Federal State Autonomous Educational Institution for Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian and Technological Institute

WORKING COURSE SYLLABUS

Veterinary microbiology and mycology

Recommended by the Methodological Council for the Education Field:

36.05.01 Veterinary medicine

2022 г.

1. GOALS AND OBJECTIVES OF THE DISCIPLINE

The aim of mastering the discipline "**Veterinary microbiology and mycology**" is is to assist students in the development of theoretical questions about the diversity of the world of microorganisms, about their role in general biological processes and in animal pathology, the theoretical foundations of the diagnosis of infectious diseases, the principles of immunological research, the manufacture and control of biological products.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

The development of the discipline "**Veterinary microbiology and mycology**" is aimed at creating the following competencies (parts of competencies) for students:

Table 2.1. List of competencies formed by students during the development of the discipline (results of the development of the discipline)

Code	Competence	Indicators of competence accomplishment (within the discipline)
UK -8	The ability to create and maintain safe living conditions in everyday life and in professional activities for the preservation of the natural environment, ensuring the sustainable development of society, including in the event of a threat and occurrence of emergencies and military conflicts.	UK-8.1 Analyzes the factors of harmful influence on the vital activity of elements of the habitat. (technical means, technological processes, materials, buildings and structures, natural and social phenomena);
		UK -8.2 Identifies dangerous and harmful factors within the scope of the task being performed;
		UK-8.3 Identifies and eliminates problems related to safety violations in the workplace;
		UK-8.4 Explains measures to prevent emergencies;
		UK -8.5 "Explains the rules of conduct in the event of emergencies of natural and man-made origin, as well as in the event of military conflicts;"
		UK-8.6 Provides first aid, participates in recovery activities.
GPC-2	The ability to interpret and evaluate in professional activity the influence of natural, socio-economic, genetic and economic factors on the physiological state of the animal organism.	GPC-2.1 Has knowledge of the influence of natural, socio-economic, genetic and economic factors on the animal body.
		GPC-2.2 He is able to establish the presence and reliability of cause-and-effect relationships between the effects of certain etiological factors on the animal's body and the development of diseases.

		GPC-2.3 Possesses methods of preventive and curative correction of the effects of adverse environmental factors that can cause deterioration of animal health.
GPC -4	The ability to use methods of solving problems using modern equipment in the development of new technologies in professional activity and to use modern professional methodology for conducting experimental research and interpreting their results.	GPC-4.1 Possesses the conceptual and methodological apparatus of basic natural sciences at a level sufficient for full-fledged professional activity at the modern level.
		GPC-4.2 He knows the methods of solving problems using modern equipment.
		GPC-4.3 He is ready to use modern methodology in the development and conduct of experimental research.
		GPC-4.4 Uses modern professional methodology in interpreting research results.
GPC -6	The ability to analyze, identify and assess the risk of the risk of the occurrence and spread of diseases.	GPC-6.1 Has knowledge in the field of etiology and pathogenesis of animal diseases of different species.
		GPC-6.2 Has the skills to diagnose non-infectious, infectious and invasive diseases, identify pathogens of infectious and invasive diseases in animals.
		GPC-6.3 He knows the patterns of the occurrence and spread of diseases in animal populations, factors predisposing to diseases and the causes of possible complications.
PC -3	Ability to develop animal research programs using special (instrumental) and laboratory methods.	PC-3.1 He is able to develop individual animal research programs, including the use of special (instrumental) and laboratory methods to detect deviations from the physiological norm of the state of a living organism, conduct differential diagnosis of the detected pathology or control the course of the disease and the effectiveness of the prescribed treatment.
		PC-3.2 Capable of developing mass comprehensive animal research programs (medical examination programs) of animals, taking into account their type and purpose, both general and special.
PC -4	The ability to conduct clinical studies of animals using special	PC-4.1 Able to conduct additional animal studies using laboratory methods to clarify the diagnosis.

	(instrumental) and laboratory methods to clarify the diagnosis.	PC-4.2 Able to conduct additional animal studies using special (instrumental) methods to clarify the diagnosis.
PC -6	The ability to develop a treatment plan for animals based on the established diagnosis and individual characteristics of animals.	PC-6.1 Able to develop a treatment plan for animals based on the established diagnosis and individual characteristics of animals.
		PC-6.2 He is able to develop recommendations on therapeutic and preventive manipulations to prevent diseases, the high probability of which was revealed during the study of the patient.
		PC-6.3 He is able to develop recommendations for carrying out preventive and curative measures based on the results of the examination of animals carried out as part of the medical examination.
PC -7	The ability to choose the necessary drugs of chemical and biological nature for the treatment of animals, taking into account their combined pharmacological effect on the body.	PC -7.1 He is able to choose medicines of chemical and biological nature necessary for the treatment of animals, guided by the principles of evidence-based medicine, taking into account their combined pharmacological effect on the body.
		PC-7.2 He is able to justify the prescription of a drug in a certain clinical case or the impossibility of using this drug in the situation under consideration.
		PC-7.3 He is able to calculate the dose, frequency and duration of the course of application of the drug to the patient, taking into account the form of release and the characteristics of the administration of the drug to the patient.
		PC-7.4 He is able to take into account drug interactions when prescribing a course of treatment to an animal already receiving medications and biologically active additives due to the presence of diseases identified earlier.
		PC-7.5 He is able to take into account economic, species and age characteristics, as well as the results of laboratory studies of the patient when choosing drugs for the treatment of the patient.

