methods of laboratory testing of the causative agent of pseudotuberculosis?
439. The causative agent of tularemia
440. Laboratory diagnosis of tularemia
441. Characteristics of the causative agent of tularemia
442. Morphological and tinctorial features of the causative agent of tularemia
443. Cultural characteristics of the causative agent of tularemia
444.What patmaterials are obtained for examination for the causative agent of tularemia.
445. What are the methods of laboratory examination of the causative agent of tularemia?
446. The causative agent of listeriosis
447. Laboratory diagnosis of Listeriosis pathogen
448. Morphological and cultural characteristics of the causative agent of listeriosis
449. Resistance, antigenic structure, immunity of Listeriosis pathogen.
450. State the biological properties of the causative agent of listeriosis
451. Explain the pathogenesis and pathogenesis of the causative agent of listeriosis
452. State the characteristics of the causative agent of listeriosis.
453. What are the methods of laboratory testing for the causative agent of listeriosis?
454. Biopreparations used in listeriosis.
455. What pathogens are obtained for examination for the causative agent of listeriosis.
456. Serological examination in listeriosis.
457. The causative agent of infectious enterotoxemia
458. Pathogenesis of infectious enterotoxemia and laboratory diagnosis.
459. Morphological and cultural characteristics of the causative agent of infectious enterotoxemia
460. Resistance to the pathogen of infectious enterotoxemia, antigenic structure, immunity.
461. State the biological properties of infectious enterotoxemia
462. Explain the pathogenesis and pathogenesis of infectious enterotoxemia

463. State the characteristics of the causative agent of infectious enterotoxemia.
464. What are the methods of laboratory examination of the causative agent of infectious enterotoxemia?
465. Biopreparations used in infectious enterotoxemia.
466. What pathogens are obtained for examination in infectious enterotoxemia.
467. The causative agent of necrobacteriosis
468. Pathogen of necrobacteriosis and laboratory diagnosis.
469. Morphological and cultural characteristics of the causative agent of necrobacteriosis
470. Resistance to necrobacteriosis, antigenic structure, immunity.
471. State the biological properties of the causative agent of necrobacteriosis
472. Explain the pathogenicity and pathogenesis of the causative agent of necrobacteriosis
473. State the properties of the causative agent of necrobacteriosis.
474. What are the methods of laboratory examination of the causative agent of necrobacteriosis?
475. Biopreparations used in necrobacteriosis.
476. What materials are obtained for testing in necrobacteriosis.

477. Laboratory diagnosis of campylobacteriosis
478. Campylobacteriosis pathogen and laboratory diagnosis.
479. Morphological and cultural characteristics of the causative agent of campylobacteriosis
480. Resistance, antigenic structure, immunity to the causative agent of campylobacteriosis.
481. State the biological properties of the causative agent of campylobacteriosis
482. Explain the pathogenesis and pathogenesis of the causative agent of campylobacteriosis
483. State the properties of the causative agent of campylobacteriosis.
484. What are the methods of laboratory testing of the causative agent of campylobacteriosis?
485. Biopreparations used in campylobacteriosis.
486. What materials are obtained for testing for campylobacteriosis.
487. Explain pathogenic rickettsiae
488. Morphological features of rickettsiae
489. Diseases caused by rickettsiae
490. Bacteriological examination of pathogenic chlamydia
491. Morphological features of pathogenic chlamydia
492. Classification of chlamydia
493. Pathogens of chlamydia
494. Reproduction of chlamydia
495. Resistance of chlamydia
496. Antigenic structure of chlamydia

497. The causative agent of ornithosis.
498. Pathogenicity of ornithosis pathogen
499. Pathogenesis of ornithosis pathogen
500. Resistance and immunity to the ornithosis pathogen

4.7. Test questions for 1 OB (200)

1. **Who invented the doctrine of humoral immunity?**
A. 1907 IPPavlov
B. 1907 Erlix
C. 1886 IISechenov
D. 1903 IIMechnikov

2. Who and when discovered that nitrobacteria control the nitrification process?
A. 1927 DIMendeleyev
B. 1903 IIMechnikov
C. 1907 IPPavlov
D. 1877 SNVinogradskiy

3. Who was the first scientist in Russia to develop an anthrax vaccine and put it into practice?
ALSSenkovskiy
BSNVinogradskiy
SVLOmelyanskiy
DIIMechnikov

4. The scientist who identified the pathogens that make up the fiber?
AVLOmelyanskiy
BLSSenkovskiy
SSNVinogradskiy
DIIMechnikov

5. Who is the scientist who discovered that the causes of wine disease are microbes and invented a method to protect wine from spoilage by heating it to 55 ^{0}C?
ALSSenkovskiy
B. Robet Cox
SVLOmelyanskiy
D. Louis Pasteur

6. The scientist who first studied the infusoria using the experimental method?
ARKox
B. Ermengem
SMMTerexovskiy
DLPaster

7. Who is the scientist who thought that the cause of human plague was a germ, tried to find it under a microscope, and proposed a method of vaccination against human plague?
ADSSamoylovich
BMMTerexovskiy
C. Ermengem
DRKox

8. A scientist who used mango and tuberculosis allergens in 1891 for diagnostic purposes?
AMMTerexovskiy
BXIGelman
C. Ermengem
DRKox

9. What is the role of sanitary microbes?
A. plant debris, rotting animal carcasses, cleans the earth, water
B. cleans plant residues, fodder, meat products.
C. purifies food, water.
D. plant and animal products, purified from polymers

10. What is a strain?
A. a culture that belongs to the same species but is separated from different animals and substrates and differs with less variation in their mutual properties.
B. a culture that belongs to a different species but is separated from an animal and substrates and differs in less variation in its mutual propertieC.
C. belongs to the same species, but only a culture that is separated from different substrates and does not differ in its mutual properties.
D. a culture separated from animals and distinguished by similarities in mutual features}

11. What is a clone?
A. culture of microorganisms isolated from one or two cell colonies
B. culture of microorganisms isolated from several cells.
C. Culture of microorganisms isolated from two cells.
D. culture of microorganisms isolated from a single cell.

12. What system is adopted for grouping prokaryotes?
A. stratification classification system
B. taxonomic classification system.
C. hierarchical classification system
D. identifier classification system

13. What is the function of the "Berg bacterium detector"?
A. prokaryotic organisms carry out rapid identification more fully.
B. performs a more complete classification of prokaryotic organisms.
C. makes a more complete classification of eukaryotic organisms.
D. eukaryotes perform more rapid identification of organisms}

14. "What kind of organisms are bacteria?
A. single-celled microorganisms that differ in shape, size, and some biological properties
B. single-celled microorganisms that do not differ in shape, size, and some biological properties
C. Two-celled microorganisms that differ in shape, size, and some biological properties
D. multicellular microorganisms that do not differ in shape, size and some biological properties}

15. How many groups of cocci are there?
A. 5
B. 7
C. 8
D. 6

16. What bacteria are called protoplasts?
A. cell wall thick bacteria
B. bacteria without a cell wall
C. cell wall delicate bacteria
D. bacteria that have a cell wall

17. Bacteria are divided into how many groups according to the number and location of worms?
A. 3
B. 5
C. 6
D. 4

18. What organisms are actinomycetes?
A. are fungal, single-celled gram-positive microorganisms.
B. are fungal, multicellular gram-positive microorganisms.
C. are fungal, single-celled gram-negative microorganisms.
D. are light-loving fungi, multicellular gram-negative microorganisms

19. What organisms are spirochetes?
A. Microorganisms that are mobile, slender and spiral in shape, with many fine foldC.
B. microorganisms that are motionless, thin and spiral, with many fine foldC.
C. microorganisms that are motile, thick and spiral, with many small foldC.
D. motionless, thick and spiral, microorganisms without folds}

20. Indicate which microorganisms enter prokaryotes?
A. bacteria, archaebacteria, cyanobacteria
B. archaebacteria, simple hay von, cyan bacteria
C. viruses, fungi, bacteria
D. algae, slugs, simple animals

21. What are the non-permanent parts of a bacterial cell?
A. nucleus, shell, capsule
B. cytoplasm, spore, nucleus
C. xivchin, spore, capsule
D. shell, hivchin, core

22. What is the difference between a bacterium and a bacilli?
A. bacilli are also bacteria, but form capsules and spores
B. differs by biological, pathogenicity
C. bacteria grow in a normal nutrient medium
D. a vaccine is prepared from bacteria

23. It is a complex colloidal system composed of water, protein, carbohydrates, fats, nucleic acids, various organic and inorganic substanceC. What part of this cell?
A. shell
B. nucleus
C. cytoplasm
D. vacuole

24. The structure of the bacterial cell shell?
A. cell wall, capsule, mucous membrane
B. cell devo ri, cytoplasm tic membrane
C. cytoplasmic membrane na, mucous layer
D. exine, intina, cytoplasmic membrane

25. How many layers does a cell wall consist of?
A. 2
B. 3
C. 4
D. 5

26. What is the difference between mycoplasmas and bacteria?
A. movement, capsule formation.
B. spore formation, with movement
C. cell wall, with no mucous layer
D. absence of cell wall, capsule

27. What is the difference between microscopic fungal spores and bacterial spores?
A. reproduction, nutrition
B. reproduction, protection
C. growth, respiration
D. nutrition, enzyme production

28. Determine the average amount of water in a bacterial cell?
A. 90-95%
B. 10-20%
C. 25-35%
D. 75-85%

29. What is the amount of dry matter in a bacterial cell?
A. 15-25%
B. 30-40%
C. 50-60%
D. 1-10%

30. What percentage of protein dry matter in the body of pathogenic microbes?
A. More than 40%
B. more than 50%
C. more than 30%
D. more than 20%

31. What are antigens, toxins, enzymes?
A. protein
B. polysaccharide
C. monosaccharide
D. polypeptide

32. What are the carbohydrates in the microbial cell?
A. with polysaccharides
B. with proteins
C. with monosaccharides
D. with polypeptides

33. How many classes of enzymes are there?
A. 6
B. 5
C. 4
D. 3

34. Aerobic microbes?
A. assimilates oxygen in the atmosphere
B. does not absorb oxygen from the atmosphere
C. partially assimilates oxygen in the atmosphere
D. assimilates oxygen by breaking down nitrogen-free organic compounds

35. What are the types of respiration of microorganisms?
A. aerobic, heterotrophic
B. aerobic, autotrophic
C. aerobic, anaerobic, microaerophilic
D. aerobic, metatrophic

36. The concept of anaerobic microorganisms:
A. microorganisms that thrive in an oxygenated environment
B. microorganisms that grow in an oxygen-free environment
C. microorganisms that thrive in any environment
D. microorganisms that grow in an acidic environment

37. What is an obligate anaerobic?

A. development in absolutely oxygen-free conditions
B. microorganisms that thrive in an oxygenated environment
C. microorganisms that thrive in any environment
D. microorganisms that grow in an acidic environment

38. What are irradiated microbes called?
A. photobacteria
B. organobacteria
C. chemoorganotropes
D. photoorganotrophs

39. Explain holozoy nutrition
A. plants, microbes
B. animals, humans
C. naive, insects
D. bacteria, protozoa

40. Determine the type of nutrition of microorganisms?
A. autotrophic, heterotrophic
B. autotrophic, aerobic
C. heterotrophic, anaerobic
D. metatrophic, microaerophilic

41. Describe the phases of growth and development of microorganisms?
A. 10-12
B. 1-3
C. 2-5
D. 4-8

42. What is the difference between exo and endotoxins of microbes ?
A. antigenicity, reproduction, growth
B. decomposition, chemical composition, toxicity
C. growth, development, impact
D. capsule, enzyme formation

43. Specify the respiratory enzyme?
A. oxidase, peroxidase
B. lipase, amylase
C. lactase, zimaza
D. hydrolase, proteinase

44. Where are microorganisms most common?
A. soil
B. suv
C. air
D. cosmos

45. How long is the tubercle bacillus stored in the soil?
A. Up to 100 yiga
B. up to 10 years
C. 5 months to 2 years
D. up to 2 months

46. How long are brucellae stored in the soil?
A. 100 left
B. 5 months to 2 years
C. up to 10 years
D. up to 100 yiga

47. According to the microcenosis in water , it is divided into how many zones?
A. 5
B. 4
C. 2
D. 3

48. What is the nature of the polysaccharide zone water?
A. water is very dirty, up to several million microbes in 1 ml
B. water is moderately polluted, containing up to 100,000 microbes per ml

C. water is clean, there are tens to hundreds of microbes in 1 ml
D. The water is very clean, 1 ml completely dissolves germs

49. What is the nature of mesosaprobic zone water?
A. water is moderately polluted, containing up to 100,000 microbes per ml
B. water is clean, there are tens to hundreds of microbes in 1 ml
C. The water is very clean, 1 ml completely dissolves germs
D. water is very dirty, up to several million microbes per 1 ml

50. What is the nature of oligasaprobic zone water?
A. water is very clean, 1 ml of water completely cleans germs,
B. water is very dirty, up to several million microbes in 1 ml
C. water is moderately polluted, containing up to 100,000 microbes per ml
D. 1 ml contains tens and hundreds of microbes

51. How much water is divided according to its origin?
A. 3
B. 2
C. 6
D. 8

52. In which clause is groundwater correctly indicated?
A. all right
B. well
C. artesian
D. ground

53. When it comes to the **number of microbes in the** GPA **:**
A. The number of colonies in 1 ml of water
B. The number of microbes in 10 ml of water
C. The number of microbes in 500 ml
D. The number of microbes in 200 ml

54. The presence of even a single E. coli in the least amount of water (ml):
A. coli-titre
B. coli-index
C. microbial number
D. titre

55. The amount of Escherichia coli in 1 liter of water:
A. coli-index
B. coli-titre
C. microbial number
D. titre

56. What should be the total number of microbes in 1 ml of tap water?
A. Not to exceed 10
B. Not to exceed 100
C. not to exceed 50
D. Not to exceed 20

57. Coli-titre of tap water:
A. Not less than 100
B. Not less than 500
C. should not be less than 50
D. Not less than 15

58. Coli-titre for well water and open sources:
A. Not less than 200
B. should not be less than 10
C. should not be less than 111
D. Not less than 1000

59. Coli-index for well water and open sources:
A. More than 9
B. more than 20
C. More than 100
D. more than 200

60. What should be the total amount of microorganisms in 1 ml of tap water?
A. Not more than 100
B. should not be more than 10
Q. Not more than 20
D. should not be at all

61. Coli titer of piped water?
A. Not less than 333
B. Not less than 100
Q. Not less than 10
D. Not less than 1000

62. How many different methods are used to determine the air microflora ?
A. 4
B. 1
C. 5
D. 2

63. How many bacteria are released into the air when a person or animal sneezes?
A. 4500-150,000 cha
B. 100
C. 1000
D. 50

64. What are the pathogens that are spread by airborne dust?
A. all
B. influenza, anthrax
C. tuberculosis
D. smallpox

65. What are the pathogens that are transmitted by airborne droplets?
A. protein, y.sh.m. peripneumonia
B. influenza, anthrax
C. tuberculosis
D. smallpox

66. Determine the effect of physical factors on microorganisms?
A. heavy metal salts, pressure, nutrition
B. temperature, acid, alkali
C. temperature, pressure, drying, rays
D. rays, alkalis, heavy metal salts

67. How different are microorganisms in relation to temperature?
A. 3
B. 2
C. 4
D. 5

68. What microorganisms are psychrophiles?
A. microbes that have learned to live at low temperatures
B. bacteria accustomed to moderate temperatures
C. heat-loving microorganisms
D. Bacteria adapted to live at optimal temperatures

69. What microorganisms are mesophiles?
A. heat-loving microorganisms
B. microbes that have learned to live at low temperatures
C. Bacteria accustomed to moderate temperatures
D. batteries adapted to live at optimal temperatures

70. What microorganisms are thermophiles?
A. heat-loving microorganisms
B. microbes that have learned to live at low temperatures
C. Bacteria accustomed to moderate temperatures
D. batteries adapted to live at optimal temperatures

71. Describe the effect of chemical factors on microorganisms?
A. pH, acid, alkali
B. pressure, temperature, alkalis
C. acid, rays, drying
D. rays, pressure, pH

72. Is the approach of a microbe to it under the influence of some chemical -?
A. negative chemotaxis
B. movement
C. positive chemotaxis
D. fixation

73. What is the name of a microbe moving away from a chemical substance?
A. negative chemotaxis
B. positive chemotaxis
C. movement
D. fixation

74. What are the methods of disinfection?
A. mechanical, group, binding
B. mechanical, physical, chemical, biological
C. physical, daily, needy
D. biological, basic, planned

75. Is it to prevent germs from entering wounds?
A. disinfection
B. antiseptic
C. asepsis
D. disinsection

76. What is the chemical killing of germs in wounds and other objects?
A. antiseptic
B. asepsis
C. disinfection
D. disinsection

77. Determine the effect of biological factors on microorganisms?
A. bacteriophage, antibiotic, phytoncide
B. temperature, alkali, drying
C. environmental reaction, rays, bacteriophage
D. acid, alkali, pressure

78. What is the relationship between two or more species of microbes living in the same environment?
A. commensalism
B. symbiosis
C. metobiosis
D. Sattelizm

79. What are phytoncides, when were they discovered?
A. Antibiotics derived from plants, 1928
B. Antibiotics derived from fungi, 1938
C. is derived from special bacteria, 1948
D. reduces reactivity , 1958

80. Which scientist introduced the term antibiotic to science?
AALevenguk
BZAVaksman

SIIMechnikov
D. Erlix

90. What is an antibiotic?
A. Bacteria, actinomycetes, molds, lichens, products of life activities of animals and plants
B. a set of macro-micronutrients
C. a means of killing germs in the body of animals
D. bacteria, vitamins derived from fungi, enzymes

91. Sources of antibiotics?
A. fungus, bacterium, plant, animal
B. air, plant, mold
C. soil, fungus, actinomycetes
D. animal, water, air, bacteria

92. What determines the biological activity of antibiotics.
A. affected unit
B. solution concentration
C. the amount of solution
D. with the composition and volume of the solution

93. What is the dissolution of bacteria under the influence of phage?
A. bacteriophage
B. toxemia
C. bacteremia
D. invasiveness

94. What is the difference between fungi and bacteria?
A. The structure of reproduction, respiration, movement
B. nutrition, spore structure, respiration
C. movement, breathing, nutrition
D. spore formation, nutrition

95. What is the opposite process to nitrification?
A. decay
B. ammonification
C. denitrification
D. kneading

96. Name the nitrifying bacteria?
A. potatoes, hay bacilli
B. gut, bulgarian rod
C. nitrobacteria, nitrous bacteria
D. yeasts, cabbage bacilli

97. What are the causative agents of alcoholism?
A. saccharomyces cerevisiae, sacch. Vini
B. penicilla, intestinal rod chasi, actinomycetes
C. aspergilla, vulgar protein, milk streptococci
D. thermophilic strepto cocci, E. coli, Kl. putrifikum

98. Microorganisms are involved in the circulation of which elements?
A. nitrogen, carbon, phosphorus, sulfur, iron
B. hydrogen, oxygen, nitrogen, barium, iron
C. potassium, sodium, lithium, bromine, phosphorus
D. sulfur, nitrogen, calcium, carbon

99. Describe the process of denitrification?
A. decomposition of nitrates
B. oxidation of fats
C. decay of proteins
D. oxidation of nitrites

100. What are the pathogens of heterofermentative lactic acid fermentation?
A. leiconosto c **, intestinal rod**
B. acidophilus rod, mold fungus
C. Escherichia coli, putrefactive bacteria
D. bulgarian bacillus, milk streptococci

101. Name the homofermentative lactic acid fermentation pathogens?
A. milk streptococci, bulgarian, acidophilus rods
B. potato stick, gut stick
C. vulgar pro tea, thermophilic streptococci
D. potato sticks, cabbage sticks

102. How do spores settle in a cell?
A. central or free
B. on or near the cell
C. central, terminal, subterminal
D. terminal free or joint

103. Name aerobic putrefactive bacteria?
A. megaterium, basC. mesentericus, basC. Subtilis
B. Kl.pasterianum, Kl. Putrifikum
C. intestinal rod, vulgar protein
D. Kl.putrifikum, Kl. tetani

105. Name anaerobic putrefactive bacteria?
A. Actinomycetes, Cl. tetani, yeast
B. Cl. putrificus, CI. vibriosepticus, CI. Tetani
C. BaC. mikoedes, BaC. Subtilis
D. intestinal rod, CI. putrifikum, CI. Sporogenesis

106. What are the main pathogens of fatty acid fermentation?
A. Cl. Pasteuria num, Cl. pectinovorum, Cl. Felsineum
BEkoli, St. lactis, Prot. Vulgaris
C. Acetobacter acety, St. Aureus
D. Aspergillus niger, salmonella

107. What are the main forms of bacteria?
A. spherical, rod-shaped, twisted
B. trapezoidal, rhombic, amoebic
C. cubic, spiral, spherical
D. rod -shaped , star-shaped , polygonal

108. What is an infection?
A. entry of pathogenic microbes into the body, development
B. pollution, poisoning
C. the body's response, inflammation
D. the formation of toxins and enzymes by microbes

109. What is the meaning of the word infection?
A. get rid of
B. against infection
C. I infect
D. to be free

110. What is the complex biological process, the interaction between the animal organism and the pathogen in the external environment?
A. disinfection
B. immunity
C. subinfection
D. infection

111. What is immunity?
A. resistance of the organism to pathogenic microbe and its toxins

B. microbial growth, spread, toxicity
C. specific resistance of the organism to infection, inflammation
D. infiltration and spread of pathogenic mycobacterial lap to the organism

112. Identify the types of artificially acquired immunity?
A. nosteril, congenital
B. active, passive
C. sterile, antibacterial
D. antitoxin, antiferment

