

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL
SCIENCES OF UKRAINE**
Department of Veterinary Surgery named after Academician I.O. Povazhenko

APPROVED
Faculty of
Veterinary Medicine
“01” _____ 06 _____ 2026__

CURRICULUM OF THE ACADEMIC DISCIPLINE
"VETERINARY IMMUNOLOGY"

Field of Study 21 «Veterinary»

Specialty 211 «Veterinary Medicine»

Academic programme «Veterinary Medicine»

Faculty of Veterinary Medicine

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Sciences

(First Name SURNAME, academic position, academic degree, academic title)

Description of the Academic Discipline. Veterinary immunology is a discipline that, using the achievements of many fundamental biomedical sciences, allows teachers to teach students of all aspects of the immune system in animals. It studies the immune system of animals, focusing on how it function in both health and disease. In particular, it quite clearly, concisely and at the same time fully reveals the basics of fundamental and applied veterinary immunology, explains a function of organs and cells of immune system, immune responses to pathogens highlights the pathogenesis of a large number of immunopathological phenomena in the animal body, and also introduces students to classical and modern immunological methods of diagnosis and prevention of animal diseases.

The discipline makes a significant contribution in supporting of animal welfare and public health and remains a key science in the list of disciplines for training veterinarians, as it helps them to find ways to solve the main problems of veterinary medicine related to the features of immunoprophylaxis, immunodiagnostics and the development of therapeutic approaches in the treatment of animals for infectious and non-infectious diseases, in the mechanism of development of which there is an immune component.

Field of study, specialty, educational program, degree level		
Degree level	<i>«Master's»</i>	
Specialty	<i>211 "Veterinary Medicine"</i>	
Educational program	<i>"Veterinary Medicine"</i>	
Characteristics of the academic discipline		
Type	Compulsory (Mandatory)	
Total number of hours	90	
Number of ECTS credits	3	
Number of content modules	2	
Course project / paper:	--	
Form of assessment	<i>credit test / test</i>	
Parameters of the academic discipline for full-time, part-time, and distance learning modes of higher education		
	Mode of higher education	
	full-time	part-time / distance
Year of study (training)	2	None
Semester	4	None
Lectures	<i>15 hours</i>	None
Practical classes / seminars	None	None
Laboratory classes	<i>15 hours</i>	None
Independent study	<i>60 hours</i>	None
Weekly classroom hours (full-time)	2	None

1. Goal, competencies and program learning outcomes of the discipline

Goal. The goal is to introduce students with basic information about the structure and functioning of the immune system of animals in normal and pathological conditions, to explain the mechanisms of the immune response, classical and modern methods of immunodiagnosis, immunotherapy, and immunoprophylaxis of animal diseases.

List of academic disciplines that precede the study:

CC 5 Genetics.

CC 14 Anatomy of domestic animals.

CC 15 Cytology, histology, embryology.

CC 16 Principles of animal breeding.

CC 17 Veterinary microbiology.

CC 18 Animal biochemistry with principles of physical colloid chemistry.

CC 19 Animal physiology.

CC 20 Animal feeding.

CC 22 Veterinary virology.

Acquisition of competencies:

– *Integral competence (IC):*

Ability to solve complex tasks and problems in the field of veterinary medicine, which involves conducting research and/or implementing innovations and is characterized by uncertainty of conditions and requirements.

general competencies (GC):

GC 2. Ability to apply knowledge in practical situations.

GC 7. Ability to conduct research at the appropriate level.

GC 9. Ability to make grounded decisions.

– *Special (professional) competencies (PC):*

PC 2. Ability to use tools, special devices, instruments, laboratory equipment and other technical means to perform necessary manipulations during professional activity.

PC 7. Ability to organize and conduct laboratory and special diagnostic investigations and analyze their results.

PC 12. Ability to develop and implement measures aimed to protect the population from diseases common to animals and humans.

PC 13. Ability to develop strategies for the prevention of diseases of various etiologies.

– *Program learning outcomes (PLO):*

PLO 3. To determine the essence of physicochemical and biological processes that occur in the body of animals in normal and pathological conditions.

PLO 6. To develop quarantine and health measures, methods of therapy, prevention, diagnosis and treatment of diseases of various etiologies.

PLO 9. To develop measures aimed to protect the population from diseases common to animals and humans.

Day One Competences:

1. To demonstrate understanding of the ethical and legal frameworks within which a veterinarian must work, including professional aspects, aspects related to the welfare of animals, animal owners, public health, societal and environmental aspects related to professional activity.