PC -8	Ability to choose methods of non-drug therapy, including physiotherapy methods for the treatment of animals.	PC-8.1 He is able to choose and justify his choice of methods of non-drug therapy, including physiotherapy methods, for the treatment of animals;
		PC-8.2 He is able to evaluate the effectiveness of the chosen method in the treatment of the patient and, if necessary, adjust the treatment method or change the chosen method to another one.
PC -9	The ability to carry out therapeutic, including physiotherapy procedures using special equipment in compliance with safety rules.	PC-9.1 Able to carry out therapeutic, including physiotherapy, procedures using special equipment in compliance with safety rules;
		PC -9.2 He is able to take into account the species, age and individual characteristics of animals undergoing treatment using special equipment, choose acceptable methods of fixing the patient during the procedure, the conditions of the procedures and their duration.
PC -10	The ability to determine the need for the use of surgical methods in the treatment of animals.	PC-10.1 Able to determine the need for the use of surgical methods in the treatment of animals;
		PC-10.2 Able to choose the optimal surgical method for the patient, taking into account the external conditions and the status of the patient's body, and if necessary, several manipulations - their order and time distribution;
		PC-10.3 He is able to take into account the risks and possible complications accompanying surgical interventions and take measures to prevent them.
PC -11	Ability to develop a surgical operation plan, including the choice of analgesia method	PC-11.1 Able to develop a surgical operation plan;
		PC-11.2 He is able to choose and justify the optimal variant of anesthesia of the patient during surgery and in the postoperative period.
PC -17	Ability to organize disinfection and disinfection of livestock premises to ensure veterinary and sanitary well-being in	PC-17.1 He is capable of collecting and analyzing information necessary for the organization and planning of veterinary and sanitary measures

	accordance with the plan of veterinary and sanitary measures	PC-17.2 He is able to choose the optimal equipment, consumables and medicinal and disinfecting preparations necessary and safe enough for the conduct of veterinary and sanitary measures
		PC-17.3 He is able to determine the procedure for disinfection, disinsection, deratization and other veterinary and sanitary measures, taking into account the peculiarities of animal husbandry, technical characteristics of premises and epizootic situation
		PC-17.4 He is able to monitor the results of veterinary and sanitary measures
PC -20	Ability to develop an annual plan of antiepizootic measures, a plan for the prevention of non-infectious animal diseases, a plan of veterinary and sanitary measures.	PC-20.1 Able to conduct epizootological examination of the organization, territory.
		PC-20.2 He is able to develop an annual plan of antiepizootic and antiparasitic measures, a plan for the prevention of non-infectious animal diseases, a plan of veterinary and sanitary measures.
		PC-20.3 He is able to analyze the effectiveness of measures for the prevention of animal diseases in order to improve them.
PC -21	The ability to carry out inspections of the veterinary and sanitary condition and microclimate of livestock premises in accordance with the plan of antiepizootic measures, the plan of prevention of non-infectious animal diseases, the plan of veterinary and sanitary measures	PC-21.1 He is able to detect deviations in the parameters of the microclimate in livestock premises from the normative
		PC-21.2 He is able to detect violations of the veterinary and sanitary condition of livestock premises, determine their cause and possible consequences
		PC-21.3 He is able to use the information obtained during the inspection of the veterinary and sanitary condition and microclimate of livestock premises for risk analysis of non-infectious, infectious and invasive diseases
PC -22	Ability to organize measures to protect the organization from the introduction of infectious and invasive diseases in accordance with the plan of antiepizootic measures.	PC -22.1 He is able to assess the epizootic state of an organization (territory), identify risks and possible causes of epizootic foci, as well as factors affecting their spread in specific organizations, territories.
		PC-22.2 Able to choose and apply the most effective measures to protect the organization from the introduction of infectious and invasive diseases.

		PC-22.3 He is able to carry out operational control of the effectiveness of the activities carried out.

3. COURSE IN HIGHER EDUCATION

The discipline "**Veterinary microbiology and mycology**" refers to the mandatory part of block B1 of the Educational Program of Higher Education.

As part of the Educational Program of Higher Education, students also master other disciplines and /or practices that contribute to achieving the planned results of mastering the discipline "**Veterinary microbiology and mycology**".