113. When does artificial passive immunity appear in animals?
A. when vaccinated with hyperimmune blood
B. when vaccinated with the vaccine
C. when vaccinated with bacterial culture
D. when the reactivity decreases

114. What is the meaning of the word immunity?
A. to be free, to get rid of
B. I am infected
C. against infection
D. contagious

115. Immunity resulting from the delivery of immune substances to the body?
A. artificial passive immunity
B. active immunity
C. special immunity
D. natural passive immunity

116. What are the substances that form an immune substance against itself when administered parenterally ?
A. antibody
B. antigen
C. allergen
D. anatoxin

117. What are the anatomical and physiological factors of immunity?
A. antitoxin, antiferment, poisons
B. antibodies, antigens, enzymes
C. toxins, enzymes, aggression
D. skin-mucous membranes, humoral, hormonal

118. Identify specific factors of immunity?
A. cellular, humoral, hormonal
B. antibodies, allergens
C. anaphylaxis, antibodies, humoral
D. allergens, cellular, hormonal

119. Specify full-value antigens?
A. polysaccharides, endotoxins
B. proteins, polysaccharides
C. lipoids, exotoxins
D. proteins, exotoxins

120. Identify completely worthless antigens?
A. lipids, complex carbohydrates
B. enzymes, DNA
C. polysaccharides, RNA
D. exo-endotoxins

121. The main factors that increase the virulence of microorganisms show?
A. toxins, spores, hivchins
B. spores, capsules, hivchins
C. enzymes, spores, aggression
D. capsule, fepments, toxins

123. Specify the virulence factor of the microbe?
A. invasiveness, a **n** tifagocytic, toxic
B. spores, movement, growth
C. enzyme, spore, capsule, movement

D. growth, development, distribution in the body

124. Determine the average harmful and lethal dose of virulence?
A. Zd 50, Ld 50
B. Zd 100, Ld 100
C. Zd 75, Ld 75
D. Zd 25, Ld 25

125. What is the ability of microorganisms to enter, spread and multiply in the tissues of macroorganisms?
A. invasiveness
B. toxigenicity
C. bacteremia
D. sepsis

126. Identify the types of infection?
A. primary, active
B. simple, mixed
C. passive, mixed
D. reinfaction, sterile

127. How to determine the pathogenicity, virulence properties of microorganisms?
A. culturally
B. in the biosinov method
C. tinctorial method
D. by the method of antibiotics

128. Identify the ways in which the microbe spreads in the body?
A. lymph, with urine
B. with milk, blood
C. meat, with skin
D. with blood, lymph, nerve fibers

129. In what ways can reduce the virulence of microbes?
A. prolonged cultivation in artificial nutrient media t^0, adding chemicals, drying, bacteriophages
B. change the composition of nutrient media
C. Add weak disinfectants to nutrient media
D. drying

130. What is the dose of LD_{50}?
A. 50% kills an infected animal
B. Kills 100% infected animal
C. 50% infects the animal
D. 100% harmful to the animal

131. What is the dose of ZD_{50}?
A. 50% kills an infected animal
B. Kills 100% infected animal
C. 50% infects the animal
D. 100% ill

132. What causes the appearance and development of infection?
A. the degree of pathogenicity of the microbe, the immunological state of the macroorganism, the conditions of the external environment.
B. to the level of pathogenicity of the microbe
C. to the immunological state of the macroorganism
D. to external environmental conditions

133. What is the property of a microbe to cause a specific infectious disease under certain conditions?
A. pathogenicity
B. virulence
C. infection
D. immunity

134. What is the degree of pathogenicity of a microbe?

A. virulence.
B. invasiveness
C. toxigenicity
D. pathogenicity

135. The function of the capsule ?
A. from sunlight
B. protection from phagocytosis
C. from the cold
D. from pressure

136. What is the multiplication of a microbe in the blood and its transmission through the blood to the whole organism?
A. sepsis
B. septicemia
C. toxigenicity
D. bacteremia

137. Microbes multiply in the injured area (tissue), the resulting toxin enters the bloodstream and poisons the whole organism. What is it called?
A. toxemia
B. viremia
C. bacteremia
D. bacterophagia

138. Infections by origin?
A. alimentary
B. endogenous
C. exogenous and endogenous
D. superinfection

139. What infection is called a type of inflammatory disease?
A. simple
B. mixed
C. subinfection
D. alimentary

140. Infection caused by the entry of two or more types of pathogens:
A. subinfection
B. mixed
C. alimentary
D. simple

150. An animal that recovers from a disease becomes ill again without developing immunity ?
A. reinfection
B. mixed
C. subinfection
D. alimentary

151. Recurrence of clinical signs of exacerbation of the disease, the pathogen remains in the body, although the clinical symptoms disappear?
A. recurrence
B. superinfection
C. reinfection
D. mixed

152. At what stage of the development of the infectious process appear specific, general symptoms of some infections?
A. the preaching period
B. incubation period
C. prodromal period
D. period of reconvolution

153. What is the name of the first stage of development of the infectious process ?
A. incubation
B. prodromal
C. woodpecker
D. convalescence

154. How are diseases differentiated according to their course?
A. acute and chronic
B. sharp
C. chronic
D. abortive

155. What are the methods of microbiological diagnosis of infectious diseases?
A. microscopic, bacteriological, biological
B. photoelectrocolorimetric
C. serological, biochemical, microscopic
D. allergic, biological

156. What can be an antigen?
A. alcohol, enzymes
B. acid, alkali, metal
C. oil, heavy metal salts
D. microorganisms, their poisons

157. Types of special immunity:
A. naturally or artificially acquired
B. natural
C. artificial
D. absolute and relative

158. Which group of microorganisms forms spores?
A. mycoplasmas, algae
B. simplifications, rickettsiae
C. bacteria, fungi
D. fungi, blue-green algae

159. In which point the sequence of preparation of the extract in PR is given correctly?
A. filtration, crushing, sterilization, extraction
B. sterilization sterilization **,** crushing, extraction, filtration
C. crushing, filtering, extraction,
D. extraction, filtration, crushing, sterilization

160. Specify soluble antibodies?
A. hemolysins, bacteriolysins
B. agglutinins, antitoxins
C. precipitins, opsonins
D. antiferments, agglutinins

161. Identify coagulating antibodies?
A. antifepments, antitoxins
B. agglutinins, precipitins
C. agglutinins, oposinins
D. precipitins, hemolysins

162. Identify the types of antibodies?
A. debilitating, lethal, depressing
B. neutralizing, dissolving, coagulating
C. antitoxin, albumin, lipoid
D. enhancing, antifungal, antimicrobial

163. Identify the antibodies involved in the agglutination reaction?
A. coagulating, precipitating
B. sedative, neutralizing
C. solvent, neutralizer
D. neutralizing, coa gulling

164. Milk ring reaction is used in the diagnosis of which disease?
A. salmonellosis
B. brucellosis
C. listeriosis
D. tuberculosis

165. How many different ways to put PR in a test tube?
A. 5
B. 4
C. 2
D. 3

166. In which of the PR methods the serum is below the test tube?
A. whey is not at all below the test tube
B. when pouring whey under the extract
C. when the antigen is poured on the serum
D. in all ways

167. In how many systems does the CBR pass?
A. 1
B. 2
C. 3
D. 4

168. What condition is manifested in CBD?
A. bacteriolysis, hemolysis
B. agglutination, lysis
C. precipitation, toxigenicity
D. bacterial complement bond formation.

169. What are the components of the agglutination reaction?
A. blood serum, antigen, agglutination serum, physical solution
B. hemolysin, agglutination serum, antigen
C. sheep erythrocyte, complement, antigen, hemolysin
D. complement, test serum, antigen, extract

170. Determine a positive assessment of the precipitation reaction?
A. formation of a white-gray ring on the wall of the test tube
B. sedimentation at the bottom of the probipka
C. redness of the liquid in the test tube
D. the color of the liquid in the test tube does not change

171. How many microorganisms are in the large abdomen of a cow with a live weight of 400-500 kg?
A. 10 kg
B. 2 kg
C. 5 kg
D. 3 kg

172. The use of yeast fungi?
A. In the preparation of technical alcohol
B. in the preparation of wine, beer bread, silage, haylage, cheese ……
C. in the preparation of artificial milk
D. in the preparation of dairy products

173. In the feces of a person infected with dysentery found the causative agent of dysentery , who called it, when bacteriophage?
1917 D.Errel
1881 L. Pasteur
1880 Mechnikov
1882 R. Cox

174. Bacteriocidal, bacteriostatic preparations
A. kills bacteria, stops growth
B. killing infectious pathogens
C. killer of invasions
D. rodent killer

175. Prion antigen?
A. no
B. ha
When C. binds to peptones, it becomes an antigen.
D. antigenicity is low

176. Gapten antigen?

A. no
B. ha
C. sometimes antigen
D. antigenicity is low

177. Who invented the doctrine of cellular immunity?
A. 1903 IIMechnikov
B. 1907 IPPavlov
C. 1886 IISechenov
D. 1907 Erlix

178. How long does passive immunity last on average?
A. 8-10 days
B. 10-14 days
C. 4-6 days
D. 6-8 days

179. When does passive immunity appear in animals?
A. when vaccinated with hyperimmune blood
B. when vaccinated with the vaccine
C. when vaccinated with bacterial culture
D. when the reactivity decreases

180. Methods of water purification
A. precipitation, coagulation, filtration, chlorination, biological method
B. boiling, filtering
C. sedimentation
D. Sterilization

181. How many microbes per $1m^2$ in barns have a high level of pollution?
A. 1000-1500
B. 500-1000
C. 1500-2000
D. 2000-3000

182. What are the antibiotics taken from the body of animals?
A. erythrin, ekmolin, lysozyme
B. Pancreatin
C. Properdins
D. Penicillin

183. What type of immunization is vaccination?
A. seasonal
B. passive
C. active
D. constant

184. What are the names of single-celled microorganisms that differ in shape, size and some biological properties?
A. bacteria
B. viruses
C. fungi
D. lichens

185. It is a complex colloidal system composed of water, protein, carbohydrates, fats, nucleic acids, various organic and inorganic substanceC. What part of this cell?
A. cytoplasm
B. nucleus
C. shell
D. vacuole

186. What is the middle layer of the cell wall of a bacterium called?
A. lipoprotein
B. lipopolysaccharide
C. mucopolymer
D. membrane

187. Polymorphic microorganisms that pass through filters of 100-150 nm, do not form spores, capsules,

gram-negative inactive microorganismC. What are these microorganisms?
A. mycoplasmas
B. chlamydia
C. actinomycetes
D. rickettsiae

188. What is the name of single-celled, immobile, polymorphic, gram-negative organisms, located between bacteria and viruses?
A. rickettsiae
B. mycoplasmas
C. chlamydia
D. actinomycetes

189. What are the names of organisms that are motile microorganisms and have many small folds in a thin and spiral shape?
A. spirochetes
B. mycoplasmas
C. chlamydia
D. actinomycetes

190. Oxidoreductases are:
A. carrier enzymes
B. hydrogen and oxygen-carrying, respiratory, digestive enzyme
C. accelerates the hydrolysis reaction.
D. enzymes that bind or separate various binary compounds without the presence of water

191. Transferases are:
A. carrier enzymes
B. accelerates the hydrolysis reaction.
C. enzymes that bind or dissociate various compounds in the presence of water
D. hydrogen and oxygen-carrying, respiratory, digestive enzyme

192 Hydrolases are:
A. enzymes that bind or separate various binary compounds without the presence of water **.**
B. hydrogen and oxygen-carrying, respiratory, digestive enzyme
C. accelerates the hydrolysis reaction
D. carrier enzymes

193. Liases are:
A. accelerates the hydrolysis reaction
B. enzymes that bind or separate various binary compounds without the presence of water
C. hydrogen and oxygen permeable, respiratory, digestive enzyme
D. carrier enzymes

194. Isomerases are:
A. enzymes that convert organic compounds into their isomers
B. enzymes that bind or separate various binary compounds without the presence of water
C. accelerates the hydrolysis reaction
D. hydrogen and oxygen-carrying, respiratory, digestive enzyme

195. The cultural characteristics of bacteria are:
A. growth in nutrient media
B. attitude to paint
C. disease-causing feature
D. protein production

196. What is included in the peripheral immune system?
A. thymus, spleen, liver
B. blood, lymph nodes, spleen
C. lungs, stomach, liver
D. gastric juice, red marrow

197. How is normal whey obtained?
A. taken from a healthy animal
B. is taken from a sick animal
C. is taken from a vaccinated animal
D. Whey is obtained from the sent animal

198. When did the heuristic period in the development of microbiology begin?
A. In the III-IY centuries BC
B. In the YI-YII centuries
C. In the eighth and ninth centuries
D. In the X - XI centuries

199. When did the morphological period in the development of microbiology begin?
From the day A. Antony van Levenguk (1632-1723) discovered bacteria.
Since the day B. Geralimo Fracastro (1632-1723) discovered bacteria.
Since the day SMMTerexovsky (1632-1723) discovered bacteria.
Since the day DXIGelman (1632-1723) discovered bacteria.

200. When did the physiological period in the development of microbiology begin?
A. From the discoveries of Louis Pasteur (1822- 1895) in the second half of the nineteenth century.
B. From the discoveries of DSSamoylovich (1822-1895) in the second half of the XIX century.
C. From the discoveries of MMTerekhovsky (1822- 1895) in the second half of the XIX century.
D. From the discoveries of Gelman (1822- 1895) in the second half of the nineteenth century.

4.8. Test questions for 2 OB (200)

1.Stafi lococcus in horses, pigs and sometimes cattle -
A. leads to the development of botryomycosis
B. leads to the development of mucormycosis
C. leads to the development of candidiasis
D. leads to the development of aspergillosis

2. Pathogenicity of staphylococci?
A. The formation of all the toxins and enzymes shown
B. histotoxin and hematoxin
C. enterotoxin, leukosidin
D. coagulase, fibrinolysin

3. Pathogenicity of pathogenic (hemolytic) staphylococci -
A. manifests itself in poisoning processes
B. manifests itself in inflammatory processes
C. is manifested in purulent processes
D. manifests itself in regeneration processes

4. In which clause are the saprophytes of streptococci correctly indicated?
A. Str.agalactiae, Str.equi
B. Str. lactis, Str. crimoris, Str. salivaris
C. Str. pneumoniae Str.pyogenes
D. Str. salivaris, Str.pyogenes

5. Stre ptokokklarning pathogenic species which point, right?
A. Str.agalactiae, Str.equi,
Str. pneumoniae Str.pyogenes

B. Str. Salivaris, Str.pyogenes Str. Lactis
C. Str. pneumoniae, Str. crimoris, Str. Salivaris
D. Str.equi, Str. crimoris, Str. salivaris}

6. How many groups of streptococci are there for a specific polysaccharide antigen detected in a precipitation reaction?
A. There are 13 groups
B. There are 15 groups
C. There are 17 groups
D. There are 11 groups

7. Pa togen staphylococci and streptococci for the first time -
A. In 1880, L. Pasteur separated
B. In 1880 Lister separated
C. In 1880, R. Cox separated
D.1880 separated by P. Erlix

8. Pathogenic staphylococci and streptococci -
A. In 1884, Pasteur studied and expressed it.
B. In 1884, Rosenbach studied and expressed it.
C. In 1884, Lister studied and expressed it.
D. In 1884, Mixin studied and articulated it.

9. Which type of staphylococci is extremely pathogenic?
A. Staph. Epidermidis
B. Staph. Aureus
C. Staph. Saprophyticus
D. The causative agent of mastitis

10. What is the nutrient medium used to differentiate between pathogens and non-pathogenic staphylococci?
A. GPA added to crystalline violet
B. GPB with cryatallviolet added
C. if the glucose is bloody
D. GPJ, GPA, GPB

11. What is the special method of staining the drug in the detection of the causative agent of tuberculosis?
A. Gram
B. Sil-Nilsen
C. Kozlovskiy
D. Mixin

12. Which dye solution is used in the Sil Nielsen method?
A. carbolic tuberculosis fuchsia, leffler methylene blue
B. gensianviolet, sil fuksini
C. malachite blue, gensianviolet
D. saffron, methyl blue

13. What is the duration of biological testing for tuberculosis?
A. 3 months
B. 10 kun
C. 1 oy
D. 14 kun

14. Which dye solution is used in the Sil Nielsen method?
A. carbolic tuberculosis fuchsia, leffler methylene blue
B. gensianviolet, sil fuksini
C. malachite blue, gensianviolet
D. saffron, methyl blue

15. How many minutes does a tuberculosis fuchsia dye last?
A. 2
B. 3
C. 4
D. 5

16. Processing of patmaterial in tuberculous erysipelas - the difference between Gon and Alikayev methods?
In the A. gon method, a suspension of patmaterial is prepared in a 10-12% solution of H_2SO_4 and centrifuged. In the method of alikayev patmaterial is crushed in 0.5 cm^3 size in 10-8-6% H_2SO_4 solution for 10-20 minutes
Exposure of H_2SO_4 solution to patm material by B. gon method 30 minutes, Alikayev method 10 minutes
C. A solution of $H_2SO_{4\,of}$ different percentages is used
D. varies with the amount of patmaterial obtained for the suspension

17. Why is the tubercle bacillus not stained in the usual way?
A. resistant to acid, alcohol, alkali, the shell contains steorin acids, waxy substances
B. resistant to alcohol , dense cytoplasm, nucleus formed, granular
C. acid -resistant, shell thick, cytoplasm dense
D. alkali -resistant, cytoplasm and nucleus altered, granular

18. How many types of tuberculosis pathogens are there?
A. 4
B. 5
C. 3
D. 6

19. In what nutrient media does the tuberculosis pathogen grow.
A. egg-starch, Petranyani, Levenstein Iyensen, Gelberg, glycerin GPB, GPA
B. egg-starch, Lyuboshenko, Ulengut, Kitt-Tarossi
C. blood glucose agar, glucose whey agar, GPB, GPA, Endo
D. whey agar, broth, Levin, Ploskirev, Kessler

20. What is the duration of bacteriological examination in tuberculosis?
A. 1oy
B. 3 months
C. 2 oy
D. 14 kun

21. What is the dried live culture of the M. Bovis vaccine strain ?
A. BSG
B. PPD
C. OA
D. Alttuberculin

22. How many ml are given to cattle in the diagnosis of allergy
A. 2
B. 10
C. 3
D. 4

23. Which reaction method of serological diagnosis gave reliable results .
A. AR
B. PR
C. KBR
D. DPR

24. How long are brucellae stored in the soil?
A. 5 months to 2 years
B. 100 left

C. up to 10 years
D. up to 100 yiga

25. There are several types of brussels sprouts
A. 6
B. 5
C. 4
D. 3

26. When is blood taken from an aborted animal for testing for brucellosis?
A. a week later
B. on this day
C. two days later
D. after a month

27. Brucella migration?
A. pathogenesis
B. air transmission
C. is also found in non-host animals
D. pathogenicity

28. Immunity in brucellosis?
A. congenital
B. Nosteril
C. Acquired
D. Passive

29. AR titer in brucellosis in cattle?
A. 1: 50+
B. 1: 100+
Q. 1: 50 ++
D. 1 **:** 100 ++

30. What type of brucellosis is found in sheep and goats
A. Br. Melitensis
B. Br. abortion
C. Br. ovis
D. Br. neotomae

31. What are the methods of staining grease made of patmaterial when testing for brucellosis?
A. Gram, Kozlovskiy
B. Gram, Sil-Nielsen
C. Kozlovskiy, Romanovskiy Gimza
D. Gram, Mixin, Peshkov}

32. In brucellosis, in what atmosphere are grown patmaterial crops from rams
A. in a normal atmosphere
B. all in an atmosphere with 10-15% CO_2
C. half 10-15% $CO_{2\ in\ the}$ atmosphere
D. under anaerobic conditions}

33. Serum ratios of cattle in brucellosis for AR
A. 1:25 to 1: 200
B. 1:50 to 1: 400
Q. 1:10 to 1:80 p.m.
D. 1: 2 to 1:64

34. Sheep serum ratios for AR in brucellosis
A. 1:25 to 1: 200
B. 1:10 to 1:80 p.m.
Q. 1:50 to 1: 400
D. 1: 2 to 1:64

35. Pig serum ratios in brucellosis for AR
A. 1:10 to 1:80 p.m.
B. 1:25 to 1: 200
Q. 1: 2 to 1:64
D. 1:50 to 1:64

36. In what nutrient environments does E.coli grow?
A. Bismuth sulfite agar, Kitt-Tarossii
B. GPB, GPA, Endo

C. Seyssler agar, Ploskirev environment
D. Bloody Saline GPA, GPB}

37. What antigens of E. coli are different.
A. O, H
B. O, K, H
C. K, O
D. K, H

38. When and by whom was E.coli isolated?
A. by Erlix in 1885
B. by Pasteur in 1885
C. by Lister in 1885
D. by Esherich in 1885

39. E.coli-
A. aerobic or microaerophilic
B. aerobic or obligate anaerobic
C. aerobic or facultative anaerobic
D. microaerophilic or facultative anaerobic

40. E.coli-
A. *E. coli* breaks down maltose, mannitol, lactose into acids and gases
B. *E. coli* does not break down maltose, mannitol, lactose into acids
C. *E. coli* breaks down maltose, mannitol, and lactose into gases
D. *E. coli* does not break down maltose, mannitol, lactose into acids and gases}

41. Who found the substance colicin - an antibiotic-like substance in E. coli culture.
A. A. Gracia in 1925
BLPaster in 1925
SIMechnikov in 1925
D. Lister in 1925}

42. Salmonella lactose and sucrose?
A. does not decompose
B. decomposes
C. decomposes to form acid
D. decomposes to form a gas

43. In Salmonella (except *C. gallinarum*) -
A. *O* - (somatic); *There is a K* - (shell) antigen
B. *K* - (shell); *There is an H* - (hivchinli) antigen
C. *H* - (xivchinli) antigen
D. *O* - (somatic); *There is an H* - (hivchinli) antigen