2. To understand scientific research methods, the contribution of foundational and applied research to science and the implementation of the 3Rs principle (Replacement, Reduction, Refinement).

4. To promote and monitor the preservation of health and safety of oneself, patients, animal owners, colleagues and the environment during professional activity; to demonstrate knowledge of quality assurance principles; to apply risk management principles in practice.

9. To be able to think critically, review and evaluate literature and presentations.

10. To understand and apply the principles of the One Health concept to ensure proper clinical practice in veterinary medicine, as well as scientifically grounded and evidence-based veterinary medicine.

12. To use a professional skills to promote the development of veterinary knowledge and the implementation of the One Health with aim to promote the health, safety and well-being of animals, humans and the environment, as well as the achievement of the UN Sustainable Development Goals.

18. To conduct a full clinical examination and demonstrate personal capacity for independent clinical decision-making.

19. To develop an appropriate patient treatment plans and administer treatment in the best interests of each animal, utilizing available resources, and making appropriate personal considerations regarding to animal and human health and the environment.

20. To provide an emergency and first aid care to animals of common species. To prioritize and allocate resources as appropriate to each specific situation.

24. To use basic diagnostic equipment and effectively conduct animal examinations according to the specific case, in accordance with good health care and biosafety practice and current regulatory documents. To understand the contribution of digital tools and artificial intelligence to the theory and practice of veterinary medicine.

25. To recognize a signs of possible animal diseases that are subject to notification to the appropriate government authorities, zoonoses, as well as signs of animal cruelty and to take appropriate measures, including notifying the appropriate authorities.

27. Correctly and responsibly prescribe a medications to patients and dispense them in accordance with the Legislation and the latest guidelines.

30. To properly perform aseptic procedures.

31. To safely perform sedation, general and regional anesthesia on an animal; to apply chemical methods of restraint.

32. To assess the state of the animal's pain response, manage pain and prevent pain in the animal proactively.

33. To determine the appropriateness of euthanasia, to perform it with respect for the animal and its owners, using an appropriate method that is safe for those who are present during the procedure; to provide an advice on ethical and legal aspects of the disposal of the corpse.

37. To protect a public health by identifying conditions which are directly or indirectly related to animals, animal products and by-products, if they contribute to the protection, preservation and improvement of human health.

38. To advise the public and implement disease prevention and eradication programs in accordance with the disease and species of animals, accepted standards of animal health, animal welfare, public health and environmental protection.

2. Program and structure of the academic discipline for:

– full-time mode of higher education (term of study 5 years 10 months) specialty 211 "Veterinary medicine".

Modules and topics	Hours quantity													
	full-time education							part-time education						
	week	total	including					total	including					
			lec	pr	lab	ind	s.st.		lec	pr	lab	ind	s.st.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Module 1. Immune system and the basics of its functioning														
Topic 1. The history of the establishment of immunology as a science. The concept of immunity	1-2	6	2	-	2	-	2		-	-	-	-	-	
Topic 2. Antigens. Antibodies	3-4	10	2	-	2	-	6		-	-	-	-	-	
Topic 3. Structure and functions of the immune system organs. Factors and mechanisms of the immune response	5-6	10	2	-	2	-	6		-	-	-	-	-	
Topic 4. Mechanisms of regulation of the immune response. Immune tolerance	7-8	19	2	-	2	-	15		-	-	-	-	-	
Total Module 1		45	8	-	8	-	29		-	-	-	-	-	
Module 2. Immunological reactivity in normal and pathological conditions, immunoprophylaxis and immunodiagnosis														
Topic 1. Immune system and microbiome. Immunity of fetus and newborn animals	9-10	14	2	-	2	-	10		-	-	-	-	-	
Topic 2. Antiviral, antibacterial, antifungal and antiparasitic immunity. Antitumor immunity	11-12	14	2	-	2	-	10		-	-	-	-	-	

Topic 3. Allergy. Autoimmune diseases. Immunodeficiencies of animals	13-14	10	2	-	2	-	6	-	-	-	-	-
Topic 4. Immunoprophylaxis and immunotherapy. Immunodiagnostics	15	7	1	-	1	-	5	-	-	-	-	-
Total Module 2	45	7	-	7	-	31	-	-	-	-	-	-
Total hours	90	15	-	15	-	60	-	-	-	-	-	-
Course project (work) in <small>(if included in the working curriculum)</small>			-	-	-	-	-	-	-	-	-	-
Total hours	90	15	-	15	-	60	-	-	-	-	-	-