Table 3.1. List of Higher Education Program components disciplines that contribute to expected learning outcomes

Competence code	Competence	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
UK -8	The ability to create and maintain safe living conditions in everyday life and in professional activities for the preservation of the natural environment, ensuring the sustainable development of society, including in the event of a threat and occurrence of emergencies and military conflicts.	History Inorganic and analytical chemistry Organic chemistry Biological physics Physical and Colloidal Chemistry Life safety Biological chemistry	Virology and biotechnology Veterinary radiobiology Parasitology and invasive diseases Epizootology and infectious diseases Organization of veterinary affairs General and Veterinary Ecology Veterinary sanitation Veterinary deontology Laboratory diagnostics of infectious and invasive diseases Organization of state veterinary supervision
GPC-2	The ability to interpret and evaluate in professional activity the influence of natural, socio-economic, genetic and economic factors on the physiological state of the animal organism.	Biology with the basics of ecology Veterinary genetics	Virology and biotechnology Physiology and ethology of animals Breeding with the basics of private animal husbandry Animal health and welfare Pathological physiology

			Veterinary radiobiology Pathological anatomy Instrumental diagnostic methods Toxicology Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Forensic veterinary examination and dissection of animals Immunology General and Veterinary Ecology Veterinary sanitation Fodder plants Zoopsychology Здоровье и благополучие животных Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of bees and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology

			Veterinary ophthalmology Animal Dentistry
GPC -4	The ability to use methods of solving problems using modern equipment in the development of new technologies in professional activity and to use modern professional methodology for conducting experimental research and interpreting their results.	Inorganic and analytical chemistry Organic chemistry Biological physics Computer science Physical and Colloidal Chemistry Cytology, Histology and Embryology Biological chemistry	Virology and biotechnology Physiology and ethology of animals Breeding with the basics of private animal husbandry Pathological physiology Veterinary radiobiology Clinical diagnostics Pathological anatomy Operative surgery with topographic anatomy Instrumental diagnostic methods Toxicology Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Maths Immunology Veterinary sanitation Processing technology for livestock products Medicinal and poisonous plants Fodder plants The basics of intellectual work Personality psychology and professional self-determination Clinical laboratory diagnostics

			Laboratory diagnostics of infectious and invasive diseases Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of bees and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology Reconstructive surgery Veterinary ophthalmology Animal Dentistry
GPC -6	The ability to analyze, identify and assess the risk of the risk of the occurrence and spread of diseases.	Biology with the basics of ecology Life safety	Virology and biotechnology Animal health and welfare Feeding animals with the basics of forage production Veterinary radiobiology Clinical diagnostics Pathological anatomy Instrumental diagnostic methods Toxicology Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases

			Epizootology and infectious diseases Veterinary and sanitary examination Organization of veterinary affairs Forensic veterinary examination and dissection of animals Introduction to the specialty General and Veterinary Ecology Veterinary sanitation Processing technology for livestock products Medicinal and poisonous plants Fodder plants Animal health and welfare Clinical laboratory diagnostics Laboratory diagnostics of infectious and invasive diseases Organization of state veterinary supervision Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of bees and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, resuscitation and intensive care Veterinary ophthalmology Animal Dentistry
PC -3	Ability to develop animal research	Animal anatomy Organic chemistry	Virology and biotechnology

	programs using special (instrumental) and laboratory methods.	Biological physics Physical and Colloidal Chemistry Biological chemistry	Physiology and ethology of animals Pathological physiology Clinical diagnostics Pathological anatomy Instrumental diagnostic methods Toxicology Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Immunology Veterinary deontology Clinical laboratory diagnostics Laboratory diagnostics of infectious and invasive diseases Veterinary and industrial laboratories with design basics Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of bees and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology

			Reconstructive surgery Veterinary ophthalmology Animal Dentistry
PC -4	The ability to conduct clinical studies of animals using special (instrumental) and laboratory methods to clarify the diagnosis.	Animal anatomy Biological physics Cytology, Histology and Embryology Biological chemistry	Virology and biotechnology Physiology and ethology of animals Pathological physiology Clinical diagnostics Pathological anatomy Instrumental diagnostic methods Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Clinical laboratory diagnostics Laboratory diagnostics of infectious and invasive diseases Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology Veterinary ophthalmology Animal Dentistry

PC -6	The ability to develop a treatment plan for animals based on the established diagnosis and individual characteristics of animals.	Veterinary genetics	Virology and biotechnology Pathological physiology Veterinary pharmacology Toxicology Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Maths Immunology Zoopsychology Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of bees and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology Reconstructive surgery Veterinary ophthalmology Animal Dentistry
PC -7	The ability to choose the necessary drugs of chemical and biological nature for the treatment of animals, taking into	Inorganic and analytical chemistry Organic chemistry	Virology and biotechnology Pathological physiology

	account their combined pharmacological effect on the body.	Physical and Colloidal Chemistry Biological chemistry	Veterinary pharmacology Toxicology Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Medicinal and poisonous plants Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of bees and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology Veterinary ophthalmology Animal Dentistry
PC -8	Ability to choose methods of non-drug therapy, including physiotherapy methods for the treatment of animals.	-	Virology and biotechnology Physiology and ethology of animals Feeding animals with the basics of forage production Pathological physiology Veterinary radiobiology

			Internal diseases General surgery Private Veterinary Surgery Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology Reconstructive surgery Veterinary ophthalmology Animal Dentistry
PC -9	The ability to carry out therapeutic, including physiotherapy procedures using special equipment in compliance with safety rules.	Animal anatomy Life safety	Virology and biotechnology Physiology and ethology of animals Pathological physiology Veterinary radiobiology General surgery Private Veterinary Surgery Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology

			Nephrology Reconstructive surgery Veterinary ophthalmology Animal Dentistry
PC -10	The ability to determine the need for the use of surgical methods in the treatment of animals.	Veterinary genetics Cytology, Histology and Embryology	Physiology and ethology of animals Pathological physiology Clinical diagnostics Pathological anatomy Obstetrics, gynecology and andrology General surgery Private Veterinary Surgery Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of exotic animals Dermatology Cardiology Endocrinology Nephrology Reconstructive surgery Veterinary ophthalmology Animal Dentistry
PC -11	Ability to develop a surgical operation plan, including the choice of analgesia method	Animal anatomy	Physiology and ethology of animals Pathological physiology Veterinary pharmacology Pathological anatomy Operative surgery with topographic anatomy Obstetrics, gynecology and andrology General surgery Private Veterinary Surgery

			Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology Reconstructive surgery
PC -17	Ability to organize disinfection and disinfection of livestock premises to ensure veterinary and sanitary well-being in accordance with the plan of veterinary and sanitary measures	Inorganic and analytical chemistry Organic chemistry Physical and Colloidal Chemistry Life safety	Virology and biotechnology Veterinary pharmacology Veterinary sanitation Здоровье и благополучие животных
PC -20	Ability to develop an annual plan of antiepizootic measures, a plan for the prevention of non-infectious animal diseases, a plan of veterinary and sanitary measures.	-	Animal health and welfare Feeding animals with the basics of forage production Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Organization of veterinary affairs Fundamentals of Economics and Management Veterinary sanitation Economics and organization of agricultural production Здоровье и благополучие животных Diseases of bees and entomophages Fish pathology and aquaculture
PC -21	The ability to carry out inspections of the	-	Virology and biotechnology

	veterinary and sanitary condition and microclimate of livestock premises in accordance with the plan of antiepizootic measures, the plan of prevention of non-infectious animal diseases, the plan of veterinary and sanitary measures		Animal health and welfare Veterinary radiobiology Veterinary sanitation Здоровье и благополучие животных
PC -22	Ability to organize measures to protect the organization from the introduction of infectious and invasive diseases in accordance with the plan of antiepizootic measures.	Life safety	Virology and biotechnology Animal health and welfare Veterinary pharmacology Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Organization of veterinary affairs General and Veterinary Ecology Veterinary sanitation Processing technology for livestock products Здоровье и благополучие животных Laboratory diagnostics of infectious and invasive diseases Organization of state veterinary supervision Diseases of bees and entomophages Fish pathology and aquaculture

4. COURSE WORKLOAD AND TRAINING ACTIVITIES

Course workload of the discipline "**Veterinary microbiology and mycology**" is 6 credits.

*Table 4.1. Types of academic activities during the period of the HE program mastering for **full-time** study*

Types of academic activities		**HOURS**	**Semesters**			
			3	**4**	**-**	**-**
Contact academic hours		126	72	54	-	-
including						
Lectures		36	18	18	-	-
Lab work		90	54	36	-	-
Seminars (workshops/tutorials)		-	-	-	-	-
Self-study		68	24	44	-	-
Evaluation and assessment (exam/pass/fail grading)		22	12	10	-	-
Course workload	Academic hour	**216**	**108**	**108**	-	-
	Credit unit	**6**	**3**	**3**	-	-

*Table 4.2. Types of academic activities during the period of the HE program mastering for **part-time** study*

Types of academic activities		**HOURS**	**Semesters**			
			3	**4**	**-**	**-**
Contact academic hours		72	36	36	-	-
including						
Lectures		36	18	18	-	-
Lab work		36	18	18	-	-
Seminars (workshops/tutorials)		-	-	-	-	-
Self-study		124	62	62	-	-
Evaluation and assessment (exam/pass/fail grading)		20	10	10	-	-
Course workload	Academic hour	**216**	**108**	**108**	**-**	-
	Credit unit	**6**	**3**	**3**	**-**	-

5. CONTENT OF THE DISCIPLINE

Table 5.1 Content of the discipline (module) by type of academic work

Name of the discipline section	**Content of the section (topics)**	**Types of academic activities**
Section 1. Systematics, morphology and structure of microorganisms	Topic 1.1. The concept of the taxonomy and classification of microorganisms. Taxonomic categories. The principles of modern classification of bacteria according to Burgey. Prokaryotes and eukaryotes.	Lectures, Lab work.