44. When is Saramas disease diagnosed?
A. If the pathogen is found on luminescent microscopy, pure culture is isolated , the biosynthesis result is positive
B. If the pathogen culture is separated from the patmaterial, the greases have characteristic morphological features
C. Even if no pathogen is found on luminescent microscopy, pure culture can be isolated from the material.
D. If the results of microscopic and serological examination are positive

45. What does the causative *agent* of *Saramas* disease *E. rhusiopathiae* look like in an ointment prepared from damaged heart valves?
A. in the form of long threads
B. in the form of small chains consisting of rods
C. single, double, ball-shaped
D. in the form of separate rods

46. The optimal conditions for the cultivation of Eryzipelothrix rhusiopathiae are correctly indicated in which clause?
A. anaerobic, grown at 35 ^{0}c for 48 hours
B. aerobic, grown at 41 ^{0}c for 18 hours
C. aerobic, microaerophilic, grown at 37 ^{0}c for 18-24 hours
D. anaerobic, grown at 37-38 ^{0}c for 16-18 hours

47. In which laboratory animals are biosynthesized in Saramas disease?
A. white mouse, pigeon
B. rabbit, white mouse
C. guinea pig, pigeon
D. pigeon, rabbit

48. The causative agent of jaundice in luminescent microscopy
A. produces a special radiation of intensity not less than three targets (+++) B. produces a special radiation of intensity not less than three targets (++++) C. intensity of not less than three targets (+++) produces special radiation
D. produces a special radiation of intensity not less than three targets (+)}

49. Pasteurella multocida grows well in which nutrient media?
A. GPA, GPJ, Kitt-Tarossii
B. GPA, GPB, Saburo agar
C. serum GPA, GPB, bloody GPA
D. GPB, Saburo agar, Endo environment}

50. In pasteurellosis patmaterial is examined in what ways?
A. microscopy, bacteriology, biosinov
B. microscopy, bacteriology, serology
C. serological, biosinov, microscopy
D. biosinov, cultured in Gissa medium, serological

51. In pasteurellosis in which laboratory animals biosinov is put?
A. rabbit, white mouse, chicken, duck
B. rabbit, white mouse, rooster
C. guinea pig, white mouse, rat
D. squirrel, white mouse, duck

52. When testing for pasteurellosis (P.multocida) in which case the result is positive?
A. gram-negative, capsule-forming, inactive, rod-shaped bacteria culture is isolated if virulence is confirmed in biosynthesis
B. culture of gram-positive, capsule-forming, motile, rod - shaped bacteria is isolated, virulence is confirmed in biosynthesis
C. gram-negative, capsule-forming, motile, coccygeal bacteria culture is isolated if virulence is confirmed in biosynthesis
D. culture of gram-negative, capsule-forming, motile, rod -shaped bacteria is isolated, virulence is confirmed in biosynthesis

53. Does Pasteurella form a capsule in multocida?
A. does not form
B. forms
C. does not always form
D.produces only in artificial nutrient media

54. How to check the pasteurellability of rabbits?

A. by instilling a solution of 0.5% diamond green in water from 2 drops in the nose for three days
B. by treating the skin with 0.5% diamond green for three days
C. bacteriological and serological examination of blood
D. by injecting 0.2 ml of a 0.5% solution of diamond green in water under the skin

55. Who was the first to separate Pasterella and when?
AIMechnikov separated in 1880
BLPaster separated in 1880.
SPErlixr separated in 1880.
DRKox separated in 1880
56. Who was the first to discover the pure quitura of Bac.anthracis ?
A. In 1876, first R. Cox, then L. Pasteur
B. Daven in 1850
C. In 1789 SS Andrievsky
D. Pollender in 1849.

57. What forms of anthrax occur depending on the location of pathological processes ?
A. cutaneous, hemorrhagic, tonsils
B. skin, intestines, lungs, and tonsils
C. angionosis, spleen, liver
D. lungs, kidneys, throat

58. Growth of anthrax in dense nutrient media?
A. smooth, rough colonies
B. white, smooth colonies
C. gray colonies
D. clear, colorless colonies

59. What is the method of hardening of ointments in anthrax?
A. special alcohol - perhydrol solution for 30 minutes
B. on the flame
C. in ethyl alcohol for 20 minutes
D. alcohol - 20 minutes on air

60. What is the difference between anthrax and soil bacilli?
A. movement and spore formation
B. hemolysis and spore formation
C. Sensitivity to penicillin and phage
D. spore and capsule formation

61. Which antibiotic is used for the test "Marjon" in the diagnosis of anthrax?
A. streptomycin
B. penicillin
C. tetracycline
D. Erythromycin

62. Anthrax spores:
Produces
Does not produce
It does not occur in shape
It does not form a capsule
63. How many components does Bac.anthracis exoto xin consist of?
A. 3
B. 4
C. 5
D. 2

64. For how many days are animals with biosinov observed ?
A. 5
B. 14
C. 20
D. 10

65. What materials are sent to the laboratory in case of anthrax?
A. blood, ear, spleen, throat lymph nodes, piece of connective tissue

B. feces, milk, runny nose, blood, ear, spleen
C. lymph nodes, piece of connective tissue, saliva, secretions
D. ear, spleen, nasal discharge, feces, urine

66. What is the method of laboratory examination of anthrax in anthrax?
A. serological
B. microscopic
C. bacteriological
D. biosinov}

67. What is the molecular-genetic method of examination in rheumatic fever?
A. PZR
B. ELISA
C. PR
D. GATR

68. What is the basis for the final diagnosis of anthrax in laboratory tests?
A. bacteriology, pr, microscopy results
B. microscopy, the result of bacteriological examination
C. to the result of luminescent microscopy, PR, biosinov
D. coral ”test,“ phagotyping ”, microscopy results

69. Terms of inspection , microscopic inspection - the date of delivery of the material,
bacteriological examination - …. day, biological-…. days .
A. 5-12
B. 3-10
C. 6-14
D. 4-8

70. The concept of anaerobic microorganisms:
A. microorganisms that grow in an oxygen-free environment
B. microorganisms that thrive in an oxygenated environment
C. microorganisms that thrive in any environment
D. microorganisms that grow in an acidic environment

71.. The causative agent of measles:
A. gr +, sporadic, motionless, coccygeal
B. polymorphic, gr-, spore, and capsular, motionless rod
C. gr-, capsule, mobile rod
D. polymorphic, gr +, sporadic, mobile rod. bacteria

72. Which animals are infected with measles?
A. Ot
B. pig
C. Cattle
D. Parranda

73. In what nutrient environments and conditions does the black causative agent grow?
A. Kitt-Tarossi, glucose-blooded Seyssler agar, at 37-38 °C, under anaerobic conditions
B. In GPB, GPA, GPJ, at 40-42 °C, under aerobic conditions
In C. Endo, Levin, Ploskirev environments, at 37 °C, under anaerobic conditions
D. Gissa medium, in Gelberg, Lyuboshenko environments, at 37 °C, under anaerobic conditions

74. What are the methods of testing for rabies in the laboratory?

A. microscopy, bacteriology, biosinov
B. microscopy, serology, bacteriology
C. serological, microscopy, pathoanatomical
D. biological, pathoanatomical, clinical

75. Immunity to blackheads?
A. congenital, nosteril
B. antitoxin, antimicrobial
C. congenital, antitoxic
D. acquired, absolute

76. At what age are cattle most often infected with blackheads?
A. 3 months to 4 years of age
B. 3 months to 1 year of age
C. 3 months to 2 years of age
D. 3 months to 3 years of age

77. Seyssler agarida *Cl.chauvoei* -
A. The colonies grow as the edges are trimmed, like a glossy button or grape leaf, and a small hemolysis zone appears around the colony.
B. colonies grow as the edges are trimmed, like a glossy button or grape leaf, no hemolysis zone appears around the colony.
C. colonies grow between the edges like a glossy button, a small hemolysis zone appears around the colony.
D. colonies grow as grape leaves are trimmed at the edges, no hemolysis zone appears around the colony.

78. Cultural characteristics of the causative agent of black spot ?
A. strictly anaerobic
B. facultative anaerobic
C. Microaerophilic
D. grows in normal nutrient environments

79. At what age do animals become infected with rabies?
A. 6 months to 4 years of age
B. From 1 year
C. From birth
D. from age

80. What pathogens are sent to the laboratory in case of joint disease?
A. wound secretion, tissue fragments, blood, liver, spleen
B. damaged muscle fragments, tissue exudate, parenchymal organs
C. damaged muscle, intestinal fragments, lymph nodes
D. parenchymatous organs, bone marrow, affected part of the intestine

81. What is the causative agent of coronary heart disease?
A. Cl. chauvoei
B. Cl. tetani
C. Cl. septicum
D. Cl. oedematiens

82. The causative agent of coronary heart disease:
A. spores oval, lemon-shaped
B. located in the center of the spores, in a spiral shape
C. spores are located near one end, in a noxious shape
D. has a round spore at one end, in the shape of a drumstick

83. What is the peculiarity of the culture of the causative agent of coccidiosis
A. The smell of burnt horn
B. the smell of sour oil
C. the smell of sour fish
D. spoiled egg smell

84. Name the types of solid anaerobic microbes?
A. black, solid, botulism pathogens
B. anthrax, blackleg, yellow fever pathogens
C. salmonella, pasterella, tetani, streptococcus
D. Escherichia coli, tuberculosis, yellow fever

85. In what cases in the diagnosis of solid disease is not carried out examination for the separation of cultures.
A. If a solid toxin is released in the material under test
B. If no solid toxin is released in the material under test
Q. If the culture is separated from the material being examined
D. If the culture is not separated from the material being examined}

86. In testicular disease, a test tube is a suspension implanted in Kitt-Tarossi medium.
A. Heat at 70 °C for one hour
B. heated at 80 °C for one hour
C. Heat at 60 °C for one hour
D. heated for one hour at 50 °C}

87. Who was the first to find the causative agent of cholera and when ?
A. In 1883 the Russian scientist ND Monastirsky
B. In 1882 the Russian scientist ND Monastirsky
C. In 1881 the Russian scientist ND Monastirsky
D. In 1880 the Russian scientist ND Monastirsky}

88. Who was the first to isolate the pure culture of the causative agent of tetanus and when ?
A. In 1884 Sh. Kitazato separated
B. separated in 1887 by Sh. Kitazato
C. was separated in 1889 by Sh. Kitazato
D. in 1880 by Sh. Kitazato

89. What are the main symptoms of botulism?
A. paralysis of the swallowing, chewing muscles
B. blindness
C. diarrhea, vomiting
D. asphyxia

90. Who discovered the causative agent of botulism, and when?
A. 1880 L.Paster
B. 1882 R.Kox
C. 1896 Ermengem
D. 1936 I.Pavlov

91. How does Cl.teta breathe?
A. Anaerobic and aerobic
B. Arerob
C. Anaerobic
D. Obligate aerobics

92. Thin, twisted ends, polymorphic, rod 2-10 microns long, 0.8-1 microns wide, in the form of a thread in the grease made of serous layerC. Gram-negative, does not form capsules, spores, located at the tips or center, motile.
A. Cl.histolyticum
B. Cl. oedematiens
C. Cl. perfringens
D. Cl. septicum

93. Patmaterial sent to the laboratory in botulism?
A. Samples from suspected food, stomach mass of a dead animal, liver fragment, and blood of sick animals
B. samples from parenchymatous organs, bone marrow
C. bone marrow, small intestine segment, spleen
D. excretions and secretions, bone marrow, parenchymal organs

94. Separation of botulism toxin:
A. Prepare 2 suspensions, leave at room temperature for 2 hours, filter, heat in 2 parts boiling water bath for 20-30 minuteC. Biosinov is placed with filtrates
B. The suspension is prepared, filtered, heated in a water bath for 30 minutes, biosinov is added
C. patmaterial suspension is extracted, filtered, and biosynthesized
D. The suspension is prepared, filtered, cultured in a nutrient medium, and biosinov is added.}

95. In what ways do the types of pathogens of botulism differ from each other?
A. immunological
B. bacteriological
C. fermentative
D. morphological

96. Cl. botulinum:
A. spores are round, cell-shaped drumsticks
B. spores oval, cell tennis racket-shaped
C. spores are oval, cell-shaped
D. spores oval, round, cell pear, lemon-shaped

97. What are the main symptoms of botulism?
A. Asphyxia
B. Not being able to see
C. Diarrhea, vomiting
D. Paralysis of swallowing, chewing muscles

98. What is the causative agent of botulism?
A. Cl. oedematiens
B. Cl. Chauvoei
C. Cl. Septicum
D. Cl.botulinum

99. In which clause are the Bradzot stimuli correctly given?
A. Cl. septicum,
Cl. oedematiens
B. Cl. tetani, Cl. chauvoei
C. Cl. perfringens, Cl. histolyticum
D. Cl.sordelii, Cl. sporogenes

100. In what nutrient media do Bradzot pathogens grow?
A. Kitt-Tarossi, Seyssler agar
B. GPB, GPA, GPJ
C. GPB, GPA, Endo
D.Gelberg, GPJ, Levin}

101. In Bradzot biosynthesis is placed in which type of laboratory animal?
A. rabbit
B. white mouse
C. guinea pig
D.chicken

102. What pathogens are sent to the laboratory in gas gangrene?
A. damaged muscle fragments, tissue exudate, parenchymatous organs
B. sputum, excretions and secretions, bone marrow, intestinal mucosa

C. lymph nodes, intestinal tract, parenchymal organs
D. tissue exudate, breast and abdominal fluid, small intestine, bone marrow

103. What is the difference of Cl.perfringens in gas gangrene from other pathogens?
A. forms a capsule, motionless
B. location of spores, small in size
C. with shape and size
D. painting, size, mobility

104. Under what conditions do gas gangrene pathogens grow?
A. 18 hours at 37 ^{0}C in an atmosphere containing 10-15% CO_2
B. 24-48 hours at 37-38 ^{0}C under aerobic conditions
C. 24-48 hours at 37-38 ^{0}C under anaerobic conditions
D. 28 hours at 37 ^{0}C in an atmosphere containing 10-15% CO_2

105. Which of the following is inactive?
A. Cl. oedematiens
B. Cl. septicum
C. Cl. perfringens
D. Cl.histolyticum

106. Which of the following pathogens forms a capsule?
Cl. perfringens
Cl. septicum
Cl. oedematiens
Cl.histolyticum

107. What kind of bacteria are clostridia?
the diameter of the spores is larger than that of the bacterium
spores are located at the tip of the bacterium
spores are located in the center of the bacterium
The diameter of the spores is small

108. What is the difference between clostridia and bacilli?
with the size of the spores
with the formation of spores
by forming a capsule
with bacterial cell size

109. The causative agent of necrobacteriosis -
A. In 1882, F. Lyoffler found it and described it in full
B. In 1882, R. Cox found it and described it in full
C. In 1882, B. Bang found it and described it in full
D. In 1882, L. Pasteur found it and described it in full}

110. Necrobacteriosis bacteria -
A. grows strongly aerobic, 36-38 ^{0}C, ambient pH 7.4-7.6
B. strongly anaerobic, grows at 36-38 ^{0}C, ambient pH 7.4-7.6
C. facultative anaerobic, grows at 36–38 ^{0}C, ambient pH 7.4–7.6
D. facultative aerobic, grows at 36-38 ^{0}C, ambient pH 7.4-7.6}

111. Patmaterial sent from a dead animal to the laboratory in necrobacteriosis
A. carcasses of small animals , fragments of parenchymal organs from large animals
B. carcasses of small animals , blood from large animals, damaged mucous membranes

C. carcasses of small animals , tissues damaged by large animals
D. Fragments of parenchymatous organs with carcasses of small animals , tissues damaged by large animals and foci of necrosis

112. In necrobacteriosis patmaterial sent to the laboratory from a sick animal
A. The affected areas are removed from the boundary of healthy and necrotic tissue
B. Samples and blood are taken from the affected area
C. Sample, milk and blood are taken from the affected area
D. extracts, milk and blood samples are taken}

113. Which laboratory animal is most susceptible to necrobacteriosis?
A. pigeons and rats
B. rabbits and white mice
C. guinea pig and owl
D. rat and guinea pig

114. If there is ***F. Necrophorum in the*** **examined patmaterial or culture** -
A. necrosis develops after 3-4 days at the site of injection into the rabbit's ear
B. necrosis develops after 5-6 days at the site of injection into the rabbit's ear
C. necrosis develops after 7-8 days at the site of injection into the rabbit's ear
D. necrosis develops after 8-9 days at the site of injection into the rabbit's ear

115. Who first discovered the causative agent of campylobacteriosis?
A. F. Lyoffler and Shtokman in 1913-1918
B. McFedian and Stockman in 1913-1918
C. McFedien and F. Lyoffler in 1913-1918
D. L. Pasteur and Stockman in 1913-1918

116. The causative agent of campylobacteriosis-
AC fetus
B. Cl. septicum
C. Cl. oedematiens
DF necrophorum

117. The causative agent of campylobacteriosis - C. fetus -
A. mikroaerofil 37.5 ^{0}C, 10% CO_2 conditions added to the blood or serum intensive, semi-liquid food environments grow
B. grows in semi-liquid, dense nutrient media with the addition of blood or serum under conditions of aerobic, 37.5 ^{0}C, 10% CO_2
C. grows in semi-obligate anaerobic, dense nutrient media with the addition of blood or serum under conditions of anaerobic, 37.5 ^{0}C, 10% CO_2
D. grows in semi-liquid, dense nutrient media with the addition of blood or serum under conditions of facultative anaerobic, 37.5 ^{0}C, 10% CO_2 }

118. How are endotrix spores located?
A. in the form of a chain along its length inside the hair
B. in the form of a chain along its length around the hair
C. in the form of a chain along its length inside and on the hair
D. in the form of a chain along its length in a child with broken hair}

119. How are ectotrix-spores located?
A. in the form of a chain along its length inside the hair
B. in the form of a chain around its length along the hair
C. in the form of a chain along its length inside and on the hair
D. in the form of a chain along its length in a child with broken hair}

120. How are neoendotrix-spores located?
A. in the form of a chain along its length in a broken child of hair
B. in the form of a chain along its length inside the hair
C. in the form of a chain along its length around the hair
D. in the form of a chain inside and outside the hair fiber along the length of the hair
in the form of a coating

121. Spores of the pathogen Trichophytia-
A. are placed in straight rows only along the length of the hair.
B. are located irregularly only along the length of the hair
C. are located in balls only along the length of the hair
D. are arranged in wavy rows only along the length of the hair

122. Where are trichophytons found?
A. It is found in preparations made from patmaterial treated with 10% alkali, on damaged hair
B. is found in greases prepared from a piece of leather treated with 10% alkali
C. is found in preparations prepared from extracts treated with 10% alkali
D. It is found in preparations prepared from a blood sample treated with 10% alkali

123. What mycoses are included in dermatomycoses ?
A. accompanied by damage to the skin and its derivatives
B. accompanied by damage to the lymph nodes and respiratory tract
C. accompanied by damage to the circulatory and nervous systems
D. accompanied by damage to the mucous membranes and digestive tract

124. Where do dermatomycosis pathogens parasitize?
A. In tissues that have keratin
B. in connective tissue
C. in nerve cells
D. in glycogen-rich tissues

125. What is the correct explanation for mycoses:
A. diseases that are accompanied only by skin damage
B. Diseases caused by mold fungi
C. diseases caused by mycoplasmas
D. a group of diseases caused by pathogenic microscopic fungi

126.The causative agent of trichophytia?
AB mezentericum
B. Tr. verrucosum
C. Cl. Oedymatiens
DM Lanosum1

127. Clinical signs of trichophytia?
A. cough, inflammation of the hair follicles

B. inflammation of the hair follicles, hair breakage
C. violation of the integrity of the epidermis, diarrhea
D. hair breakage, cough, diarrhea

128. Who discovered one of the pathogens of Trichophytia and when?
AAX Sarkisov in 1845
BM Malmsten in 1845
SSV Petrovich in 1845
DLI Nikifirov in 1845

129. Spores of microsporidial pathogens-
A. are arranged in wavy rows only along the length of the hair
B. are placed in straight rows only along the length of the hair.
C. are located in balls only along the length of the hair
D. is arranged in an irregular, mosaic shape only along the length of the hair

130. In trichophytia biosinov is put in what way, in what species of animal?
A. The skin of a guinea pig or rabbit is scratched and patmaterial is applied to it
B. by sending the skin of a guinea pig or rabbit under the skin
C. patmaterial is applied to the conjunctiva of the eye of a guinea pig or rabbit
D. by sending a patmaterial suspension into the vein of a guinea pig or rabbit

131. Patmaterial obtained in trichophytia and microsporia?
A. A scraping taken from the boundary of damaged and healthy tissue
B. damaged tissue, with wool fibers
C. blood and secretions
D. piece of damaged skin, separation

132. What is the difference between the pathogens of trichoftia and microsporia?
A. in relation to oxygen
B. by shape, size of spores
C. luminescent analysis, on the location of spores
D. growth in a nutrient medium, with colony color

133. Who first proved that leptospira are the cause of disease in pigs and sheep ?
ASYa.Lyuboshenko and LSNovikov (1946)
BSYa.Lyuboshenko (1938-1939 y)
SVITerskix (1938-1939)
DVITerskix (1940)

134. Leptospira - in which paragraph the explanation is given correctly?
A. lepto-twist, spira-spiral
B. lepto-small, spira-spiral
C. lepto-hidden, spira-spiral
D. lepto-thin, spira-spiral

135. Who first proved that leptospira are the cause of disease in horses?
ASYa.Lyuboshenko and LSNovikov (1946)
BVITerskix (1940)
SSYa.Lyuboshenko (1938-1939)
DVITerskix (1938-1939)

136. Who first proved that leptospira are the cause of disease in large horned cattle?
AVITerskix (1938-1939)
BSYa.Lyuboshenko (1938-1939 y)
SSYa.Lyuboshenko and LSNovikov (1946)
DVITerskix (1940)}