	Basic forms and polymorphism of bacteria. The structure of the bacterial cell. Features of the morphology and structure of spirochetes, actinomycetes, mycoplasmas, rickettsia, chlamydia.	
Section 2. Physiology of microorganisms	Topic 2.1. The chemical composition of the bacterial cell. Enzymes of microorganisms, their classification. Microorganism nutrition. The essence and types of biological oxidation of substrates by microorganisms. Classification of microbes by the type of respiration. The growth and reproduction of microorganisms. Culture media for the cultivation of microorganisms and requirements for them, classification of culture media. Features of the cultivation of strict anaerobes. The concept of cultural, enzymatic and other properties of microbes.	Lectures, Lab work.
Section 3. The influence of environmental factors on microorganisms	Topic 3.1. The influence of physical factors. The concept of sterilization and asepsis. The action of chemicals. The concept of disinfection and antiseptics. The action of biological factors on microorganisms. Colicins. Bacteriophages. Nature, properties, structural features. Practical application of bacteriophages in veterinary medicine. Antibiotics Antibiotic producers, principles of their production. Mechanism and spectrum of action of antibiotics. Antibiotic resistance of microbes.	Lectures, Lab work.
Section 4. Microorganism genetics	Topic 4.1. The concept of heredity and variability. Genetic code and information transfer. The concept of genome, genotype and phenotype. Chromosomal and extrachromosomal genetic determinants (plasmids). The nature of microbial variability. Phenotypic manifestation of variability (dissociation, modification). Genotypic variability. Spontaneous and induced mutations in bacteria. Recombination variability in bacteria. Polymerase chain reaction (PCR), DNA probes. The value of the doctrine of the variability of microbes in the diagnosis and specific prevention of infectious diseases.	Lectures, Lab work.
Section 5. The spread of microorganisms in nature	Topic 5.1. Microorganisms as symbiotic partners: mutualism, commensalism, parasitism, antagonism. Microflora of soil, water and air. Microflora of the body of animals. Dysbacteriosis, its causes and methods of correction. Normal microflora	Lectures, Lab work.

	and its protective function. Probiotics for veterinary use.	
Section 6. Fundamentals of Sanitary Microbiology	Topic 6.1. The purpose and objectives of sanitary and microbiological research of objects of veterinary supervision. Sanitary indicative microorganisms, characteristics of their properties. Principles of sanitary and microbiological research of water, soil, air of livestock buildings. Sanitary assessment of environmental objects for microbiological indicators. Transmission of pathogens of infectious diseases through water, soil and air. Microflora of manure. Microbiological processes of utilization of fiber, protein and other compounds in manure, depending on the storage method (aerobic, aerobic-anaerobic, anaerobic). Survival of pathogenic microorganisms in manure. Microflora of feed. Microbiological bases of green plant conservation (silage, haylage, hay). Principles of sanitary and microbiological assessment of the good quality of concentrated, juicy, roughage and animal feed. Indication of pathogenic microbes and microbial toxins in feed. Causative agents of foodborne diseases and toxicosis. Principles and methods of their diagnosis.	Lectures, Lab work.
Section 7. Fundamentals of the doctrine of infection	Topic 7.1. Definition of the concept "infection - infectious process". Infectious disease. Stages of development and clinical manifestations of an infectious disease. The concept of sepsis, bacteremia, toxemia, septicopyemia. Microbearer. The concept of pathogenicity and virulence of microbes. Virulence units. The main factors of pathogenicity.	Lectures, Lab work.
Section 8. Immunity	Topic 8.1. Definition of the concept of "immunity". The immune system and its functions. Central and peripheral organs of the immune system. Function of T and B lymphocytes. Cooperative relationships in the immune response with the participation of histocompatibility complex antigens, phagocytes, T- and B-lymphocytes. Forms of the immune response: synthesis of antibodies and cellular factors, immunological memory, tolerance, allergy. Antigens. The concept of "antigen". Antigens of animal origin and bacterial cells. Antigenic determinants (epitopes) of	Lectures, Lab work.

	bacteria. The main properties of a complete antigen. Antigenic specificity. Haptens and their properties. Antibodies. The concept of antibodies. Their nature and function. The structure of immunoglobulins of various classes. The concept of the active center of antibodies. Primary and secondary immune responses. Antigen-antibody interaction phenomena. Serological reactions. Allergy. The concept of allergies, its types. Hypersensitivity of immediate and delayed types. The mechanism of development of both types of hypersensitivity. Infectious allergy. Immunological tolerance. Factors contributing to tolerance. Types of immunity. The concept of the natural resistance of a macroorganism. Inherited resistance factors. Acquired immunity: post-infectious, post-vaccination, active and passive, colostral, antitoxic, sterile and non-sterile; local immunity. Biologicals. Principles of control for sterility, harmlessness, reactogenicity and activity.	
Section 9. Causative agents of staphylococcosis and streptococcosis	Topic 9.1. General characteristics of the main taxonomic groups. Spreading. Role in animal and human pathology. Staphylococci. Characterization of morphological, tinctorial, cultural and enzymatic properties of the main types of staphylococci. Pathogenic factors. Methods for their identification. Antigenic structure. Stability. Drug resistance. Sampling of material for research. Bacteriological diagnosis of infections of staphylococcal etiology. Differentiation from non-pathogenic staphylococci. Features of immunity. Biologicals for specific prophylaxis of staphylococcosis. Streptococci. Significance in animal and human pathology. General characteristics of biological properties. Toxins and pathogenic factors. Antigenic structure. Classification of pathogenic streptococci. Immunogenic properties and post-infectious immunity. The causative agent of myta. Morphology, tinctorial, cultural and enzymatic pathogenic properties. Pathological material and bacteriological diagnostics of myta. Differentiation of the pathogen of	Lectures, Lab work.