137. Who first proved that leptospira are the cause of the disease in silver-black foxes, dogs, and goats?
ASYa.Lyuboshenko (1938-1939)
BVITerskix (1938-1939)
SSYa.Lyuboshenko and LSNovikov (1946)
DVITerskix (1940)

138. Passive immunity in leptospirosis lasts ..... days
A. 7
B. 18
C. 15
D. 8

139. What methods are tested for leptospirosis in the laboratory?
A AR
B. KBR
C. PR
D. Biosinov

140. Short-term febrile hematuria, sometimes (10%) jaundice, occurs after a ink .day incubation period.
A. 8-14
B. 4-10
C. 7-15
D. 3-16

141. Spirochetes -
Spirochaetales **family, diameter ..... microns, length ..... microns, screw-like, twisted microorganismC.**
A. 0.12-10.0; 5-500
B. 0.10-15.0; 8-300
C. 0.8-10.0; 15-400
D. 0.5-12.0; 10-200

142. Name the microbes that cause pus?
A. Escherichia coli, salmonella
B. brucella, yersinians
C. mycobacteria, actinomycetes
D. staphylococci, streptococci

143. Pathogenesis of infectious mastitis -
A. All the answers are correct
B. is characterized by the effect of streptococcal toxins and enzymes on the udder tissue and the whole organism **.**
C. streptococci multiply in the mucous membranes and cause catarrhal-purulent inflammation. D. penetrates deep into the tissue and causes purulent processes

144. What is the causative agent of infectious mastitis?
A. Str.agalactiae
B. Str.viridans
C. Str.salivaris
D. Str.lactis

145. What method is used to distinguish Str.agalactiae from other streptococci?
A. CAMP
B. microscopy
C. bacteriology
D. serology

146. In infectious mastitis biosinov is put in which species of animal?
A. white mouse, guinea pig
B. white mouse, pigeon
C. guinea pig, chicken
D. rabbit, rat

147. If the result of biosynthesis in infectious mastitis is positive -?

A. Mice become ill and die in 7 to 8 days
B. mice become ill and die in 3-4 days
C. mice become ill and die in 5 to 6 days
D. Mice become ill and die in 1 to 2 days

148. What is the cause of mute ?
A. Str.pyogenes
B. Str. equi
C. Str.viridans
D. Str. salivaris

149. Str. equi-
A. Causes disease in horses and ungulates from six months to two years of age.
B. causes disease in horses older than two years and in ungulates.
C. Causes disease in horses and ungulates less than six months of age.
D. causes disease in horses from three months to four years}

150. What is the causative agent of pneumococcal septicemia?
A. Str. pneumoniae
B. Everything is correct
C. Dipl. septicum
D. Dipl. lanceolatus

151. In pneumococcal septicemia
A. their extracts, blood is taken from sick animals
B. Sick animals are cut from the wound, blood is taken
C. their extracts from sick animals, scraped
D. Dung and blood are taken from sick animals }

152. What are pathogenic pneumococci soluble?
A. in bile fluid
B. in saline
C. heparin
D. kaolinda

153. In which paragraph the morphology of the causative agent of pneumococcal septicemia is given correctly?
A. double cocci, capsular, gram-positive, immobile, do not form spores.
B. forms gram-negative, spores and capsules, inactive cocci.
C. Gram-negative, does not form spores and capsules, motile cocci.
D. Grammusbat, forms spores, does not form capsules, inactive cocci.

154. Dumb driver - *Str. equi*
A. causes inflammation of the upper respiratory tract, submandibular lymph nodes
B. clinical abscess, manifested by nasal discharge.
C. causes catarrhal purulent inflammation of the larynx, mucous membranes, submandibular lymph nodes
D. causes catarrhal purulent inflammation of the upper respiratory tract, larynx, mucous membranes, submandibular lymph nodes

155. In which point the pathological material in dumb disease is given correctly.
A. Pus is taken from the abscess (aseptically from the unexploded abscess), samples are taken from the parenchymal organs.

B. purulent nasal discharge, tissue is removed from the wound site.
C. pus from an abscess (aseptically from an unexploded abscess), purulent nasal discharge.
D. Samples are taken from parenchymatous organs, blood, pus from the abscess

156. In what nutrient media the mute pathogen grows?
A. in serum or fibrin-deficient blood, added medium, Kitt-Tarossi medium
B. whey added medium, Ehdo medium
C. Kitt - Tarossi environment, Ploskirev environment
In the D. Levin environment, in the Kitt-Tarossi environment

157. In which species of animal is biosinov put in dumb disease?
A. white mouse, kitten
B. guinea pig, pigeon
C. white mouse, chick
D. rabbit, rat

158. What material is used to isolate the mute pathogen?
A. scraped, skin sample
B. samples from parenchymatous organs
C. pus from abscess, purulent nasal discharge
D. intestinal tract, spleen, bone marrow

159. The causative agent of microsporia?
ABMezentericum
BM lanosum
C. Cl. oedematiens
D. Tr. verrucosum

160. What disease is favus -?
A. an infectious disease characterized by damage to the skin, feathers, hair, and nails
B. an infectious disease characterized by fractures of the skin, feathers, hair, and nails
C. an infectious disease characterized by discoloration of the skin, feathers, hair, and nails
D. Infectious disease characterized by loss of skin, feathers, hair and nails}

161. Favusda -
A. Internal organs may also be partially damaged
B. Internal organs may not be damaged
Q. Internal organs can also be damaged
D. Internal organs can be damaged only in birds}

162. The causative agent of favus in birds -
A. *Ach.gallinae*
B. *Ach.schoenleini*
C. *Tr.faviforme*
D. *Tr. gypseum*

163. For the first time the etiological significance of mycoplasmas in animal pathology
A. in cattle peripneumonia was identified in 1893 by Nokar and Rular
B. in cattle peripneumonia in 1893 MGTartakovsky and Ye.P. The Dzhunkovskys have identified
C. was diagnosed in cattle peripneumonia in 1893 by Edward and Freundt
D. in cattle peripneumonia was identified in 1893 by VDTimakov and GY Kagan

164. Who studied the causative agent of anthrax?

ASSAndrevskiy
BRKox
C. Salmon
D. Basov

165. Which of the following is the causative agent of anthrax?

ABanthracis
BB megaterium
SBsubtilis
DB mycoides

166. What biopreparations are used in anthrax?

A. immunoglobulin, antigen, bacteriophage
B. Strain 55, STI, VGNKI
C. vaccine, immune serum, diagnosticum
D. immune serum, antigen, bacteriophage

167. What form of anthrax occurs in pigs?

A. septic
B. tonsillar
C. carbuncleosis
D. lungs

168. Dissection of the body when anthrax is suspected?

A. is done in part
B. allowed
C. is strictly prohibited
D. depends on the course of the disease

169. In what form does the anthrax pathogen grow in GPJ?

A. inverted spruce
B. in the form of a spruce
C. in the form of a cloud
D. in the form of a piece of cotton

170. Anthrax vaccine?

A. Strain 82
B. Strain 19
C. Shtamm 55
D. Antirabic

171. In which clause the morphology of E.coli is given correctly?

A. gram-negative, rod with twisted ends, located one by one, some strains form a capsule, there are mobile and inactive species, do not form spores
B. gram-negative, rod with twisted ends, located one by one, some strains form capsules, there are mobile and inactive species, do not form spores
C. gram-negative, rod with twisted ends, located one by one, some strains form capsules, immobile, form spores
D. gram-positive, rod with twisted ends, located one by one, has mobile and inactive species, does not form spores, capsules}

172. Differential diagnostic nutrient media used for the cultivation of enterobacteria?

A. Levin, Endo
B. Ploskiryov, GPA
C. Gissa, GPB
D. Bismuth sulfite agar, Endo

173 calves at the age of colibacteriosis ill?

A. 10-14 days
B. 1 month old
C. 6-month-old
D. people of all ages

174. In what forms is colibacillosis manifested?

A. septic, enterotoxic, enteritis
B. intoxication, inflammation of the lungs, edema
C. skin, muscle damage, poisoning
D. septicemia, inflammation of the lungs

175. Patmaterial obtained from a sick animal in colibacillosis?

A. feces from the rectum
B. urine, blood, discharge
C. milk, runny nose
D. scraped from the intestine

176. Who discovered Salmonella and when?

A. 1885 Salmon
B. 1881 L.Paster
C. 1880 R.Kox
D. 1842 Basov

177. In which point are the materials obtained from a sick animal in salmonellosis given correctly?

A. feces, placenta, secretions, aborted fetus or its stomach, parenchymatous organs
B. feces, urine, blood, milk samples, parenchymal organs
C. blood, milk, skin, intestinal mucosa, parenchymal organs
D. all excretions and secretions, parenchymatous organs

178. Do Salmonella form spores and capsules?

A. both are correct
B. ha
C. no
D. sometimes

179. Which type of Salmonella is inactive?

AS pullorum (gallinarum)
BS typhimurium
SS enteritidis
DS choleraesuis

180. How is the difference between Salmonella and Escherichia coli determined?

A. on pathogenic properties
B. grown in normal nutrient environments
C. Endo, Ploskiryov, grown on bismuth-sulfite agar
D. a disease transmitted by a disorder of blood formation

181What disease do Salmonella cause in birds?

A. pullorosis
B. brucellosis
C. colibacillosis
D. pasteurellosis

182. Epizootic and enzootic manifestations of bronchiomycosis are observed in summer, when the water temperature is .....

A. + 22 + 25 ^{0}C
B. + 20 + 22 ^{0}C
C. + 10 + 20 ^{0}C
D. + 15 + 18 ^{0}C

183. The disease is very severe. The epizootic manifestation of the disease is more often observed in summer, depending on the temperature of the external environment …… .. lasts for days, that is, an acute flow is manifested.

A. 5-12
B. -5

C. -10
D. 5-8

184. Carp, carp, their hybrids, silverfish, ala forehead, white forehead, death of young fish in bronchiomycosis .. ……%, if the disease is acute, all sick fish die will be.
A. -50
B. 30-40
C. 20-30
D. 50-60

185. What percentage of experimental fish die in pseudomonas disease is considered positive biosynthesiC.
A. 70
B. 30
C. 50
D. 60

186. Bronchiomycosis - a disease in which the tissues of the parenchymatous organs are filled with blood , what happens to the layer of fat and glycogen .
A. tvorogsimon
B. thick
C. thin
D. extinct

187. Nephromycosis of fish was first found in early 5–6-year-old carp species.
A. XI
B. XIX
C. XX
D. XV

188. Ichthyosporidiosis (ichthyponosis or "drunkenness" disease of fish) first appeared in the late twentieth century
A. XX
B. XIX
S.XI
D. XV

189. Ichthysporidiosis (ichthyponosis or intoxication of fish) in which country was the first recurrence of trout species grown in artificial reservoirs?
A. Russia
B. in Germany
C. France
D. Italy

190. L.monocytogenes is the causative agent of which disease?
A. listeriosis
B. tuberculosis
C. brucellosis
D. temiratki

191. In what diseases allergy is checked?
A. tuberculosis, brucellosis
B. Colibacillosis
C. Anthrax
D. Black

192. How many diplococci are in the grease?
A. 2 and dan
B. 1 and dan
C. 4 and dan
D. 5 of them

193. What is the form of the causative agent of campylobacteriosis?
A. Rod-shaped
B. Comma
C. Kokksimon

D. Spiral

194. What is the causative agent of listeriosis?
AL gebdomadis
BL bataviye
SLmonocytogenes
DL influenza

195. What is mycotoxicosis?
A. Poisoning by fungal venom
B. bacterial poisoning
C. Poisoning by mycoplasma venom
D. Poisoning by plant venom

196. What is a test microbe?
A. decomposer
B. synthesizer
C. tester
D. oxidizing

197. Specify test microbes?
A. Escherichia coli, streptococcus, staphylococcus, hay t **a** collar
B. pathogens of anthrax, measles, mumps, rubella
Pathogens of C. tuberculosis, brucellosis, pasteurellosis, aspergillosis
D. causative agents of erysipelas, salmonellosis, pasteurellosis, mucormycosis

198. What color are the larvae affected by European rot?
A. yellow
B. is dark
C. brown
D. malla

199. Aspergillosis pathogens die in 30 minutes when heated to several degrees
A. 60
B. 30
C. 80
D. 100

200. The diameter of the fetal body of the fungus Aspergil together with conidia reaches… .. µm.
A. 80
B.60
C. 90
D. 100

4.9. Test questions for YaB (500)

1. **Who invented the doctrine of humoral immunity?**
A. 1907 IPPavlov
B. 1907 Erlix
C. 1886 IISechenov
D. 1903 IIMechnikov

2. Who and when discovered that nitrobacteria control the nitrification process?
A. 1927 DIMendeleyev
B. 1903 IIMechnikov
C. 1907 IPPavlov
D. 1877 SNVinogradskiy

3. Who was the first scientist in Russia to develop an anthrax vaccine and put it into practice?
ALSSenkovskiy
BSNVinogradskiy
SVLOmelyanskiy
DIIMechnikov

4. The scientist who identified the pathogens that make up the fiber?
AVLOmelyanskiy
BLSSenkovskiy
SSNVinogradskiy

DIIMechnikov

5. Who is the scientist who discovered that the causes of wine disease are microbes and invented a method to protect wine from spoilage by heating it to 55 ^{0}C?
ALSSenkovskiy
B. Robet Cox
SVLOmelyanskiy
D. Louis Pasteur

6. The scientist who first studied the infusoria using the experimental method?
ARKox
B. Ermengem
SMMTerexovskiy
DLPaster

7. Who is the scientist who thought that the cause of human plague was a germ, tried to find it under a microscope, and proposed a method of vaccination against human plague?
ADSSamoylovich
BMMTerexovskiy
C. Ermengem
DRKox

8. A scientist who used mango and tuberculosis allergens in 1891 for diagnostic purposes?
AMMTerexovskiy
BXIGelman
C. Ermengem
DRKox

9. What is the role of sanitary microbes?
A. plant debris, rotting animal carcasses, cleans the earth, water
B. cleans plant residues, fodder, meat products.
C. purifies food, water.
D. plant and animal products, purified from polymers

10. What is a strain?
A. a culture that belongs to the same species but is separated from different animals and substrates and differs with less variation in their mutual properties.
B. a culture that belongs to a different species but is separated from an animal and substrates and differs in less variation in its mutual propertieC.
C. belongs to the same species, but only a culture that is separated from different substrates and does not differ in its mutual properties.
D. a culture separated from animals and distinguished by similarities in mutual features}

11. What is a clone?
A. culture of microorganisms isolated from one or two cell colonies
B. culture of microorganisms isolated from several cells.
C. Culture of microorganisms isolated from two cells.
D. culture of microorganisms isolated from a single cell.

12. What system is adopted for grouping prokaryotes?
A. stratification classification system
B. taxonomic classification system.
C. hierarchical classification system
D. identifier classification system

13. What is the function of the "Berg bacterium detector"?
A. prokaryotic organisms carry out rapid identification more fully.
B. performs a more complete classification of prokaryotic organisms.
C. makes a more complete classification of eukaryotic organisms.
D. eukaryotes perform more rapid identification of organisms}

14. "What kind of organisms are bacteria?
A. single-celled microorganisms that differ in shape, size, and some biological properties
B. single-celled microorganisms that do not differ in shape, size, and some biological properties
C. Two-celled microorganisms that differ in shape, size, and some biological properties
D. multicellular microorganisms that do not differ in shape, size and some biological properties}

15. How many groups of cocci are there?
A. 5
B. 7
C. 8
D. 6

16. What bacteria are called protoplasts?
A. cell wall thick bacteria
B. bacteria without a cell wall
C. cell wall delicate bacteria
D. bacteria that have a cell wall

17. Bacteria are divided into how many groups according to the number and location of worms?
A. 3
B. 5
C. 6
D. 4

18. What organisms are actinomycetes?
A. are fungal, single-celled gram-positive microorganisms.
B. are fungal, multicellular gram-positive microorganisms.
C. are fungal, single-celled gram-negative microorganisms.
D. are light-loving fungi, multicellular gram-negative microorganisms

19. What organisms are spirochetes?
A. Microorganisms that are mobile, slender and spiral in shape, with many fine foldC.
B. microorganisms that are motionless, thin and spiral, with many fine foldC.
C. microorganisms that are motile, thick and spiral, with many small foldC.
D. motionless, thick and spiral, microorganisms without folds}

20. Indicate which microorganisms enter prokaryotes?
A. bacteria, archaebacteria, cyanobacteria
B. archaebacteria, simple hay von, cyan bacteria
C. viruses, fungi, bacteria
D. algae, slugs, simple animals

21. What are the non-permanent parts of a bacterial cell?
A. nucleus, shell, capsule
B. cytoplasm, spore, nucleus
C. xivchin, spore, capsule
D. shell, hivchin, core

22. What is the difference between a bacterium and a bacilli?
A. bacilli are also bacteria, but form capsules and spores
B. differs by biological, pathogenicity
C. bacteria grow in a normal nutrient medium
D. a vaccine is prepared from bacteria

23. It is a complex colloidal system composed of water, protein, carbohydrates, fats, nucleic acids, various organic and inorganic substanceC. What part of this cell?
A. shell
B. nucleus
C. cytoplasm
D. vacuole

24. The structure of the bacterial cell shell?
A. cell wall, capsule, mucous membrane
B. cell devo ri, cytoplasm tic membrane
C. cytoplasmic membrane na, mucous layer
D. exine, intina, cytoplasmic membrane

25. How many layers does a cell wall consist of?
A. 2
B. 3
C. 4
D. 5

26. What is the difference between mycoplasmas and bacteria?
A. movement, capsule formation.
B. spore formation, with movement
C. cell wall, with no mucous layer
D. absence of cell wall, capsule

27. What is the difference between the spores of microscopic fungi and bacterial spores?
A. reproduction, nutrition
B. reproduction, protection
C. growth, respiration
D. nutrition, enzyme production

28. Determine the average amount of water in a bacterial cell?
A. 90-95%
B. 10-20%
C. 25-35%
D. 75-85%

29. What is the amount of dry matter in a bacterial cell?
A. 15-25%
B. 30-40%
C. 50-60%
D. 1-10%

30. What percentage of protein dry matter in the body of pathogenic microbes?
A. More than 40%
B. more than 50%
C. more than 30%
D. more than 20%

31. What are antigens, toxins, enzymes?
A. protein
B. polysaccharide
C. monosaccharide
D. polypeptide

32. What are the carbohydrates in the microbial cell?
A. with polysaccharides

B. with proteins
C. with monosaccharides
D. with polypeptides

33. How many classes of enzymes are there?
A. 6
B. 5
C. 4
D. 3

34. Aerobic microbes?
A. assimilates oxygen in the atmosphere
B. does not absorb oxygen from the atmosphere
C. partially assimilates oxygen in the atmosphere
D. assimilates oxygen by breaking down nitrogen-free organic compounds

35. What are the types of respiration of microorganisms?
A. aerobic, heterotrophic
B. aerobic, autotrophic
C. aerobic, anaerobic, microaerophilic
D. aerobic, metatrophic

36. The concept of anaerobic microorganisms:
A. microorganisms that thrive in an oxygenated environment
B. microorganisms that grow in an oxygen-free environment
C. microorganisms that thrive in any environment
D. microorganisms that grow in an acidic environment

37. What is an obligate anaerobic?
A. development in absolutely oxygen-free conditions
B. microorganisms that thrive in an oxygenated environment
C. microorganisms that thrive in any environment
D. microorganisms that grow in an acidic environment

38. What are irradiated microbes called?
A. photobacteria
B. organobacteria
C. chemoorganotropes
D. photoorganotrophs

39. Explain holozoy nutrition
A. plants, microbes
B. animals, humans
C. naive, insects
D. bacteria, protozoa

40. Determine the type of nutrition of microorganisms?
A. autotrophic, heterotrophic
B. autotrophic, aerobic
C. heterotrophic, anaerobic
D. metatrophic, microaerophilic

41. Describe the phases of growth and development of microorganisms?
A. 10-12
B. 1-3
C. 2-5
D. 4-8

42. What is the difference between exo and endotoxins of microbes ?
A. antigenicity, reproduction, growth
B. decomposition, chemical composition, toxicity
C. growth, development, impact
D. capsule, enzyme formation

43. Specify the respiratory enzyme?
A. oxidase, peroxidase
B. lipase, amylase

C. lactase, zimaza
D. hydrolase, proteinase

44. Where are microorganisms most common?
A. soil
B. suv
C. air
D. cosmos

45. How long is the tubercle bacillus stored in the soil?
A. Up to 100 yiga
B. up to 10 years
C. 5 months to 2 years
D. up to 2 months

46. How long are brucellae stored in the soil?
A. 100 left
B. 5 months to 2 years
C. up to 10 years
D. up to 100 yiga

47. According to the microcenosis in water , it is divided into how many zones?
A. 5
B. 4
C. 2
D. 3

48. What is the nature of the polysaccharide zone water?
A. water is very dirty, up to several million microbes in 1 ml
B. water is moderately polluted, containing up to 100,000 microbes per ml
C. water is clean, there are tens to hundreds of microbes in 1 ml
D. The water is very clean, 1 ml completely dissolves germs

49. What is the nature of mesosaprobic zone water?
A. water is moderately polluted, containing up to 100,000 microbes per ml
B. water is clean, there are tens to hundreds of microbes in 1 ml
C. The water is very clean, 1 ml completely dissolves germs
D. water is very dirty, up to several million microbes per 1 ml

50. What is the nature of oligasaprobic zone water?
A. water is very clean, 1 ml of water completely cleans germs,
B. water is very dirty, up to several million microbes in 1 ml
C. water is moderately polluted, containing up to 100,000 microbes per ml
D. 1 ml contains tens and hundreds of microbes

51. How much water is divided according to its origin?
A. 3
B. 2
C. 6
D. 8

52. In which clause is groundwater correctly indicated?
A. all right
B. well
C. artesian
D. ground

53. When it comes to the **number of microbes in the** GPA **:**
A. The number of colonies in 1 ml of water

B. The number of microbes in 10 ml of water
C. The number of microbes in 500 ml
D. The number of microbes in 200 ml

54. The presence of even a single E. coli in the least amount of water (ml):
A. coli-titre
B. coli-index
C. microbial number
D. titre

55. The amount of Escherichia coli in 1 liter of water:
A. coli-index
B. coli-titre
C. microbial number
D. titre

56. What should be the total number of microbes in 1 ml of tap water?
A. Not to exceed 10
B. Not to exceed 100
C. not to exceed 50
D. Not to exceed 20

57. Coli-titre of tap water:
A. Not less than 100
B. Not less than 500
C. should not be less than 50
D. Not less than 15

58. Coli-titre for well water and open sources:
A. Not less than 200
B. should not be less than 10
C. should not be less than 111
D. Not less than 1000

59. Coli-index for well water and open sources:
A. More than 9
B. more than 20
C. More than 100
D. more than 200

60. What should be the total amount of microorganisms in 1 ml of tap water?
A. Not more than 100
B. should not be more than 10
Q. Not more than 20
D. should not be at all

61. Coli titer of piped water?
A. Not less than 333
B. Not less than 100
Q. Not less than 10
D. Not less than 1000

62. How many different methods are used to determine the air microflora ?
A. 4
B. 1
C. 5
D. 2

63. How many bacteria are released into the air when a person or animal sneezes?
A. 4500-150,000 cha
B. 100
C. 1000
D. 50

64. What are the pathogens that are spread by airborne dust?
A. all
B. influenza, anthrax
C. tuberculosis
D. smallpox

65. What are the pathogens that are transmitted by airborne droplets?
A. protein, y.sh.m. peripneumonia

B. influenza, anthrax
C. tuberculosis
D. smallpox

66. Determine the effect of physical factors on microorganisms?
A. heavy metal salts, pressure, nutrition
B. temperature, acid, alkali
C. temperature, pressure, drying, rays
D. rays, alkalis, heavy metal salts

67. How different are microorganisms in relation to temperature?
A. 3
B. 2
C. 4
D. 5

68. What microorganisms are psychrophiles?
A. microbes that have learned to live at low temperatures
B. bacteria accustomed to moderate temperatures
C. heat-loving microorganisms
D. Bacteria adapted to live at optimal temperatures

69. What microorganisms are mesophiles?
A. heat-loving microorganisms
B. microbes that have learned to live at low temperatures
C. Bacteria accustomed to moderate temperatures
D. batteries adapted to live at optimal temperatures

70. What microorganisms are thermophiles?
A. heat-loving microorganisms
B. microbes that have learned to live at low temperatures
C. Bacteria accustomed to moderate temperatures
D. batteries adapted to live at optimal temperatures

71. Describe the effect of chemical factors on microorganisms?
A. pH, acid, alkali
B. pressure, temperature, alkalis
C. acid, rays, drying
D. rays, pressure, pH

72. Is the approach of a microbe to it under the influence of some chemical -?
A. negative chemotaxis
B. movement
C. positive chemotaxis
D. fixation

73. What is the name of a microbe moving away from a chemical substance?
A. negative chemotaxis
B. positive chemotaxis
C. movement
D. fixation

74. What are the methods of disinfection?
A. mechanical, group, binding
B. mechanical, physical, chemical, biological
C. physical, daily, needy
D. biological, basic, planned

75. Is it to prevent germs from entering wounds?
A. disinfection
B. antiseptic
C. asepsis

D. disinsection

76. What is the chemical killing of germs in wounds and other objects?
A. antiseptic
B. asepsis
C. disinfection
D. disinsection

77. Determine the effect of biological factors on microorganisms?
A. bacteriophage, antibiotic, phytoncide
B. temperature, alkali, drying
C. environmental reaction, rays, bacteriophage
D. acid, alkali, pressure

78. What is the relationship between two or more species of microbes living in the same environment?
A. commensalism
B. symbiosis
C. metobiosis
D. Sattelizm

79. What are phytoncides, when were they discovered?
A. Antibiotics derived from plants, 1928
B. Antibiotics derived from fungi, 1938
C. is derived from special bacteria, 1948
D. reduces reactivity , 1958

80. Which scientist introduced the term antibiotic to science?
AALevenguk
BZAVaksman
SIIMechnikov
D. Erlix

90. What is an antibiotic?
A. Bacteria, actinomycetes, molds, lichens, products of life activities of animals and plants
B. a set of macro-micronutrients
C. a means of killing germs in the body of animals
D. bacteria, vitamins derived from fungi, enzymes

91. Sources of antibiotics?
A. fungus, bacterium, plant, animal
B. air, plant, mold
C. soil, fungus, actinomycetes
D. animal, water, air, bacteria

92. What determines the biological activity of antibiotics.
A. affected unit
B. solution concentration
C. the amount of solution
D. with the composition and volume of the solution

93. What is the dissolution of bacteria under the influence of phage?
A. bacteriophage
B. toxemia
C. bacteremia
D. invasiveness

94. What is the difference between fungi and bacteria?
A. The structure of reproduction, respiration, movement
B. nutrition, spore structure, respiration
C. movement, breathing, nutrition
D. spore formation, nutrition

95. What is the opposite process to nitrification?
A. decay
B. ammonification
C. denitrification

D. kneading

96. Name the nitrifying bacteria?
A. potatoes, hay bacilli
B. gut, bulgarian rod
C. nitrobacteria, nitrous bacteria
D. yeasts, cabbage bacilli

97. What are the causative agents of alcoholism?
A. saccharomyces cerevisiae, sacch. Vini
B. penicilla, intestinal rod chasi, actinomycetes
C. aspergilla, vulgar protein, milk streptococci
D. thermophilic strepto cocci, E. coli, Kl. putrifikum

98. Microorganisms are involved in the circulation of which elements?
A. nitrogen, carbon, phosphorus, sulfur, iron
B. hydrogen, oxygen, nitrogen, barium, iron
C. potassium, sodium, lithium, bromine, phosphorus
D. sulfur, nitrogen, calcium, carbon

99. Describe the process of denitrification?
A. decomposition of nitrates
B. oxidation of fats
C. decay of proteins
D. oxidation of nitrites

100. What are the pathogens of heterofermentative lactic acid fermentation?
A. leiconosto c **, intestinal rod**
B. acidophilus rod, mold fungus
C. Escherichia coli, putrefactive bacteria
D. bulgarian bacillus, milk streptococci

101. Name the homofermentative lactic acid fermentation pathogens?
A. milk streptococci, bulgarian, acidophilus rods
B. potato stick, gut stick
C. vulgar pro tea, thermophilic streptococci
D. potato sticks, cabbage sticks

102. How do spores settle in a cell?
A. central or free
B. on or near the cell
C. central, terminal, subterminal
D. terminal free or joint

103. Name aerobic putrefactive bacteria?
A. megaterium, basC. mesentericus, basC. Subtilis
B. Kl.pasterianum, Kl. Putrifikum
C. intestinal rod, vulgar protein
D. Kl.putrifikum, Kl. tetani

105. Name anaerobic putrefactive bacteria?
A. Actinomycetes, Cl. tetani, yeast
B. Cl. putrificus, CI. vibriosepticus, CI. Tetani
C. BaC. mikoedes, BaC. Subtilis
D. intestinal rod, CI. putrifikum, CI. Sporogenesis

106. What are the main pathogens of fatty acid fermentation?
A. Cl. Pasteuria num, Cl. pectinovorum, Cl. Felsineum
BEkoli, St. lactis, Prot. Vulgaris
C. Acetobacter acety, St. Aureus
D. Aspergillus niger, salmonella

107. What are the main forms of bacteria?
A. spherical, rod-shaped, twisted
B. trapezoidal, rhombic, amoebic
C. cubic, spiral, spherical
D. rod -shaped , star-
shaped , polygonal

108. What is an infection?
A. entry of pathogenic microbes into the body, development
B. pollution, poisoning
C. the body's response, inflammation
D. the formation of toxins and enzymes by microbes

109. What is the meaning of the word infection?
A. get rid of
B. against infection
C. I infect
D. to be free

110. What is the complex biological process, the interaction between the animal organism and the pathogen in the external environment?
A. disinfection
B. immunity
C. subinfection
D. infection

111. What is immunity?
A. resistance of the organism to pathogenic microbe and its toxins
B. microbial growth, spread, toxicity
C. specific resistance of the organism to infection, inflammation
D. infiltration and spread of pathogenic mycobacterial lap to the organism

112. Identify the types of artificially acquired immunity?
A. nosteril, congenital
B. active, passive
C. sterile, antibacterial
D. antitoxin, antiferment

113. When does artificial passive immunity appear in animals?
A. when vaccinated with hyperimmune blood
B. when vaccinated with the vaccine
C. when vaccinated with bacterial culture
D. when the reactivity decreases

114. What is the meaning of the word immunity?
A. to be free, to get rid of
B. I am infected
C. against infection
D. contagious

115. Immunity resulting from the delivery of immune substances to the body?
A. artificial passive immunity
B. active immunity
C. special immunity
D. natural passive immunity

116. What are the substances that form an immune substance against itself when administered parenterally ?
A. antibody
B. antigen
C. allergen
D. anatoxin

117. What are the anatomical and physiological factors of immunity?
A. antitoxin, antiferment, poisons
B. antibodies, antigens, enzymes
C. toxins, enzymes, aggression

D. skin-mucous membranes, humoral, hormonal

118. Identify specific factors of immunity?
A. cellular, humoral, hormonal
B. antibodies, allergens
C. anaphylaxis, antibodies, humoral
D. allergens, cellular, hormonal

119. Specify full-value antigens?
A. polysaccharides, endotoxins
B. proteins, polysaccharides
C. lipoids, exotoxins
D. proteins, exotoxins

120. Identify completely worthless antigens?
A. lipids, complex carbohydrates
B. enzymes, DNA
C. polysaccharides, RNA
D. exo-endotoxins

121. The main factors that increase the virulence of microorganisms show?
A. toxins, spores, hivchins
B. spores, capsules, hivchins
C. enzymes, spores, aggression
D. capsule, fepments, toxins

123. Specify the virulence factor of the microbe?
A. invasiveness, a **n** tifagocytic, toxic
B. spores, movement, growth
C. enzyme, spore, capsule, movement
D. growth, development, distribution in the body

124. Determine the average harmful and lethal dose of virulence?
A. Zd 50, Ld 50
B. Zd 100, Ld 100
C. Zd 75, Ld 75
D. Zd 25, Ld 25

125. What is the ability of microorganisms to enter, spread and multiply in the tissues of macroorganisms?
A. invasiveness
B. toxigenicity
C. bacteremia
D. sepsis

126. Identify the types of infection?
A. primary, active
B. simple, mixed
C. passive, mixed
D. reinfaction, sterile

127. How to determine the pathogenicity, virulence properties of microorganisms?
A. culturally
B. in the biosinov method
C. tinctorial method
D. by the method of antibiotics

128. Identify the ways in which the microbe spreads in the body?
A. lymph, with urine
B. with milk, blood
C. meat, with skin
D. with blood, lymph, nerve fibers

129. In what ways can reduce the virulence of microbes?
A. prolonged cultivation in artificial nutrient media t^0, adding chemicals, drying, bacteriophages
B. change the composition of nutrient media
C. Add weak disinfectants to nutrient media
D. drying

130. What is the dose of LD_{50}?
A. 50% kills an infected animal
B. Kills 100% infected animal
C. 50% infects the animal
D. 100% harmful to the animal

131. What is the dose of ZD_{50}?
A. 50% kills an infected animal
B. Kills 100% infected animal
C. 50% infects the animal
D. 100% ill

132. What causes the appearance and development of infection?
A. the degree of pathogenicity of the microbe, the immunological state of the macroorganism, the conditions of the external environment.
B. to the level of pathogenicity of the microbe
C. to the immunological state of the macroorganism
D. to external environmental conditions

133. What is the property of a microbe to cause a specific infectious disease under certain conditions?
A. pathogenicity
B. virulence
C. infection
D. immunity

134. What is the degree of pathogenicity of a microbe?
A. virulence.
B. invasiveness
C. toxigenicity
D. pathogenicity

135. The function of the capsule ?
A. from sunlight
B. protection from phagocytosis
C. from the cold
D. from pressure

136. What is the multiplication of a microbe in the blood and its transmission through the blood to the whole organism?
A. sepsis
B. septicemia
C. toxigenicity
D. bacteremia

137. Microbes multiply in the injured area (tissue), the resulting toxin enters the bloodstream and poisons the whole organism. What is it called?
A. toxemia
B. viremia
C. bacteremia
D. bacterophagia

138. Infections by origin?
A. alimentary
B. endogenous
C. exogenous and endogenous
D. superinfection

139. What infection is called a type of inflammatory disease?
A. simple
B. mixed
C. subinfection
D. alimentary

140. Infection caused by the entry of two or more types of pathogens:
A. subinfection
B. mixed
C. alimentary
D. simple

150. An animal that recovers from a disease becomes ill again without developing immunity ?
A. reinfection
B. mixed
C. subinfection
D. alimentary

151. Recurrence of clinical signs of exacerbation of the disease, the pathogen remains in the body, although the clinical symptoms disappear?
A. recurrence
B. superinfection
C. reinfection
D. mixed

152. At what stage of the development of the infectious process appear specific, general symptoms of some infections?
A. the preaching period
B. incubation period
C. prodromal period
D. period of reconvolution

153. What is the name of the first stage of development of the infectious process ?
A. incubation
B. prodromal
C. woodpecker
D. convalescence

154. How are diseases differentiated according to their course?
A. acute and chronic
B. sharp
C. chronic
D. abortive

155. What are the methods of microbiological diagnosis of infectious diseases?
A. microscopic, bacteriological, biological
B. photoelectrocolorimetric
C. serological, biochemical, microscopic
D. allergic, biological

156. What can be an antigen?
A. alcohol, enzymes
B. acid, alkali, metal
C. oil, heavy metal salts
D. microorganisms, their poisons

157. Types of special immunity:
A. naturally or artificially acquired
B. natural
C. artificial
D. absolute and relative

158. Which group of microorganisms forms spores?
A. mycoplasmas, algae
B. simplifications, rickettsiae
C. bacteria, fungi
D. fungi, blue-green algae

159. In which point the sequence of preparation of the extract in PR is given correctly?
A. filtration, crushing, sterilization, extraction
B. sterilization sterilization **,** crushing, extraction, filtration
C. crushing, filtering, extraction,
D. extraction, filtration, crushing, sterilization

160. Specify soluble antibodies?
A. hemolysins, bacteriolysins
B. agglutinins, antitoxins

C. precipitins, opsonins
D. antiferments, agglutinins

161. Identify coagulating antibodies?
A. antifepments, antitoxins
B. agglutinins, precipitins
C. agglutinins, oposinins
D. precipitins, hemolysins

162. Identify the types of antibodies?
A. debilitating, lethal, depressing
B. neutralizing, dissolving, coagulating
C. antitoxin, albumin, lipoid
D. enhancing, antifungal, antimicrobial

163. Identify the antibodies involved in the agglutination reaction?
A. coagulating, precipitating
B. sedative, neutralizing
C. solvent, neutralizer
D. neutralizing, coa gulling

164. Milk ring reaction is used in the diagnosis of which disease?
A. salmonellosis
B. brucellosis
C. listeriosis
D. tuberculosis

165. How many different ways to put PR in a test tube?
A. 5
B. 4
C. 2
D. 3

166. In which of the PR methods the serum is below the test tube?
A. whey is not at all below the test tube
B. when pouring whey under the extract
C. when the antigen is poured on the serum
D. in all ways

167. In how many systems does the CBR pass?
A. 1
B. 2
C. 3
D. 4

168. What condition is manifested in CBD?
A. bacteriolysis, hemolysis
B. agglutination, lysis
C. precipitation, toxigenicity
D. bacterial complement bond formation.

169. What are the components of the agglutination reaction?
A. blood serum, antigen, agglutination serum, physical solution
B. hemolysin, agglutination serum, antigen
C. sheep erythrocyte, complement, antigen, hemolysin
D. complement, test serum, antigen, extract

170. Determine a positive assessment of the precipitation reaction?
A. formation of a white-gray ring on the wall of the test tube
B. sedimentation at the bottom of the probipka
C. redness of the liquid in the test tube
D. the color of the liquid in the test tube does not change

171. How many microorganisms are in the large abdomen of a cow with a live weight of 400-500 kg?
A. 10 kg
B. 2 kg

C. 5 kg
D. 3 kg

172. The use of yeast fungi?
A. In the preparation of technical alcohol
B. in the preparation of wine, beer bread, silage, haylage, cheese ……
C. in the preparation of artificial milk
D. in the preparation of dairy products

173. In the feces of a person infected with dysentery found the causative agent of dysentery , who called it, when bacteriophage?
1917 D.Errel
1881 L. Pasteur
1880 Mechnikov
1882 R. Cox

174. Bacteriocidal, bacteriostatic preparations
A. kills bacteria, stops growth
B. killing infectious pathogens
C. killer of invasions
D. rodent killer

175. Prion antigen?
A. no
B. ha
When C. binds to peptones, it becomes an antigen.
D. antigenicity is low

176. Gapten antigen?
A. no
B. ha
C. sometimes antigen
D. antigenicity is low

177. Who invented the doctrine of cellular immunity?
A. 1903 IIMechnikov
B. 1907 IPPavlov
C. 1886 IISechenov
D. 1907 Erlix

178. How long does passive immunity last on average?
A. 8-10 days
B. 10-14 days
C. 4-6 days
D. 6-8 days

179. When does passive immunity appear in animals?
A. when vaccinated with hyperimmune blood
B. when vaccinated with the vaccine
C. when vaccinated with bacterial culture
D. when the reactivity decreases

180. Methods of water purification
A. precipitation, coagulation, filtration, chlorination, biological method
B. boiling, filtering
C. sedimentation
D. Sterilization

181. How many microbes per $1m^2$ in barns have a high level of pollution?
A. 1000-1500
B. 500-1000
C. 1500-2000
D. 2000-3000

182. What are the antibiotics taken from the body of animals?
A. erythrin, ekmolin, lysozyme
B. Pancreatin
C. Properdins
D. Penicillin

183. What type of immunization is vaccination?

A. seasonal
B. passive
C. active
D. constant

184. What are the names of single-celled microorganisms that differ in shape, size and some biological properties?
A. bacteria
B. viruses
C. fungi
D. lichens

185. It is a complex colloidal system composed of water, protein, carbohydrates, fats, nucleic acids, various organic and inorganic substanceC. What part of this cell?
A. cytoplasm
B. nucleus
C. shell
D. vacuole

186. What is the middle layer of the cell wall of a bacterium called?
A. lipoprotein
B. lipopolysaccharide
C. mucopolymer
D. membrane

187. Polymorphic microorganisms that pass through filters of 100-150 nm, do not form spores, capsules, gram-negative inactive microorganismC. What are these microorganisms?
A. mycoplasmas
B. chlamydia
C. actinomycetes
D. rickettsiae

188. What is the name of single-celled, immobile, polymorphic, gram-negative organisms, located between bacteria and viruses?
A. rickettsiae
B. mycoplasmas
C. chlamydia
D. actinomycetes

189. What are the names of organisms that are motile microorganisms and have many small folds in a thin and spiral shape?
A. spirochetes
B. mycoplasmas
C. chlamydia
D. actinomycetes

190. Oxidoreductases are:
A. carrier enzymes
B. hydrogen and oxygen-carrying, respiratory, digestive enzyme
C. accelerates the hydrolysis reaction.
D. enzymes that bind or separate various binary compounds without the presence of water

191. Transferases are:
A. carrier enzymes
B. accelerates the hydrolysis reaction.
C. enzymes that bind or dissociate various compounds in the presence of water
D. hydrogen and oxygen-carrying, respiratory, digestive enzyme

192 Hydrolases are:
A. enzymes that bind or separate various binary compounds without the presence of water **.**
B. hydrogen and oxygen-carrying, respiratory, digestive enzyme
C. accelerates the hydrolysis reaction
D. carrier enzymes

193. Liases are:
A. accelerates the hydrolysis reaction
B. enzymes that bind or separate various binary compounds without the presence of water
C. hydrogen and oxygen permeable, respiratory, digestive enzyme
D. carrier enzymes

194. Isomerases are:
A. enzymes that convert organic compounds into their isomers
B. enzymes that bind or separate various binary compounds without the presence of water
C. accelerates the hydrolysis reaction
D. hydrogen and oxygen-carrying, respiratory, digestive enzyme

195. The cultural characteristics of bacteria are:
A. growth in nutrient media
B. attitude to paint
C. disease-causing feature
D. protein production

196. What is included in the peripheral immune system?
A. thymus, spleen, liver
B. blood, lymph nodes, spleen
C. lungs, stomach, liver
D. gastric juice, red marrow

197. How is normal whey obtained?
A. taken from a healthy animal
B. is taken from a sick animal
C. is taken from a vaccinated animal
D. Whey is obtained from the sent animal

198. When did the heuristic period in the development of microbiology begin?
A. In the III-IY centuries BC
B. In the YI-YII centuries
C. In the eighth and ninth centuries
D. In the X - XI centuries

199. When did the morphological period in the development of microbiology begin?
From the day A. Antony van Levenguk (1632-1723) discovered bacteria.
Since the day B. Geralimo Fracastro (1632-1723) discovered bacteria.
Since the day SMMTerexovsky (1632-1723) discovered bacteria.
Since the day DXIGelman (1632-1723) discovered bacteria.