	myta from other types of streptococci. Formation of immunity. Biologicals. The causative agent of mastitis. Morphology, tinctorial, cultural and enzymatic properties, pathogenicity. Bacteriological diagnosis of streptococcal mastitis. Differentiation of streptococcus mastitis from other types of streptococci. Features of immunity. Used biological products. The causative agent of pneumococcal infection (septicemia) of young animals. Morphology, tinctorial, cultural, enzymatic properties, pathogenicity. Age susceptibility of farm animals. Selection of pathological material for research on pneumococcal infection. Bacteriological diagnostics. Immunity. Used biological products.	
Section 10. Enterobacteriaceae	Topic 10.1. General characteristics. Classification. Role in the pathology of farm animals. The causative agent of colibacillosis. The role of E. coli in the etiology of colibacillosis of young farm animals, edematous disease of piglets. Age susceptibility of farm animals. Antigenic structure. Morphology, tinctorial, cultural and enzymatic properties, pathogenicity. Selection of material and bacteriological diagnosis of colibacillosis. Scheme of bacteriological research. Serological identification of the causative agent of colibacillosis. Features of immunity in escherichiosis. Biologicals. Causative agents of salmonellosis. Significance in human and animal pathology. Age susceptibility of farm animals; the importance of the carrier of bacteria in adult animals; sensitivity of laboratory animals. Antigenic structure. Salmonella persistence. Morphology, tinctorial, cultural and enzymatic properties, pathogenicity. Selection of material for research. Scheme of bacteriological research. Serological identification (serogroups). Features of immunity. Biologicals.	Lectures, Lab work.
Section 11. The causative agents of pig erysipelas and listeriosis	Topic 11.1. The causative agent of pig erysipelas. Distribution in nature and significance in human and animal pathology. Basic biological properties.	Lectures, Lab work.

	Spectrum of pathogenicity. Stability in the external environment. Laboratory diagnostics. Differentiation of erysipelas from listeria and the causative agent of septicemia in mice. Immunity. Biologicals. The causative agent of listeriosis. Distribution in nature and significance in the pathology of animals and humans. Basic biological properties. Susceptibility of farm animals. Resistance of Listeria to low temperatures and other physicochemical factors. Selection of pathological material. Laboratory diagnostics of listeriosis. Differentiation of listeria from the causative agent of swine erysipelas. Immunity. Biologicals.	
Section 12. Pathogenic mycobacteria	Topic 12.1. General characteristics of the mycobacteria family. Features of morphology and chemical composition. The role of mycobacteria in the etiology of tuberculosis and paratuberculosis. The causative agents of tuberculosis of farm animals. Characterization of tinctorial and cultural properties of Mycobacterium tuberculosis. Pathogenicity for agricultural and laboratory animals. The peculiarity of preparing material for research. Laboratory diagnostics of tuberculosis. Differentiation of pathogenic mycobacteria from acid-fast saprophytes and fast-growing mycobacteria. Allergic and serological diagnosis of tuberculosis. Immunity. Biologicals. The causative agent of paratuberculosis (paratuberculosis enteritis) in cattle. Spreading. Biological characteristics of the pathogen. Antigenic structure. Laboratory diagnostics of paratuberculosis. Differentiation of paratuberculosis mycobacteria from mycobacterium tuberculosis. Allergic diagnostics. Immunity and specific prevention of paratuberculosis.	Lectures, Lab work.
Section 13. Causative agents of zoonotic infections	Topic 13.1. The causative agent of anthrax. Discovery history. Spreading. Stability in the external environment. Role in animal and human pathology. Features of the morphology of the microorganism. Capsule and sporulation. Tinctorial properties, cultural characteristics, enzymatic activity, toxigenicity, antigenic properties. Selection of pathological material. Safety at work.	Lectures, Lab work.

	Laboratory diagnostic methods. Research of leather and fur raw materials for anthrax. Differentiation from soil saprophytic bacilli. Immunity. Diagnostic, preventive and therapeutic biological products. The causative agent of brucellosis. Discovery history. Role in human and animal pathology. Resistance to physical and chemical factors. Morphology, tinctorial properties, peculiarities of cultivation and enzymatic properties of various species of brucella. Pathogenicity. Antigenic structure. Selection of material for research. Laboratory diagnostic methods. Scheme of bacteriological research. Serological diagnosis of brucellosis. Allergic diagnostics and features of immunity. Diagnostic and preventive biological products. The causative agent of tularemia. Discovery history. Role in animal pathology. Morphology, tinctorial, cultural and biochemical properties, pathogenicity, antigenic structure. Selection of material for research. Laboratory diagnostic methods. The value of the allergic test. Immunity. Biologicals.	
Section 14. Yersinia	Topic 14.1. The causative agent of the zooanthroponous plague. Discovery history. Spreading. The susceptibility of animals and humans. Main morphological, tinctorial, cultural and enzymatic properties; pathogenicity, antigenic structure. Stability. Selection of material for research. Plague bacteriological diagnostics. Precautions and safety measures during laboratory research. Differentiation of the causative agent of the zooanthroponous plague from Yersinia pseudotuberculosis. Biologicals. The causative agent of pseudotuberculosis. Spreading. The susceptibility of animals and humans. Main morphological, tinctorial, cultural and enzymatic properties; pathogenicity, antigenic structure. Selection of material for research. Bacteriological diagnostics.	Lectures, Lab work.
Section 15. The causative agent of pasteurellosis	Topic 15.1. Discovery history. Pasteurelling and the significance of this phenomenon in animal pathology. Morphological, tinctorial and other biological properties of the pathogen.	Lectures, Lab work.

	Susceptibility of agricultural and laboratory animals and birds. Resistance of pasteurella to physical and chemical factors. Laboratory diagnostics of pasteurellosis. Biologicals.	
Section 16. Pathogenic anaerobes	Topic 16.1. Clostridia are the causative agents of anaerobic infections. Discovery history. General characteristics of biological properties. Significance in animal and human pathology. Stability in the external environment. Range of pathogenicity and toxins. Selection of pathological material and laboratory diagnosis of emphysematous carbuncle, malignant edema, tetanus, botulism, bradzot, anaerobic lamb dysentery, sheep enterotoxemia. Application of the neutralization reaction to identify and determine the type of toxins of pathogenic clostridia. Formation of immunity in clostridiosis. Used biological products.	Lectures, Lab work.
Section 17. Causative agents of necrobacteriosis and hoof rot	Topic 17.1. The susceptibility of animals. General characteristics. Morphology, tinctorial, cultural and enzymatic properties, pathogenicity. Toxins. Pathogenesis. Antigenic structure. Selection of pathological material. Bacteriological diagnostics. Differentiation of pathogens. Immunity. Biologicals.	Lectures, Lab work.
Section 18. Pathogenic pseudomonas	Topic 18.1. The causative agent of glanders. Discovery history. Role in animal pathology. Morphology, tinctorial, cultural and enzymatic properties. Stability. Pathogenic properties. Antigenic structure. Selection of pathological material. Bacteriological and serological diagnostics. Allergic diagnosis. Feature of immunity. The causative agent of melioidosis. General characteristics. Material for research. Laboratory diagnostics (bacteriological and serological). Immunity. Used biological products	Lectures, Lab work.
Section 19. Pathogenic mycoplasmas and chlamydia	Topic 19.1. History of discovery. Distribution in nature, significance in human and animal pathology. Classification of mycoplasmas and chlamydia. The causative agents of mycoplasmosis of farm animals and birds: pleuropneumonia of cattle, pleuropneumonia of goats, infectious agalactia of sheep and goats, respiratory mycoplasmosis of birds. The main types of chlamydiae - the causative agents of	Lectures, Lab work.

	ornithosis, chlamydia of sheep, cattle and other animal species. Features of morphology, cultural and antigenic properties, the spectrum of pathogenicity. Resistance. The difference between mycoplasmas and L-forms of bacteria. Features of laboratory diagnosis in the study for mycoplasmosis and chlamydia. Immunity. Biopreparations.	
Section 20. Pathogenic rickettsia	Topic 20.1. Discovery history. Significance in human and animal pathology. Ecology of rickettsia. The role of insect vectors in the distribution and circulation of rickettsia in nature. The main types of rickettsia and chlamydia - the causative agents of rickettsiases (Q fever, kerataconjunctivitis and cattle coudriosis, canine ehrlichiosis) Biological characteristics of rickettsia. Spectrum of pathogenicity and resistance. Laboratory diagnostics of rickettsioses. Immunity. Specific prophylaxis.	Lectures, Lab work.
Section 21. Causative agents of campylobacteriosis and leptospirosis	Topic 21.1. Causative agents of campylobacteriosis. Distribution and significance in the pathology of farm animals. Features of morphology and biological properties. Susceptibility of agricultural and laboratory animals. Campylobacter resistance. Laboratory diagnostics. Differentiation of pathogenic and saprophytic campylobacter. Causative agents of leptospirosis. Distribution of pathogenic and saprophytic leptospira in nature. Significance in human and animal pathology. Features of morphology, cultural and pathogenic properties. Susceptibility of farm animals. Leptospira resistance to physical and chemical factors and in the environment. Laboratory diagnostics. Differentiation of leptospira. Application of PMA and RA for serological diagnosis of leptospirosis. Immunity in leptospirosis. Biologicals.	Lectures, Lab work.
Section 22. Causative agents of mycoses and mycotoxicosis	Topic 22.1. The causative agents of mycoses (mucor, penicilli, aspergillus, etc.). Distribution in nature, importance in the pathology of farm animals and humans, biological properties of pathogens. Pathogenicity factors, resistance. Selection of material for research. Laboratory diagnostics of mold mycoses. Causative agents of mycoses caused by yeast-like fungi. Characteristics of the properties of	Lectures, Lab work.

	the causative agents of candidiasis, coccidioidomycosis, epizootic lymphangitis, etc. The circle of susceptible animals. Selection of material for research. Laboratory diagnostics. Causative agents of dermatomycosis. The susceptibility of animals. Morphology of pathogens of trichophytosis and microsporia. Selection of material for research. Laboratory diagnostics of dermatomycosis. Criteria for differentiation of pathogens of trichophytosis and microsporia. Biologicals.	
Section 23. Causative agents of protozoal infections	Topic 23.1. Classification of protozoal animal diseases. General scheme of the development cycle of sporozoans. Causative agents of protozoal diseases of farm animals and birds: pyroplasmidosis of cattle and small ruminants, equids, dogs (piroplasmosis, babesiosis, nutalliosis, fransaiellosis), theileriosis of cattle, coccidiosis (eimeriosis, sarcocystosis, erythrocyte) , chickens, sarcocystosis of cattle and small ruminants, mastigophorosis (surra and equine disease), pig balantidiosis. Development cycles, sources of infections, localization of pathogens in the host's body, pathogenesis, prevention.	Lectures, Lab work.