200. When did the physiological period in the development of microbiology begin?
A. From the discoveries of Louis Pasteur (1822- 1895) in the second half of the nineteenth century.
B. From the discoveries of DSSamoylovich (1822-1895) in the second half of the XIX century.
C. From the discoveries of MMTerekhovsky (1822- 1895) in the second half of the XIX century.
D. From the discoveries of Gelman (1822- 1895) in the second half of the nineteenth century.

201. Staphylococci in horses, pigs and sometimes cattle -
A. leads to the development of botryomycosis
B. leads to the development of mucormycosis
C. leads to the development of candidiasis
D. leads to the development of aspergillosis

202. Pathogenicity of staphylococci?

A. The formation of all the toxins and enzymes shown

B. histotoxin and hematoxin

C. enterotoxin, leukosidin

D. coagulase, fibrinolysin

203. Pathogenicity of pathogenic (hemolytic) staphylococci -

A. manifests itself in poisoning processes

B. manifests itself in inflammatory processes

C. is manifested in purulent processes

D. manifests itself in regeneration processes

204. Sapphytes of streptococci are correctly indicated in which clause?

A. Str.agalactiae, Str.equi

B. Str. lactis, Str. crimoris, Str. salivaris

C. Str. pneumoniae Str.pyogenes

D. Str. salivaris, Str.pyogenes

205. streptococci pathogenic species which point, right?

A. Str.agalactiae, Str.equi, Str. pneumoniae Str.pyogenes

B. Str. Salivaris, Str.pyogenes Str. Lactis

C. Str. pneumoniae, Str. crimoris, Str. Salivaris

D. Str.equi, Str. crimoris, Str. salivaris

206. How many groups of streptococci are there for a specific polysaccharide antigen detected in the precipitation reaction?

A. There are 13 groups

B. There are 15 groups

C. There are 17 groups

D. There are 11 groups

207. Pathogenic staphylococci and streptococci for the first time -

A. In 1880, L. Pasteur separated

B. In 1880 Lister separated

C. In 1880, R. Cox separated

D.1880 separated by P. Erlix

208. Pathogenic staphylococci and streptococci -

A. In 1884, Pasteur studied and expressed it.

B. In 1884, Rosenbach studied and expressed it.

C. In 1884, Lister studied and expressed it.

D. In 1884, Mixin studied and articulated it.

209. Which type of staphylococci is extremely pathogenic?

A. Staph. Epidermidis

B. Staph. Aureus

C. Staph. Saprophyticus

D. The causative agent of mastitis

210. What is the nutrient medium used to distinguish between pathogenic and non-pathogenic staphylococci?

A. GPA added to crystalline violet

B. GPB with cryatallviolet added

C. if the glucose is bloody

D. GPJ, GPA, GPB

211. What is the special method of staining the drug in the detection of the causative agent of tuberculosis?

A. Gram

B. Sil-Nilsen

C. Kozlovskiy
D. Mixin

212. Which dye solution is used in the Sil Nielsen method?
A. carbolic tuberculosis fuchsia, leffler methylene blue
B. gensianviolet, sil fuksini
C. malachite blue, gensianviolet
D. saffron, methyl blue

213. What is the duration of biological testing for tuberculosis?
A. 3 months
B. 10 kun
C. 1 oy
D. 14 kun

214. Which dye solution is used in the Sil Nielsen method?
A. carbolic tuberculosis fuchsia, leffler methylene blue
B. gensianviolet, sil fuksini
C. malachite blue, gensianviolet
D. saffron, methyl blue

215. How many minutes is tuberculosis tuberculosis dyed?
A. 2
B. 3
C. 4
D. 5

216. Processing of patmaterial in tuberculous erysipelas - the difference between Gon and Alikayev methods?
In the A. gon method, a suspension of patmaterial is prepared in a 10-12% solution of H_2SO_4 and centrifuged. In the method of alikayev patmaterial is crushed in 0.5 cm^3 size in 10-8-6% H_2SO_4 solution for 10-20 minutes
Exposure of H_2SO_4 solution to patm material by B. gon method 30 minutes, Alikayev method 10 minutes
C. A solution of $H_2SO_{4\ of}$ different percentages is used
D. varies with the amount of patmaterial obtained for the suspension

217. Why is the tubercle bacillus not stained in the usual way?
A. resistant to acid, alcohol, alkali, the shell contains steorin acids, waxy substances
B. resistant to alcohol , dense cytoplasm, nucleus formed, granular
C. acid -resistant, shell thick, cytoplasm dense
D. alkali -resistant, cytoplasm and nucleus altered, granular

218. How many types of tuberculosis pathogens are there?
A. 4
B. 5
C. 3
D. 6

219. In what nutrient media does the tuberculosis pathogen grow?
A. egg-starch, Petranyani, Levenstein Iyensen, Gelberg, glycerin GPB, GPA
B. egg-starch, Lyuboshenko, Ulengut, Kitt-Tarossi
C. blood glucose agar, glucose whey agar, GPB, GPA, Endo
D. whey agar, broth, Levin, Ploskirev, Kessler

220. What is the duration of bacteriological examination in tuberculosis?
A. 1oy
B. 3 months

C. 2 oy
D. 14 kun

221. What is the dried live culture of the M. Bovis vaccine strain ?
A. BSG
B. PPD
C. OA
D. Alttuberculin

222. How many ml are given to cattle in the diagnosis of allergy
A. 2
B. 10
C. 3
D. 4

223. Which reaction method of serological diagnosis gave reliable results .
A. AR
B. PR
C. KBR
D. DPR

224. How long brucellae are stored in the soil?
A. 5 months to 2 years
B. 100 left
C. up to 10 years
D. up to 100 yiga

225. There are several types of brussels sprouts
A. 6
B. 5
C. 4
D. 3

226. When is the blood taken from an aborted animal for testing for brucellosis?
A. a week later
B. on this day
C. two days later
D. after a month

227. Brucella migration?
A. pathogenesis
B. air transmission
C. is also found in non-host animals
D. pathogenicity

228. Immunity in brucellosis?
A. congenital
B. Nosteril
C. Acquired
D. Passive

229. AR titer in brucellosis in cattle?
A. 1: 50+
B. 1: 100+
Q. 1: 50 ++
D. 1 **:** 100 ++

230. What type of brussels sprouts are found in sheep and goats
A. Br. Melitensis
B. Br. abortion
C. Br. ovis
D. Br. neotomae

231. In what methods of smears made of patmaterial in the examination for brucellosis?
A. Gram, Kozlovskiy
B. Gram, Sil-Nielsen
C. Kozlovskiy, Romanovskiy Gimza
D. Gram, Mixin, Peshkov}

232. In brucellosis in what atmosphere are grown patmaterial crops from rams
A. in a normal atmosphere

B. all in an atmosphere with 10-15% CO_2
C. half 10-15% CO_2 in the atmosphere
D. under anaerobic conditions}

233. Serum ratios of cattle in brucellosis for AR
A. 1:25 to 1: 200
B. 1:50 to 1: 400
Q. 1:10 to 1:80 p.m.
D. 1: 2 to 1:64

234. Sheep serum ratios for AR in brucellosis
A. 1:25 to 1: 200
B. 1:10 to 1:80 p.m.
Q. 1:50 to 1: 400
D. 1: 2 to 1:64

235. Pig serum ratios in brucellosis for AR
A. 1:10 to 1:80 p.m.
B. 1:25 to 1: 200
Q. 1: 2 to 1:64
D. 1:50 to 1:64

236. In what nutrient media does E.coli grow?
A. Bismuth sulfite agar, Kitt-Tarossii
B. GPB, GPA, Endo
C. Seyssler agar, Ploskirev environment
D. Bloody Saline GPA, GPB}

237. What antigens of E.coli are distinguished.
A. O, H
B. O, K, H
C. K, O
D. K, H

238. When and by whom was E.coli isolated?
A. by Erlix in 1885
B. by Pasteur in 1885
C. by Lister in 1885
D. by Esherich in 1885

239. E.coli-
A. aerobic or microaerophilic
B. aerobic or obligate anaerobic
C. aerobic or facultative anaerobic
D. microaerophilic or facultative anaerobic

240. E.coli-
A. *E. coli* breaks down maltose, mannitol, lactose into acids and gases
B. *E. coli* does not break down maltose, mannitol, lactose into acids
C. *E. coli* breaks down maltose, mannitol, and lactose into gases
D. *E. coli* does not break down maltose, mannitol, lactose into acids and gases}

241. Who found the substance colicin - an antibiotic-like substance in E. coli culture.
A. A. Gracia in 1925
BLPaster in 1925
SIMechnikov in 1925
D. Lister in 1925}

242. Salmonella lactose and sucrose?
A. does not decompose
B. decomposes
C. decomposes to form acid
D. decomposes to form a gas

243. In Salmonella (except *C. gallinarum*) -
A. *O* - (somatic); *There is a K* - (shell) antigen
B. *K* - (shell); *There is an H* - (hivchinli) antigen
C. *H* - (xivchinli) antigen

D. *O* - (somatic); *There is an H* - (hivchinli) antigen

244. When is Saramas disease diagnosed?
A. If the pathogen is found on luminescent microscopy, pure culture is isolated , the biosynthesis result is positive
B. If the pathogen culture is separated from the patmaterial, the greases have characteristic morphological features
C. Even if no pathogen is found on luminescent microscopy, pure culture can be isolated from the material.
D. If the results of microscopic and serological examination are positive

245. What is the appearance of the causative *agent* of *Saramas* diseas e *E. rhusiopathiae in* an ointment prepared from damaged heart valves?
A. in the form of long threads
B. in the form of small chains consisting of rods
C. single, double, ball-shaped
D. in the form of separate rods

246. In which point the optimal conditions for the cultivation of Eryzipelothrix rhusiopathiae are correctly indicated?
A. anaerobic, grown at 35 ^{0}c for 48 hours
B. aerobic, grown at 41 ^{0}c for 18 hours
C. aerobic, microaerophilic, grown at 37 ^{0}c for 18-24 hours
D. anaerobic, grown at 37-38 ^{0}c for 16-18 hours

247. In which laboratory animals biosinov is put in Saramas disease?
A. white mouse, pigeon
B. rabbit, white mouse
C. guinea pig, pigeon
D. pigeon, rabbit

248. The causative agent of yellow fever in luminescent microscopy
A. produces a special radiation of intensity not less than three targets (+++) B. produces a special radiation of intensity not less than three targets (++++) C. intensity of not less than three targets (+++) produces special radiation
D. produces a special radiation of intensity not less than three targets (+)}

249. In what nutrient media does Pasteurella multocida grow well?
A. GPA, GPJ, Kitt-Tarossii
B. GPA, GPB, Saburo agar
C. serum GPA, GPB, bloody GPA
D. GPB, Saburo agar, Endo environment}

250. In pasteurellosis patmaterial is examined in what ways?
A. microscopy, bacteriology, biosinov
B. microscopy, bacteriology, serology
C. serological, biosinov, microscopy
D. biosinov, cultured in Gissa medium, serological

251. In pasteurellosis in which laboratory animals biosinov is put?
A. rabbit, white mouse, chicken, duck
B. rabbit, white mouse, rooster
C. guinea pig, white mouse, rat
D. squirrel, white mouse, duck

252. In the case of examination for pasteurellosis (P.multocida) in which case the result is positive?
A. gram-negative, capsule-forming, inactive, rod-shaped bacteria culture is isolated if virulence is confirmed in biosynthesis
B. culture of gram-positive, capsule-forming, motile, rod - shaped bacteria is isolated, virulence is confirmed in biosynthesis
C. gram-negative, capsule-forming, motile, coccygeal bacteria culture is isolated if virulence is confirmed in biosynthesis
D. culture of gram-negative, capsule-forming, motile, rod -shaped bacteria is isolated, virulence is confirmed in biosynthesis

253. Does Pasteurella form a capsule in multocida?
A. does not form
B. forms
C. does not always form
D.produces only in artificial nutrient media

254. How to check the pasteurellability of rabbits?
A. by instilling a solution of 0.5% diamond green in water from 2 drops in the nose for three days
B. by treating the skin with 0.5% diamond green for three days
C. bacteriological and serological examination of blood
D. by injecting 0.2 ml of a 0.5% solution of diamond green in water under the skin

255. Who was the first to separate Pasterella and when?
AIMechnikov separated in 1880
BLPaster separated in 1880.
SPErlixr separated in 1880.
DRKox separated in 1880

256. Who was the first to discover the pure quitura of Bac.anthracis ?
A. In 1876, first R. Cox, then L. Pasteur
B. Daven in 1850
C. In 1789 SS Andrievsky
D. Pollender in 1849.

257. What forms of anthrax occur depending on the location of pathological processes ?
A. cutaneous, hemorrhagic, tonsils
B. skin, intestines, lungs, and tonsils
C. angionosis, spleen, liver
D. lungs, kidneys, throat

58. Growth of anthrax in dense nutrient media?
A. smooth, rough colonies
B. white, smooth colonies
C. gray colonies
D. clear, colorless colonies

259. What is the method of hardening of ointments in anthrax?
A. special alcohol - perhydrol solution for 30 minutes
B. on the flame
C. in ethyl alcohol for 20 minutes
D. alcohol - 20 minutes on air

260. What is the difference between anthrax and soil bacilli?
A. movement and spore formation
B. hemolysis and spore formation
C. Sensitivity to penicillin and phage
D. spore and capsule formation

261. Which antibiotic is used for the test "Marjon" in the diagnosis of anthrax?
A. streptomycin
B. penicillin
C. tetracycline
D. Erythromycin

262. Anthrax spores:
Produces
Does not produce
It does not occur in shape
It does not form a capsule

263. How many components does Bac.anthracis exoto xin consist of?
A. 3
B. 4
C. 5
D. 2

264. For how many days are animals with biosinov observed ?
A. 5
B. 14
C. 20
D. 10

265. What pathogens are sent to the laboratory in anthrax?
A. blood, ear, spleen, throat lymph nodes, piece of connective tissue
B. feces, milk, runny nose, blood, ear, spleen
C. lymph nodes, piece of connective tissue, saliva, secretions
D. ear, spleen, nasal discharge, feces, urine

266. What is the method of laboratory examination of decomposed material in anthrax?
A. serological
B. microscopic
C. bacteriological
D. biosinov}

267. What is the molecular-genetic method of examination in rheumatic fever?
A. PZR
B. ELISA
C. PR
D. GATR

268. What is the basis for the final diagnosis of anthrax in laboratory tests?
A. bacteriology, pr, microscopy results
B. microscopy, the result of bacteriological examination
C. to the result of luminescent microscopy, PR, biosinov
D. coral ”test,“ phagotyping ”, microscopy results

269. Terms of inspection , microscopic inspection - the date of delivery of the material,
bacteriological examination - …. day, biological-…. days .
A. 5-12
B. 3-10
C. 6-14
D. 4-8

270. The concept of anaerobic microorganisms:
A. microorganisms that grow in an oxygen-free environment
B. microorganisms that thrive in an oxygenated environment
C. microorganisms that thrive in any environment

D. microorganisms that grow in an acidic environment

271. The causative agent of measles:
A. gr +, sporadic, motionless, coccygeal
B. polymorphic, gr-, spore, and capsular, motionless rod
C. gr-, capsule, mobile rod
D. polymorphic, gr +, sporadic, mobile rod. bacteria

272. Which animals are infected with measles?
A. Ot
B. pig
C. Cattle
D. Parranda

273. In what nutrient environments and conditions the black spot grows?
A. Kitt-Tarossi, glucose-blooded Seyssler agar, at 37-38 °C, under anaerobic conditions
B. In GPB, GPA, GPJ, at 40-42 °C, under aerobic conditions
In C. Endo, Levin, Ploskirev environments, at 37 °C, under anaerobic conditions
D. Gissa medium, in Gelberg, Lyuboshenko environments, at 37 °C, under anaerobic conditions

274. What are the methods of testing for rabies in the laboratory?
A. microscopy, bacteriology, biosinov
B. microscopy, serology, bacteriology
C. serological, microscopy, pathoanatomical
D. biological, pathoanatomical, clinical

275. Immunity in black?
A. congenital, nosteril
B. antitoxin, antimicrobial
C. congenital, antitoxic
D. acquired, absolute

276. At what age cattle are most often infected with black spot?
A. 3 months to 4 years of age
B. 3 months to 1 year of age
C. 3 months to 2 years of age
D. 3 months to 3 years of age

277. Seyssler agarida *Cl.chauvoei* -
A. The colonies grow as the edges are trimmed, like a glossy button or grape leaf, and a small hemolysis zone appears around the colony.
B. colonies grow as the edges are trimmed, like a glossy button or grape leaf, no hemolysis zone appears around the colony.
C. colonies grow between the edges like a glossy button, a small hemolysis zone appears around the colony.
D. colonies grow as grape leaves are trimmed at the edges, no hemolysis zone appears around the colony.

278. Cultural characteristics of the causative agent of black spot ?
A. strictly anaerobic
B. facultative anaerobic
C. Microaerophilic
D. grows in normal nutrient environments

279. At what age do animals become infected with rabies?
A. 6 months to 4 years of age
B. From 1 year
C. From birth
D. from age

280. What pathogens are sent to the laboratory in case of conjunctivitis?

A. wound secretion, tissue fragments, blood, liver, spleen
B. damaged muscle fragments, tissue exudate, parenchymal organs
C. damaged muscle, intestinal fragments, lymph nodes
D. parenchymatous organs, bone marrow, affected part of the intestine

281. What is the causative agent of coronary heart disease?
A. Cl. chauvoei
B. Cl. tetani
C. Cl. septicum
D. Cl. oedematiens

282. The causative agent of coronary heart disease:
A. spores oval, lemon-shaped
B. located in the center of the spores, in a spiral shape
C. spores are located near one end, in a noxious shape
D. has a round spore at one end, in the shape of a drumstick

283. What is the peculiarity of the culture of the causative agent of coccidiosis
A. The smell of burnt horn
B. the smell of sour oil
C. the smell of sour fish
D. spoiled egg smell

284. Name the types of solid anaerobic microbes?
A. black, solid, botulism pathogens
B. anthrax, blackleg, yellow fever pathogens
C. salmonella, pasterella, tetani, streptococcus
D. Escherichia coli, tuberculosis, yellow fever

285. In what cases in the diagnosis of solid disease is not carried out examination for the separation of cultures.
A. If a solid toxin is released in the material under test
B. If no solid toxin is released in the material under test
Q. If the culture is separated from the material being examined
D. If the culture is not separated from the material being examined}

286. In testicular disease, a test tube is a suspension implanted in Kitt-Tarossi medium.
A. Heat at 70 °C for one hour
B. heated at 80 °C for one hour
C. Heat at 60 °C for one hour
D. heated for one hour at 50 °C}

287. Who was the first to find the causative agent of cholera and when ?
A. In 1883 the Russian scientist ND Monastirsky
B. In 1882 the Russian scientist ND Monastirsky
C. In 1881 the Russian scientist ND Monastirsky
D. In 1880 the Russian scientist ND Monastirsky}

288. Who was the first to isolate the pure culture of the causative agent of cholera and when ?
A. In 1884 Sh. Kitazato separated
B. separated in 1887 by Sh. Kitazato
C. was separated in 1889 by Sh. Kitazato
D. in 1880 by Sh. Kitazato

289. The main symptoms of botulism?
A. paralysis of the swallowing, chewing muscles
B. blindness
C. diarrhea, vomiting
D. asphyxia

290. Who discovered the causative agent of botulism, and when?
A. 1880 L.Paster
B. 1882 R.Kox
C. 1896 Ermengem
D. 1936 I.Pavlov

291. How does Cl.teta breathe?
A. Anaerobic and aerobic
B. Arerob
C. Anaerobic
D. Obligate aerobics

292. Thin, twisted ends, polymorphic, rod 2-10 microns long, 0.8-1 microns wide, in the form of a thread in the grease made of serous layerC. Gram-negative, does not form capsules, spores, located at the tips or center, motile.
A. Cl.histolyticum
B. Cl. oedematiens
C. Cl. perfringens
D. Cl. septicum

293. Patmaterial sent to the laboratory in botulism?
A. Samples from suspected food, stomach mass of a dead animal, liver fragment, and blood of sick animals
B. samples from parenchymatous organs, bone marrow
C. bone marrow, small intestine segment, spleen
D. excretions and secretions, bone marrow, parenchymal organs

294. Separation of botulism toxin:
A. Prepare 2 suspensions, leave at room temperature for 2 hours, filter, heat in 2 parts boiling water bath for 20-30 minuteC. Biosinov is placed with filtrates
B. The suspension is prepared, filtered, heated in a water bath for 30 minutes, biosinov is added
C. patmaterial suspension is extracted, filtered, and biosynthesized
D. The suspension is prepared, filtered, cultured in a nutrient medium, and biosinov is added.}

295. In what ways do the types of botulism pathogens differ from each other?
A. immunological
B. bacteriological
C. fermentative
D. morphological

296. Cl. botulinum:
A. spores are round, cell-shaped drumsticks
B. spores oval, cell tennis racket-shaped
C. spores are oval, cell-shaped
D. spores oval, round, cell pear, lemon-shaped

297. The main symptoms of botulism?
A. Asphyxia
B. Not being able to see
C. Diarrhea, vomiting
D. Paralysis of swallowing, chewing muscles

298. What is the causative agent of botulism?
A. Cl. oedematiens
B. Cl. Chauvoei
C. Cl. Septicum
D. Cl.botulinum

299 bradzotom pathogens which point, correct?
A. Cl. septicum,
Cl. oedematiens
B. Cl. tetani, Cl. chauvoei
C. Cl. perfringens, Cl. histolyticum
D. Cl.sordelii, Cl. sporogenes

300. In what nutrient media do Bradzot pathogens grow?
A. Kitt-Tarossi, Seyssler agar
B. GPB, GPA, GPJ
C. GPB, GPA, Endo
D.Gelberg, GPJ, Levin}

301. What type of biosynthesis in Bradzot is put in a laboratory animal?
A. rabbit
B. white mouse
C. guinea pig
D.chicken

302. What pathogens are sent to the laboratory in case of gas gangrene?
A. damaged muscle fragments, tissue exudate, parenchymatous organs
B. sputum, excretions and secretions, bone marrow, intestinal mucosa
C. lymph nodes, intestinal tract, parenchymal organs
D. tissue exudate, breast and abdominal fluid, small intestine, bone marrow

303. What is the difference of Cl.perfringens from other pathogens in gas gangrene?
A. forms a capsule, motionless
B. location of spores, small in size
C. with shape and size
D. painting, size, mobility

304. Under what conditions do gas gangrene pathogens grow?
A. 18 hours at 37 ^{0}C in an atmosphere containing 10-15% CO_2
B. 24-48 hours at 37-38 ^{0}C under aerobic conditions
C. 24-48 hours at 37-38 ^{0}C under anaerobic conditions
D. 28 hours at 37 ^{0}C in an atmosphere containing 10-15% CO_2

305. Which of the following is inactive?
A. Cl. oedematiens
B. Cl. septicum
C. Cl. perfringens
D. Cl.histolyticum

306.Which of the stimuli forms a capsule?
Cl. perfringens
Cl. septicum
Cl. oedematiens
Cl.histolyticum

307. What kind of bacteria are clostridia?
the diameter of the spores is larger than that of the bacterium
spores are located at the tip of the bacterium
spores are located in the center of the bacterium
The diameter of the spores is small

308. What is the difference between clostridia and bacilli?
with the size of the spores
with the formation of spores
by forming a capsule
with bacterial cell size

309. The causative agent of necrobacteriosis -
A. In 1882, F. Lyoffler found it and described it in full
B. In 1882, R. Cox found it and described it in full
C. In 1882, B. Bang found it and described it in full
D. In 1882, L. Pasteur found it and described it in full}

310. Necrobacteriosis bacteria -
A. grows strongly aerobic, 36-38 ^{0}C, ambient pH 7.4-7.6
B. strongly anaerobic, grows at 36-38 ^{0}C, ambient pH 7.4-7.6
C. facultative anaerobic, grows at 36–38 ^{0}C, ambient pH 7.4–7.6
D. facultative aerobic, grows at 36-38 ^{0}C, ambient pH 7.4-7.6}

311. Patmaterial sent from a dead animal to the laboratory in necrobacteriosis
A. carcasses of small animals , fragments of parenchymal organs from large animals
B. carcasses of small animals , blood from large animals, damaged mucous membranes
C. carcasses of small animals , tissues damaged by large animals
D. Fragments of parenchymatous organs with carcasses of small animals , tissues damaged by large animals and foci of necrosis

312. Patmaterial from a sick animal to the laboratory in necrobacteriosis
A. The affected areas are removed from the boundary of healthy and necrotic tissue
B. Samples and blood are taken from the affected area
C. Sample, milk and blood are taken from the affected area
D. extracts, milk and blood samples are taken}

313. Which laboratory animal is most susceptible to necrobacteriosis?
A. pigeons and rats
B. rabbits and white mice
C. guinea pig and owl
D. rat and guinea pig

314. If *F. Necrophorum* is present in the test material or culture -
A. necrosis develops after 3-4 days at the site of injection into the rabbit's ear
B. necrosis develops after 5-6 days at the site of injection into the rabbit's ear
C. necrosis develops after 7-8 days at the site of injection into the rabbit's ear
D. necrosis develops after 8-9 days at the site of injection into the rabbit's ear

315. Who first discovered the causative agent of campylobacteriosis?
A. F. Lyoffler and Shtokman in 1913-1918
B. McFedian and Stockman in 1913-1918
C. McFedien and F. Lyoffler in 1913-1918
D. L. Pasteur and Stockman in 1913-1918

316. The causative agent of campylobacteriosis-
AC fetus
B. Cl. septicum
C. Cl. oedematiens
DF necrophorum

317. The causative agent of campylobacteriosis - C. fetus -
A. mikroaerofil 37.5 ^{0}C, 10% CO_2 conditions added to the blood or serum intensive, semi-liquid food environments grow
B. grows in semi-liquid, dense nutrient media with the addition of blood or serum under conditions of aerobic, 37.5 ^{0}C, 10% CO_2
C. grows in semi-obligate anaerobic, dense nutrient media with the addition of blood or serum under conditions of anaerobic, 37.5 ^{0}C, 10% CO_2
D. grows in semi-liquid, dense nutrient media with the addition of blood or serum under conditions of facultative anaerobic, 37.5 ^{0}C, 10% CO_2 }

318. How are endotrix spores located?
A. in the form of a chain along its length inside the hair
B. in the form of a chain along its length around the hair
C. in the form of a chain along its length inside and on the hair
D. in the form of a chain along its length in a child with broken hair}

319. How are ectotrix-spores located?
A. in the form of a chain along its length inside the hair
B. in the form of a chain around its length along the hair
C. in the form of a chain along its length inside and on the hair
D. in the form of a chain along its length in a child with broken hair}

320. How are neoendotrix-spores located?
A. in the form of a chain along its length in a broken child of hair
B. in the form of a chain along its length inside the hair
C. in the form of a chain along its length around the hair
D. in the form of a chain inside and outside the hair fiber along the length of the hair
in the form of a coating

321. Spores of the pathogen Trichophytia-
A. are placed in straight rows only along the length of the hair.
B. are located irregularly only along the length of the hair
C. are located in balls only along the length of the hair
D. are arranged in wavy rows only along the length of the hair

322. Where are trichophytons found?
A. It is found in preparations made from patmaterial treated with 10% alkali, on damaged hair
B. is found in greases prepared from a piece of leather treated with 10% alkali
C. is found in preparations prepared from extracts treated with 10% alkali
D. It is found in preparations prepared from a blood sample treated with 10% alkali

323. What mycoses are included in dermatomycoses ?

A. accompanied by damage to the skin and its derivatives
B. accompanied by damage to the lymph nodes and respiratory tract
C. accompanied by damage to the circulatory and nervous systems
D. accompanied by damage to the mucous membranes and digestive tract

324. Where do dermatomycosis pathogens parasitize?
A. In tissues that have keratin
B. in connective tissue
C. in nerve cells
D. in glycogen-rich tissues

325. What is the correct explanation for mycoses:
A. diseases that are accompanied only by skin damage
B. Diseases caused by mold fungi
C. diseases caused by mycoplasmas
D. a group of diseases caused by pathogenic microscopic fungi

326.The causative agent of trichophytia?
AB mezentericum
B. Tr. verrucosum
C. Cl. Oedymatiens
DM Lanosum1

327. Clinical signs of trichophytia?
A. cough, inflammation of the hair follicles
B. inflammation of the hair follicles, hair breakage
C. violation of the integrity of the epidermis, diarrhea
D. hair breakage, cough, diarrhea

328. Who discovered one of the pathogens of Trichophytia and when?
AAX Sarkisov in 1845
BM Malmsten in 1845
SSV Petrovich in 1845
DLI Nikifirov in 1845

329. Spores of microsporidial pathogens-
A. are arranged in wavy rows only along the length of the hair
B. are placed in straight rows only along the length of the hair.
C. are located in balls only along the length of the hair
D. is arranged in an irregular, mosaic shape only along the length of the hair

330. In trichophytia biosinov is put in what way, in what species of animal?
A. The skin of a guinea pig or rabbit is scratched and patmaterial is applied to it
B. by sending the skin of a guinea pig or rabbit under the skin
C. patmaterial is applied to the conjunctiva of the eye of a guinea pig or rabbit
D. by sending a patmaterial suspension into the vein of a guinea pig or rabbit

331. Patmaterial obtained in trichophytia and microsporia?
A. A scraping taken from the boundary of damaged and healthy tissue
B. damaged tissue, with wool fibers
C. blood and secretions
D. piece of damaged skin, separation

332. What is the difference between the pathogens of trichoftia and microsporia?
A. in relation to oxygen
B. by shape, size of spores

C. luminescent analysis, on the location of spores
D. growth in a nutrient medium, with colony color

333. Who first proved that leptospira are the cause of disease in pigs and sheep ?
ASYa.Lyuboshenko and LSNovikov (1946)
BSYa.Lyuboshenko (1938-1939 y)
SVITerskix (1938-1939)
DVITerskix (1940)

334. Leptospira - in which paragraph the explanation is given correctly?
A. lepto-twist, spira-spiral
B. lepto-small, spira-spiral
C. lepto-hidden, spira-spiral
D. lepto-thin, spira-spiral

135. Who first proved that leptospira are the cause of disease in horses?
ASYa.Lyuboshenko and LSNovikov (1946)
BVITerskix (1940)
SSYa.Lyuboshenko (1938-1939)
DVITerskix (1938-1939)

336. Who first proved that leptospira are the cause of disease in cattle?
AVITerskix (1938-1939)
BSYa.Lyuboshenko (1938-1939 y)
SSYa.Lyuboshenko and LSNovikov (1946)
DVITerskix (1940)}

337. In silver-black foxes, dogs, goats by whom was it first proved that the cause of the disease was leptospira?
ASYa.Lyuboshenko (1938-1939)
BVITerskix (1938-1939)
SSYa.Lyuboshenko and LSNovikov (1946)
DVITerskix (1940)

338. Passive immunity in leptospirosis lasts ..... days
A. 7
B. 18
C. 15
D. 8

339. What methods are tested for leptospirosis in the laboratory?
A AR
B. KBR
C. PR
D. Biosinov

340. Short-term fever hematuria, sometimes (10%) jaundice occurs after a kun .day incubation period.
A. 8-14
B. 4-10
C. 7-15
D. 3-16

341. Spirochetes - *Spirochaetales* family, diameter ..... microns, length ..... microns, screw-like, twisted microorganismC.
A. 0.12-10.0; 5-500
B. 0.10-15.0; 8-300
C. 0.8-10.0; 15-400
D. 0.5-12.0; 10-200

342. Name the microbes that cause pus?
A. Escherichia coli, salmonella
B. brucella, yersinians
C. mycobacteria, actinomycetes
D. staphylococci, streptococci

343. Pathogenesis of infectious mastitis -

A. All the answers are correct

B. is characterized by the effect of streptococcal toxins and enzymes on the udder tissue and the whole organism **.**

C. streptococci multiply in the mucous membranes and cause catarrhal-purulent inflammation. D. penetrates deep into the tissue and causes purulent processes

344. What is the causative agent of infectious mastitis?

A. Str.agalactiae

B. Str.viridans

C. Str.salivaris

D. Str.lactis

345. What method is used to distinguish Str.agalactiae from other streptococci?

A. CAMP

B. microscopy

C. bacteriology

D. serology

346. In infectious mastitis biosinov is put in which species of animal?

A. white mouse, guinea pig

B. white mouse, pigeon

C. guinea pig, chicken

D. rabbit, rat

347. If the result of biosynthesis in infectious mastitis is positive -?

A. Mice become ill and die in 7 to 8 days

B. mice become ill and die in 3-4 days

C. mice become ill and die in 5 to 6 days

D. Mice become ill and die in 1 to 2 days

348. What is the causative agent of mute ?

A. Str.pyogenes

B. Str. equi

C. Str.viridans

D. Str. salivaris

349. Str. equi-

A. Causes disease in horses and ungulates from six months to two years of age.

B. causes disease in horses older than two years and in ungulates.

C. Causes disease in horses and ungulates less than six months of age.

D. causes disease in horses from three months to four years}

350. What is the causative agent of pneumococcal septicemia?

A. Str. pneumoniae

B. Everything is correct

C. Dipl. septicum

D. Dipl. lanceolatus

351. In pneumococcal septicemia

A. their extracts, blood is taken from sick animals

B. Sick animals are cut from the wound, blood is taken

C. their extracts from sick animals, scraped

D. Dung and blood are taken from sick animals }

352. What are pathogenic pneumococci soluble?

A. in bile fluid

B. in saline

C. heparin

D. kaolinda

353. In which point the morphology of the causative agent of pneumococcal septicemia is given correctly?

A. double cocci, capsular, gram-positive, immobile, do not form spores.
B. forms gram-negative, spores and capsules, inactive cocci.
C. Gram-negative, does not form spores and capsules, motile cocci.
D. Grammusbat, forms spores, does not form capsules, inactive cocci.

354. Dumb driver - *Str. equi*

A. causes inflammation of the upper respiratory tract, submandibular lymph nodes
B. clinical abscess, manifested by nasal discharge.
C. causes catarrhal purulent inflammation of the larynx, mucous membranes, submandibular lymph nodes
D. causes catarrhal purulent inflammation of the upper respiratory tract, larynx, mucous membranes, submandibular lymph nodes

355. In which point the pathological material in mute disease is given correctly.

A. Pus is taken from the abscess (aseptically from the unexploded abscess), samples are taken from the parenchymal organs.
B. purulent nasal discharge, tissue is removed from the wound site.
C. pus from an abscess (aseptically from an unexploded abscess), purulent nasal discharge.
D. Samples are taken from parenchymatous organs, blood, pus from the abscess

356. In what nutrient media the mute pathogen grows?

A. in serum or fibrin-deficient blood, added medium, Kitt-Tarossi medium
B. whey added medium, Ehdo medium
C. Kitt - Tarossi environment, Ploskirev environment
In the D. Levin environment, in the Kitt-Tarossi environment

357. In which species of animal is biosinov put in dumb disease?

A. white mouse, kitten
B. guinea pig, pigeon
C. white mouse, chick
D. rabbit, rat

358. What material is used to isolate the mute pathogen?

A. scraped, skin sample
B. samples from parenchymatous organs
C. pus from abscess, purulent nasal discharge
D. intestinal tract, spleen, bone marrow

359. The causative agent of microsporia?

ABMezentericum
BM lanosum
C. Cl. oedematiens
D. Tr. verrucosum

360. What disease is Favus -?

A. an infectious disease characterized by damage to the skin, feathers, hair, and nails
B. an infectious disease characterized by fractures of the skin, feathers, hair, and nails
C. an infectious disease characterized by discoloration of the skin, feathers, hair, and nails

D. Infectious disease characterized by loss of skin, feathers, hair and nails}

361. Favusda -

A. Internal organs may also be partially damaged
B. Internal organs may not be damaged
Q. Internal organs can also be damaged
D. Internal organs can be damaged only in birds}

362. The causative agent of favus in birds -

A. *Ach.gallinae*
B. *Ach.schoenleini*
C. *Tr.faviforme*
D. *Tr. gypseum*

363. For the first time the etiological significance of mycoplasmas in animal pathology

A. in cattle peripneumonia was identified in 1893 by Nokar and Rular
B. in cattle peripneumonia in 1893 MGTartakovsky and Ye.P. The Dzhunkovskys have identified
C. was diagnosed in cattle peripneumonia in 1893 by Edward and Freundt
D. in cattle peripneumonia was identified in 1893 by VDTimakov and GY Kagan

364. Who studied the causative agent of anthrax?

ASSAndrevskiy
BRKox
C. Salmon
D. Basov

365. Which of the following is the causative agent of anthrax?

ABanthracis
BB megaterium
SBsubtilis
DB mycoides

366. What biopreparations are used in anthrax?

A. immunoglobulin, antigen, bacteriophage
B. Strain 55, STI, VGNKI
C. vaccine, immune serum, diagnosticum
D. immune serum, antigen, bacteriophage

367. What form of anthrax occurs in pigs?

A. septic
B. tonsillar
C. carbuncleosis
D. lungs

368. Dissection of the body when anthrax is suspected?

A. is done in part
B. allowed
C. is strictly prohibited
D. depends on the course of the disease

369. In what form does the anthrax pathogen grow in GPJ?

A. inverted spruce
B. in the form of a spruce
C. in the form of a cloud
D. in the form of a piece of cotton

370. Vaccine against anthrax?

A. Strain 82
B. Strain 19
C. Shtamm 55
D. Antirabic

371. In which clause the morphology of E.coli is given correctly?

A. gram-negative, rod with twisted ends, located one by one, some strains form a capsule, there are mobile and inactive species, do not form spores
B. gram-negative, rod with twisted ends, located one by one, some strains form capsules, there are mobile and inactive species, do not form spores
C. gram-negative, rod with twisted ends, located one by one, some strains form capsules, immobile, form spores
D. gram-positive, rod with twisted ends, located one by one, has mobile and inactive species, does not form spores, capsules}

372. Differential diagnostic nutrient media used for the cultivation of enterobacteria?
A. Levin, Endo
B. Ploskiryov, GPA
C. Gissa, GPB
D. Bismuth sulfite agar, Endo

373 calves at the age of colibacteriosis ill?
A. 10-14 days
B. 1 month old
C. 6-month-old
D. people of all ages

374. In what forms is colibacillosis manifested?
A. septic, enterotoxic, enteritis
B. intoxication, inflammation of the lungs, edema
C. skin, muscle damage, poisoning
D. septicemia, inflammation of the lungs

375. Patmaterial obtained from a sick animal in colibacillosis?
A. feces from the rectum
B. urine, blood, discharge
C. milk, runny nose
D. scraped from the intestine

376. Who discovered Salmonella and when?
A. 1885 Salmon
B. 1881 L.Paster
C. 1880 R.Kox
D. 1842 Basov

377. In which point are the materials obtained from a sick animal in salmonellosis given correctly?
A. feces, placenta, secretions, aborted fetus or its stomach, parenchymatous organs
B. feces, urine, blood, milk samples, parenchymal organs
C. blood, milk, skin, intestinal mucosa, parenchymal organs
D. all excretions and secretions, parenchymatous organs

378. Do Salmonella form spores and capsules?
A. both are correct
B. ha
C. no
D. sometimes

379. Which type of Salmonella is inactive?
AS pullorum (gallinarum)
BS typhimurium
SS enteritidis
DS choleraesuis

380. How is the difference between Salmonella and Escherichia coli determined?

A. on pathogenic properties
B. grown in normal nutrient environments
C. Endo, Ploskiryov, grown on bismuth-sulfite agar
D. a disease transmitted by a disorder of blood formation

381What disease do Salmonella cause in birds?

A. pullorosis
B. brucellosis
C. colibacillosis
D. pasteurellosis

382. Epizootic and enzootic manifestations of bronchiomycosis are observed in summer, when the water temperature is .....

A. + 22 + 25 ^{0}C
B. + 20 + 22 ^{0}C
C. + 10 + 20 ^{0}C
D. + 15 + 18 ^{0}C

383. The disease is very severe. The epizootic manifestation of the disease is more often observed in summer, depending on the temperature of the external environment …… .. lasts for days, that is, an acute flow is manifested.

A. 5-12
B. -5
C. -10
D. 5-8

384. Bronxiomikoz disease carp, carp and their hybrids, silver tovonbaliq, could peshonado'ng white peshonado'ng, the death of the young fish .. ..% if the disease is an acute ingestion, all the sick fish, dead .

A. -50
B. 30-40
C. 20-30
D. 50-60

385. What percentage of the fish in the experiment died in pseudomonas disease, the biosynthesis is considered positive.

A. 70
B. 30
C. 50
D. 60

386. Bronchiomycosis - a disease in which the tissues of the parenchymatous organs are filled with blood , what is the state of the layer of fat and glycogen .