6. CLASSROOM INFRASTRUCTURE AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Material and technical support of the discipline

Classroom for Academic Activity Type	***Equipping the classroom***	**Specialized educational/laboratory equipment, software and materials for the development of the discipline** (if necessary)
Lecture	An auditorium for conducting lecture-type classes, equipped with a set of specialized furniture; a board (screen) and technical means of multimedia presentations.	*-gas burners* *-Biomed-5 microscopes* *laboratory dry-air thermostat* *-refrigerator* *-aerostat* *-PCYa-10 cavoscope* *-vacuum filtration device PVF-35/1NB* *-instruments* *- laboratory glassware*

		-dye set *- nutrient media* *-microorganism cultures* *-When making experiments in laboratory classes, scientific equipment of bacteriological laboratory is used (centrifuges, autoclave, dry-heat chamber).*
Laboratory	An auditorium for laboratory work, individual consultations, routine monitoring and interim certification, equipped with a set of specialized furniture and equipment.	*-gas burners* *-Biomed-5 microscopes* *laboratory dry-air thermostat* *-refrigerator* *-aerostat* *-PCYa-10 cavoscope* *-vacuum filtration device PVF-35/1NB* *-instruments* *- laboratory glassware* *-dye set* *- nutrient media* *-microorganism cultures* *-When making experiments in laboratory classes, scientific equipment of bacteriological laboratory is used (centrifuges, autoclave, dry-heat chamber).*
Self-studies	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to an electronic information and educational environment.	

7. RECOMMENDED SOURCES FOR COURSE STUDIES

Main reading:

1. Kolychev N.M., Gosmanov R.G. Veterinary microbiology and mycology. SPb, Ed. Doe, 2014. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=465191&idb=0.
2. Kislenko V.N. Veterinary Microbiology and Immunology. SPb, Ed. Doe, 2016. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=449945&idb=0.
3. Gosmanov R.G., Galiullin A.K., Volkov A.Kh., Ibragimova A.I. Microbiology. SPb,

Ed. Doe, 2017. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=465013&idb=0.
4. Gosmanov R.G., Kolychev N.M., Novitsky A.A. Fundamentals of the doctrine of infection and antimicrobial immunity. SPb, Ed. "Doe", 2017. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=465046&idb=0
5. Gosmanov R.G., Kolychev N.M. Workshop on Veterinary Microbiology and Mycology. SPb, Ed. Doe, 2014.

Additional Reading:

1. Sarukhanova L.E., Volina E.G., Yashina N.V. General microbiology, virology and applied immunology. Moscow, Ed. RUDN, 2020. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=491251&idb=0.
2. Gosmanov R.G., Kolychev N.M., Novitsky A.A. and other Brief dictionary of microbiological, virological, immunological and epizootic terms. SPb, Ed. Doe, 2017. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=465045&idb=0.
3. Gosmanov R.G., Volkov A.Kh., Galiullin A.K., Ibragimova A.I. Sanitary microbiology. SPb, Ed. Doe, 2018. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=466528&idb=0.

Resources of the Internet information and telecommunication network:

1. Electronic library system of RUDN and third-party Electronic library systems to which university students have access on the basis of concluded contracts:
- Electronic library system of RUDN - ELS RUDN http://lib.rudn.ru/MegaPro/Web
- ELS "University Library online"http://www.biblioclub.ru
- ELS Yurayt http://www.biblio-online.ru
- ELS "Student Consultant"www.studentlibrary.ru
- ELS "Lan"http://eZlanbook.com/
- ELS "Trinity Bridge"http://www.trmost.com/

2. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- search engine Yandex https://www.yandex.ru/
- search engine Google https://www.google.ru/
- abstract database SCOPUS http://www.elsevierscience.ru/products/scopus/

Educational and methodological materials for independent work of students during the development of the discipline/ module*:
1. A course of lectures on the discipline "**Veterinary microbiology and mycology**".
2. Laboratory workshop on the discipline "**Veterinary microbiology and mycology**".

* - All educational and methodological materials for independent work of students are placed in accordance with the current procedure on the discipline page in the **Telecommunication educational and Information System!**

8. MID-TERM ASSESSMENT

Evaluation materials and a point-rating system* for assessing the level of competence formation (part of competencies) based on the results of mastering the

discipline "**Veterinary microbiology and mycology**" are presented in the Appendix to this Work Program of the discipline.

* - Assessment Materials and a Point Rating System are formed based on the requirements of the relevant local regulatory act of the RUDN.

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