A. tvorogsimon
B. thick
C. thin
D. extinct

387. Nephromycosis of fish was first discovered in the beginning of the twentieth century in 5-6-year-old carp species.

A. XI
B. XIX
C. XX
D. XV

388. Ichthyosporidiosis (ichthyponosis or "drunkenness" disease of fish) first appeared in the late twentieth century

A. XX
B. XIX
S.XI

D. XV

389. Ichthysporidiosis (ichthyponosis or "drunkenness" disease of fish) in which country was the first recurrence of trout species grown in artificial reservoirs?
A. Russia
B. in Germany
C. France
D. Italy

390. L.monocytogenes is the causative agent of which disease?
A. listeriosis
B. tuberculosis
C. brucellosis
D. temiratki

391. In what diseases allergy is checked?
A. tuberculosis, brucellosis
B. Colibacillosis
C. Anthrax
D. Black

392. How many diplococci are in the grease?
A. 2 and dan
B. 1 and dan
C. 4 and dan
D. 5 of them

393. What is the form of the causative agent of campylobacteriosis?
A. Rod-shaped
B. Comma
C. Kokksimon
D. Spiral

394. What is the causative agent of listeriosis?
AL gebdomadis
BL bataviye
SLmonocytogenes
DL influenza

395. What is mycotoxicosis?
A. Poisoning by fungal venom
B. bacterial poisoning
C. Poisoning by mycoplasma venom
D. Poisoning by plant venom

396. What is a test microbe?
A. decomposer
B. synthesizer
C. tester
D. oxidizing

397. Specify test microbes?
A. Escherichia coli, streptococcus, staphylococcus, hay t **a** collar
B. pathogens of anthrax, measles, mumps, rubella
Pathogens of C. tuberculosis, brucellosis, pasteurellosis, aspergillosis
D. causative agents of erysipelas, salmonellosis, pasteurellosis, mucormycosis

398. What color are the larvae affected by European rot?
A. yellow
B. is dark
C. brown
D. malla

399. Aspergillosis pathogens die in 30 minutes when heated to several degrees
A. 60
B. 30
C. 80
D. 100

400. The diameter of the fetal body of the fungus Aspergil together with conidia reaches… .. µm.
A. 80
B.60
C. 90
D. 100

401. What institution is the Center for Diagnosis of Animal Diseases and Food Safety?
A. Institution for the production of biopreparations used in veterinary medicine
B. private veterinary service institution
C. private manufacturing facility
D. State Veterinary Service Institution

402. In which point the system of veterinary laboratory on the scale of work is specified.
A. district, zonal, regional and republican veterinary laboratories
B. Republican, zonal, regional and district veterinary laboratories
C. zonal, district, republican, regional veterinary laboratories
D. regional, republican, zonal and district veterinary laboratories

403. How many different lenses are there?
A. 2
B. 1
C. 4
D. 6

404. What is included in the optical part of a microscope?
A. mirror, condenser, lens, eyepiece
B. lens, mirror, table top, revolver
C. condenser, macro and microvint, tube
D. eyepiece, tube holder, tube, lens

405. What are the main forms of bacteria?
A. trapezoidal, rhombic, amoebic
B. spherical, rod-shaped, twisted
C. cubic, spiral, spherical
D. rod-shaped, star-shaped, polygonal

406. How to determine the overall magnification of the microscope?
A. by multiplying objective and ocular indicators
B. calculate the distance between the lens, the eyepiece and the lens
C. on the lens indicator
D. is the distance of the eyepiece to the revolver

407. Dyed drugs can be seen under a microscope?
A. on a dry lens
B. in the immersion lens
C. in immersion and dry lens
D. on x8, x20, x40 lenses

408. What is the name of the fourth stage of preparation of bacterial preparations?
A. painting
B. Fixation
C. Drying
D. preparation of grease

409. The tinctorial feature is:
A. The reaction of bacteria to dye
B. disease-causing feature
C. toxin production feature
D. Distribution

410. How many different lenses are there?
A. 2
B. 1
C. 4
D. 6

411. How many different methods of fixation are there?
A. 2
B. 1
C. 4
D. 6

412. What are the non-permanent parts of a bacterial cell?
A. hivchin, spore, capsule
B. cytoplasm, spore, nucleus
C. nucleus, shell, capsule
D. shell, hivchin, core

413. What are the permanent parts of a microbial cell?
A. cytoplasm, xivchin, spore
B. spores, cytoplasm, xivchin
C. capsule, spore, nucleus
D. shell, cytoplasm, nucleus

414. In which item the process of preparation of bacterial preparations is correctly described?
A. grease preparation, drying, fixation, painting
B. drying, painting, fixing, greasing
C. painting, fixing, greasing, drying
D. fixation, painting, drying, preparation of grease

415. How many dye solutions are used in a simple dyeing method?
A. 5
B. 2
C. 3
D. 1

416. What is the condition of bacteriological dyes?
A. liquid, semi-liquid, gel
B. dry, powdery, crystalline
C. thick, alcoholic solution
D. aqueous, alcoholic solution

417. What solutions are prepared from bacteriological dyes?
A. saturated alcohol, alcohol - aqueous, aqueous solutions.
B. working solutions, simple solutions
C. complex solutions of various percentages
D. solutions consisting of a mixture of dyes

418. Which word means "infertility" ?
A. Sterilization
B. Disinfection
C. Deratization
D. Disinsection

419. Specify differential nutrient media ?.
A. Gissa
B. GPB
C. GPA
D. GPJ

420. In which clause are normal nutrient media correctly indicated?
A. GPJ, Levin, if bloody
B. GPB, endo, Vis'mut sul'fit agar
C. GPA, GPB, GPJ, if semi-liquid
D. Semi-liquid agar, Ploskirev, Gissa medium

421. What nutrient media differ in consistency?

A. liquid, semi-liquid, dense, dry
B. liquid and dense
C. powdery, special, natural
D. dense, simple, complex, dry

422. What percentage if GPA content?
A. 2-3%
B. 4-5%
C. 1%
D. 0.5%

423 - What if?
A. Nitrogen-free organic matter derived from seaweed
B. Specially prepared artificial drug
C. A mixture of plant powder and animal products
D. Animal protein, milk powder mixture

424. What are the requirements for sterilization?
A. Complete germination of the microbe, the physical and chemical properties of the material must be preserved
B. Stopping the microbe from growing for a certain period of time should not change the color of the material
C. The pH should not change during the sterilization process, only microbes in the vegetative form should be destroyed
D. It must ensure that the nutrient medium is stored intact for a certain period of time

425. Is it possible to sterilize flammable substances, liquids, food media, rubber items in dry heat?
A. not possible
B. possible
C. no difference
D. in very little time

426. Product by pasteurization?
A. Heat at 90 ^{0}C for 20 min
B. 45 minutes at 65 ^{0}C
C. 40 min at 70 ^{0}C
D. 80 ^{0}C at 30 d came

427. Equipment for sterilization at high temperature under pressure with steam?
A. autoclave
B. dryer cabinet
C. cox apparatus
D. sterilizer

428 Dry heat sterilization for what?
A. fire, drying cabinet
B. cox apparatus
C. autoclave
D. fil'trlar

429. What are the methods of isolation of pure culture?
A. 6
B. 5
C. 3
D. 2

430 pure cultures from the Pasteur and Koch methods is the difference?
A. in the food environment
B. at room temperature
C. at the dilution level
D. in the amount of culture

431. What is pure culture?

A. a microbe belonging to a species isolated from a mixture of microbes
B. microbes with similar cultural characteristics
C. morphologically similar microbes
D. allocated to the same patmaterialdan cultures

432. Methods of separation of pure culture are correctly described in which paragraph?
A. Pasteur, Cox, Drigalsky, chemical, biological, Shukevich method
B. Pasteur, Olt, Drigalskiy, Saburo, Cox
C. Rebiger, Cox, Muromsev, physical, biological
D. Chemical, Drigalsky, Auyski, Kozlovsky

433. What is the difference between the method of separation of pure cultures of anaerobes from aerobes?
A. does not matter
B. special conditions and nutrient environments are used
C. is processed at precise temperature
D. the color of the environment changes

434. In which point the index of heating of a suspension of material in the physical method of separation of pure culture is given correctly?
A. 80 ^{0}C for 30-40 min emphasis
B. 20 minutes at 90 ^{0}C
C. 65 ^{0}C at 1 p.m.
D. 20 minutes at 56 ^{0}C

435. What is culture?
A. a set of bacteria found in the body of an animal
A mixture of bacteria B.
C. microorganisms grown in nutrient media from animal, plant, external environmental substrates
D. separated from the leaves of plants, microbes

436. What is the purpose of infecting laboratory animals?
A. patmateriyaldan try to separate pure cultures, the culture of the pathogen agent,
B. to determine the effectiveness of the vaccine, immune serum
C. to determine the pathogenicity of the culture, the microbial resistance of the animal
D. biosynthesis, determination of the quality of biopreparations

437. How many ml of material is injected into the skin?
A. 0 **,** 2 ml
B. 0.5 ml
C. 0.25-0.5 ml
D. 0.5-1 ml

438. How is an animal fixed in case of damage to the abdominal cavity?
A. with his head down
B. horizontally
C. with his back slightly bent
D. ears and back, the horizontal hold.

439. How is the method of nasal infection performed?
A. The material is first infused with anesthesia and then pipetted
B. pipette the material and squeeze the nose
C. pipette the material and hold it motionless for 5 seconds
D. First clean the nose, drip the material and cover lightly with cotton

440. In which point the sequence of preparation of extract in PR is given correctly?

A. sterilization , crushing, extraction, filtration

B. crushing, filtering, extraction, sterilization

C. filtration, crushing, sterilization, extraction

D. extraction, filtration, crushing, sterilization

441. What doctrine IIMechnikov created in the development of microbiology?

A. created a complete theory of phagocytosis and its role in immunity.

B. created a complete doctrine of humoral immunity.

C. created a complete doctrine of immune deficiency.

D. created a complete doctrine of immune correction.

442 species, in which case the unit of measurement is correct?

A. mkm, nm.

B. mm, mm.

C. mkm, sm.

D. mm, km

443. What nomenclature is used to name an object in the taxonomy of bacteria?

A. Carl Linnaeus' binomial nomenclature

BSAKorolev's binominal nomenclature

Binominal nomenclature of C. NAMixin

Binominal nomenclature of DNAKrasilnikov

443. Determine the temperature of pasteurization?

A. 30 **d** aqiqa at 80 ^{0}C

B. 45 minutes at 60 ^{0}C

C. 60 minutes at 40 ^{0}C

D. 15 minutes at 120 ^{0}C

444. What dyes are used in Gram staining?

A. gensianviolet, sil fuksini (1:10)

B. gimza dye, crystal violet

C. saffron, methylene blue

D. diamond green, leffler blue

445. The composition of Lugol's solution?

A. 1 g of iodine crystals, 2 g of potassium iodine, 300 ml - distilled water

B. 10% iodine, glycerin, 300 ml - distilled water

C. Potassium iodine, calcium chloride, 300 ml - distilled water

D. Phenol, potassium iodine, glycerin, 300 ml - distilled water

446. What are the methods of staining spores?

A. Auyski, Meller, Zlatagorov, Peshkov

B. Meller, Olt, Sil-Nilsen, Muromsev

C. Zlatagorov, Gram, Mixin, Meller

D. Peshkov, Rebiger, Olt, Auyski

447. What are the methods of dyeing capsules?

A. Olt, Mixin, Romanovskiy Gimza, Rebiger

B. Peshkov, Rebiger, Olt, Auyski

C. Meller, Olt, Sil Nilsen, Muraliyev

D. Zlotogorov, Auyski, Leffler

448. Immunity caused by the release of a ready-made immune substance - antibodies?
A. artificial passive immunity
B. active immunity
C. special immunity
D. natural passive immunity

449. Infectious diseases are unique to animals:
A. zonooz
B. anthroponosis
C. zooatroponosis
D. anthropozoonosis

450. Infectious diseases are unique to humans:
A. anthroponosis
B. zonooz
C. zooatroponosis
D. anthropozoonosis

451. What are the names of infectious diseases transmitted to humans by infecting animals?
A. zooatroponosis
B. anthroponosis
C. zonooz
D. anthropozoonosis

452. What are diseases that have the ability to harm each other by infecting animals and humans?
A. antropozoonoz
B. zooatroponosis
C. anthroponosis
D. zonooz

453. Who introduced the term hapten to science?
AKLandshteyner
B. Mechnikov
C. Louis Pasteur
DRGuk

454. What is the multiplication of a microbe in the blood and its spread through the blood to the whole organism ?
A. Sepsis
B. septicemia
C. carbuncle
D. boils

455. What kind of infection is a disease caused by one type of pathogen?
A. mixed
B. Simple
C. subinfection
D. alimentary

456. Infection caused by the entry of two or more types of pathogens:
A. alimentary
B. subinfection
C. mixed
D. simple

457. Sometimes when an animal recovers from an illness, the animal does not develop immunity and becomes infected again and becomes ill again - what is this infection?
A. reinfection
B. mixed
C. subinfection
D. alimentary

458. In some cases, during the development of infection, there is a balance between the organism and the pathogen. But when an additional amount of the pathogen enters such

an organism, the disease intensifies again - what is this infection called?
A. mixed
B. reinfection
C. superinfection
D. subinfection

459. Sometimes, even after the disappearance of clinical symptoms, the organism is not free of the pathogen, and under certain conditions, the disease recurs and clinical signs of the disease appear, what is it called?
A. recurrence
B. superinfection
C. reinfection
D. mixed

460. What is the increase in hypersensitivity to foreign protein (serum, antibiotics) in the body as a result of repeated parenteral administration?
A. anaphylaxis
B. allergy
C. antibody
D. antigen

461. What are the substances that cause anaphylaxis ?
A. anophyloctogens
B. allergens
C. antigens
D. immunoglobulin

462. What is the name of the first stage of development of the infectious process ?
A. Scrolling
B. prodromal
C. incubation
D. convalescence

463. How many different antigens are in a microbial cell?
A. 4
B. 2
C. 3
D. 6

464. How are spores stained?
A. complex, special
B. simple, special
C. in complex, gram method
D. simple and complex

465. 1 ml of water is sown in meat peptone agar in Petri dishes (GPA) and grown for 24 hours at a temperature of 37 °C, the number of colonies is calculated.
A. The number of microbes in 1l of water
B. The number of microbes in 500ml
C. The number of microbes in 200 ml
The number of microbes in the D.100ml

The minimum amount of water (466 ml) even in the presence of a colon bacillus:
A. coli-titre
B. coli-index
C. microbial number
D. titre

467. The amount of Escherichia coli in 1 liter of water:
A. coli-titre
B. coli-index
C. microbial number
D. titre

468. Specify the central immune system?
A. thymus, fabrisiev sac, red marrow

B. lymph nodes, red marrow
C. spleen, blood, lungs
D. spleen, kidney, stomach

469. What indicators control the quality of vaccines?
A. sterility, specificity, toughness
B. sterility, sterility, f **a** ollik
C. sterility, toxicity, specificity
D. harmlessness, immunagenicity, enzyme formation

470. How is the vaccine tested for sterility?
A. planted in a nutrient medium
B. infecting a laboratory animal
C. in a serological reaction
D. In microscopy methods

471. Identify the components of the precipitation reaction?
A. saline solution, extract, blood serum
B. antigen, serum, hemolysin
C. serum, saline, complement
D. hemolysin, complement, extract

472. Evaluate AR with a positive solution?
A. The liquid is clear, the membrane on the surface
B. turbidity, subsidence
C. The liquid is a clear, granular precipitate
D. sedimentation, turbidity

473. What are the components of the bacteriological system of CBD?
A. hemolysin, complement, saline
B. antigen, antibody, complement
C. physiological erythema, antigen, erythrocytes
D. complement, hemolysin, antibody

474. How to evaluate a positive result in CBD?
A. erythrocytes do not lysis, precipitate, the liquid is colorless
B. erythrocytes are lysed, no sediment, the liquid is bright red
C. erythrocytes are partially lysed, precipitate, the liquid is colorless
D. erythrocytes do not lysis, no sediment, the liquid is red

475. What are the components of CBD in the hemolytic system?
A. antigen, complement, saline solution
B. complement, erythrocyte, hemolysin
C. antibody, saline, hemolysin
D. antigen, hemolysis, physiologic solution

476. What is the practical significance of bacteriophages?
A. diagnostic, therapeutic
B. therapy, vaccination
C. vaccine, assess the external environment sanitation
D. environmental health assessment, treatment

477. What is the effect of antibiotics on microbes?
A. bactericidal, bacteriostatic
B. development, growth, respiration
C. multiplication, vitamin, protein
D. nutrition, respiration, enzymes

478. Listeria monocytogenes is the causative agent of which disease?
A. Leptospirosis
B. Listeriosis
C. Anthrax
D. Campylobacteriosis

479. Which laboratory animals are prone to listeriosis?
A. kitten, white mouse
B. white mice, guinea pigs and pigeons
C. guinea pig and chicken
D. white mouse

480. *Cl. What disease causes perfringens?*
A. Leptospirosis
B. Listeriosis
C. Infectious enterotoxemia
D. Campylobacteriosis

481. In which laboratory animal in Bradzot's disease is put biosinov?
A. kitten, white mouse
B. white mice, guinea pigs and pigeons
C. guinea pig
D. chicken

482. What microbes cause ornithosis?
A. Leptospira
B. Chlamydia
C. cocci
D. fungi

483. At what temperature are formed spores of anthrax in an uncomfortable external environment?

A. 12-42 ^{0}C
B. 12-50 ^{0}C
C. 12-55 ^{0}C
D. 12-53 ^{0}C

484. B.anthracis In normal food environments - ?.
A. grows well
B. grows poorly
C. does not grow at all
D. grows slowly

485. B.anthracis sutni -?
A. Ivitadi in 2-4 dayC.
B. ivitadi in 4-5 dayC.
C. 5-6 days ivitadi.
D. ivitadi in 7-8 days.

486. anthrax disease .... family generation.
A. Bacillaceae, Bacillus
B. Bacillaceae, Clostridium
C. Enterobacteriaceae, Escherichia
D. Enterobacteriaceae, Proteus, Salmonella

487. Gissa nutrient medium belongs to which group of nutrient media?
A. Simple
B. Differential diagnosis
C. special
D. Natural

488. According to which properties of food media are classified?
A. by origin
B. on consistency
C. use
D. All

489. How is the tinctorial property determined?
A. Planted in a nutrient medium
B. Paint
C. Putting serological reactions
D. Infecting laboratory animals

490. What is the set of microbes formed by the multiplication of a bacterial cell of a species called?
A. Sof kultura
B. Culture
C. Shtam
D. Colony

491. What disease is caused by the pathogen St.equi?
A. Soqov
B. Qorason
C. Qotma
D. saramas

492. How many antigens of P.multocida are there?
A. 3
B. 2
C. 4
D. 5

493. Which organ is affected in chronic pasteurellosis?
A. lungs
B. liver
C. heart
D. kidney

494. What is the causative agent of plague in camels and humans
A. Y.pestis
BB subtilis
C. Cl. tetani
D. Cl. septicum

495. What is the causative agent of tularemia?
A. Y.pestis
BB subtilis
C. Cl. tetani
D. Francisella tularemis

496. Who isolated the causative agent of necrobacteriosis
A. In 1881, R. Cox
B. Louis Pasteur in 1881
C. In 1889, R. Cox
D. Louis Pasteur in 1887

497. What is the causative agent of campylobacteriosis?
A. Y.pestis
B. Campylobacter fetus
C. Cl. tetani
D. Francisella tularemis

498. Y.pestis is the causative agent of which disease?
A. Anthrax
B. What is the causative agent of plague in camels and humans
C. Soqov
D. Black

499. Campylobacter fetus is the causative agent of which disease?
A. Anthrax
B. What is the causative agent of plague in camels and humans
C. Soqov
D. Campylobacteriosis

500. How many layers does a spore consist of?
A. 3
B. 2
C. 4
D. 5

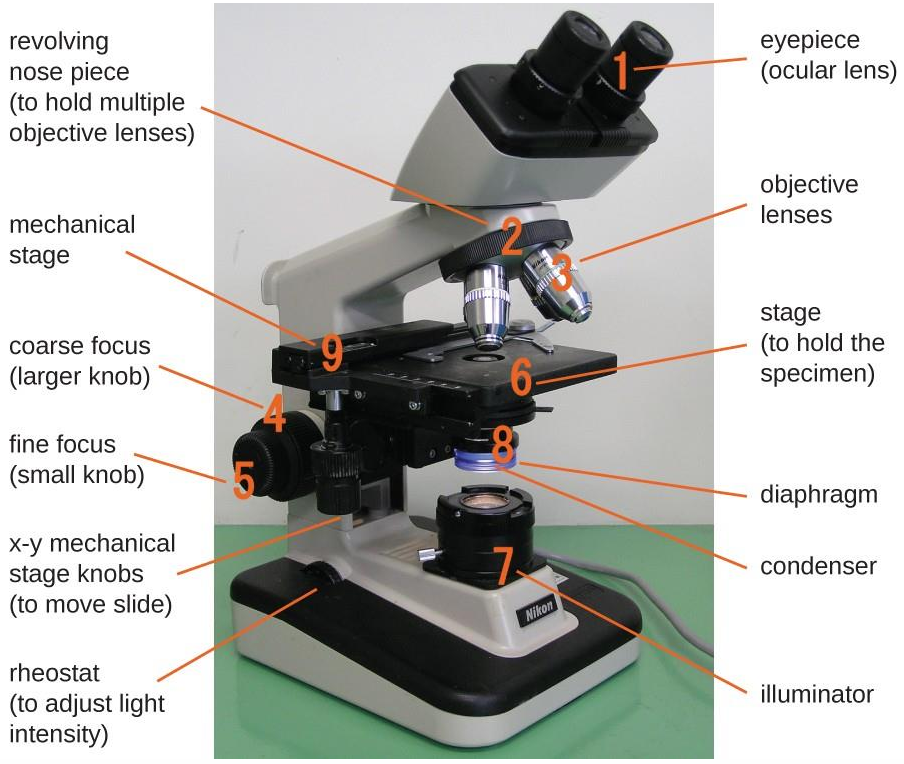
V. Evaluation criteria for science

Transfer the assessment from a 5-point scale to a 100-point scale

SCHEDULE

5 price scale	A 100-point scale	5 price scale	A 100-point scale	5 price scale	A 100-point scale
5.00-4.96	100	4.30-4.26	86	3.60-3.56	72
4.95-4.91	99	4.25-4.21	85	3.55-3.51	71
4.90-4.86	98	4.20-4.16	84	3.50-3.46	70
4.85-4.81	97	4.15-4.11	83	3.45-3.41	69
4.80-4.76	96	4.10-4.06	82	3.40-3.36	68
4.75-4.71	95	4.05-4.01	81	3.35-3.31	67
4.70-4.66	94	4.00-3.96	80	3.30-3.26	66
4.65-4.61	93	3.95-3.91	79	3.25-3.21	65
4.60-4.56	92	3.90-3.86	78	3.20-3.16	64
4.55-4.51	91	3.85-3.81	77	3.15-3.11	63
4.50-4.46	90	3.80-3.76	76	3.10-3.06	62
4.45-4.41	89	3.75-3.71	75	3.05-3.01	61
4.40-4.36	88	3.70-3.66	74	3.00	60
4.35-4.31	87	3.65-3.61	73	3.0 and less	60 and less

VI. Handouts on science



Rotating head
Contains mirrors and allows the body tube to rotate 360°.

Body tube
Passes light from the head to the eyepiece.

Eyepiece
The eyepiece is where one views the enlarged object. It contains a lens called the ocular that further magnifies the specimen by 10x.

Objective lens
Objectives produce most of the magnification. The high-power lens (blue stripe) magnifies 40x and the low-power lens (yellow stripe) magnifies 10x.

Arm
Supports the lenses, mirrors, and body tube. The microscope should be carried with one hand holding the arm and the other under the base.

Stage
Holds the slide and contains an opening that allows light to pass through the specimen on its way to the objective.

Coarse focus knob
Moves the stage up and down quickly. Used to find a specimen when using the low power objective.

Diaphragm
Rotating dial that controls the passage of light through the stage. Numbers on the dial indicate the relative amount of light passing, with "5" being the most and "1" being the least.

Fine focus knob
Used to make small focus adjustments, esp. when using the high power objective.

Base
Supports the microscope and contains the electronics. The microscope should be carried with one hand under the base and the other holding the arm.

Power switch
Turns the light on and off.

Light source
The light source illuminates the specimen by shining bright light through it.

Figure 5 The compound light microscope with descriptions of its parts