3. Lecture topics

No	Topic	Hours Qty
1.	The history of the establishment of immunology as a science. The concept of immunity	2
2.	Antigens. Antibodies	2
3.	Structure and functions of the immune system organs. Factors and mechanisms of the immune response	2
4.	Mechanisms of regulation of the immune response. Immune tolerance	2
5.	Immune system and microbiome. Immunity of fetus and newborn animals	2
6.	Antiviral, antibacterial, antifungal and antiparasitic immunity. Antitumor immunity	2
7.	Allergy. Autoimmune diseases. Immunodeficiencies of animals	2
8.	Immunoprophylaxis and immunotherapy. Immunodiagnostics	1

4. Laboratory class topics

No	Topic	Hours Qty
1.	Immunological laboratory and vivarium, their equipment and safety rules during working in them	2
2.	Isolation of immunocompetent cells	2
3.	Assessment of the functional activity of animal blood leukocytes	2
4.	Humoral nonspecific resistance	2

5.	Study of T- and B-cell immunity	2
6.	Analysis of animal blood for immunoglobulin content	2
7.	Serological methods for determining antigens and antibodies	2
8.	Methods of enzyme-linked immunosorbent assay	1

5. Self-study topics

No	Topic	Hours Qty
1.	Methods of fixation of laboratory animals	2
2.	Methods of blood obtaining in animals for immunological studies	6
3.	Obtaining of corpuscular antigens. Methods of introducing antigen to animals	6
4.	Morphological analysis of animal blood during immunological studies	15
5.	Reactions of recipitation and methods based on the precipitation reaction	10
6.	Complement binding reaction. Immunochromatographic analysis	10
7.	Methods of detecting diseases that proceed on the principle of allergic reactions	6
8.	Obtaining of an immune sera. Concept of hybridomas and monoclonal antibodies	5

6. Methods of assessing expected learning outcomes:

- oral or written examination;
- test;
- module tests;
- control works;
- defense of laboratory works;
- peer evaluation;
- defense of abstracts;
- defense of computational/graphic works.

7. Teaching methods:

- problem-based learning;
- practice-oriented learning;
- case method;
- project-based learning;
- flipped classroom;
- learning through research;
- educational discussions and debates;
- teamwork;
- gamification.

8. Assessment of learning outcomes.

Assessment of the higher education student's knowledge is carried out on a 100-point scale and is converted into a national grade according to the current «Regulations on Examinations and Credits at NULES of Ukraine».

8.1. Distribution of points by type of learning activity

Type of learning activity	Learning outcomes	Evaluation
Module 1. Immune system and the basics of its functioning		
Topic 1. The history of the establishment of immunology as a science. The concept of immunity		
Lecture 1	To know a range of issues on the history of the establishment of immunology as a science, the subject and tasks of veterinary immunology, methods of immunology, its connection with other disciplines; issues regarding to the concept of «immunity», its classification; mechanisms and factors of innate and acquired immunity; data on the formation of the organs of the immune system of animals in phylogenesis. To be able to work with laboratory animals in vivarium conditions, as well as in an immunological laboratory with devices and reagents. To record a various types of laboratory animals in order to conduct of immunological studies with them	-
Laboratory work 1		15
Self-study 1		2
Topic 2. Antigens. Antibodies		
Lecture 2	To know a range of issues related to the concept of «antigen», the structure of antigens, their classification and properties, in particular immunogenicity and antigenicity; the methods of eliminating of an antigens from the body depending on the route of their penetration; the structure of antibodies (immunoglobulins) of animals, their classification into classes and subclasses; properties of different classes of immunoglobulins; synthesis of immunoglobulins and their functions; the mechanisms of recombination of immunoglobulin genes in different animal species. To be able to isolate immunocompetent cells from animal blood using a Ficoll-Verografin density gradient: to collect blood from different animal species for immunological studies	-
Laboratory work 2		15
Self-study 2		3
Topic 3. Structure and functions of the immune system organs. Factors and mechanisms of the immune response		
Lecture 3	To now a range of issues related to the classification of the organs of the immune system of animals and their structure; features of the functioning of primary and secondary organs of immunogenesis; species-specific features of the structure and functioning of the organs	-
Laboratory work 3		15
Self-study 3		2

	<p>of the immune system in animals; origin, development, structure and functions of various populations of immunocompetent cells and their classification; functions of antigen-presenting cells and antigen processing; the role of molecules of the major histocompatibility complex in the implementation of the immune response; factors and mechanisms of immune protection of individual organs; the issues related to factors of the innate and adaptive immune response of a cellular and humoral nature; mechanisms of recognition of a foreign antigen by T-helper lymphocytes and activation of B-lymphocytes; mechanisms of killing of target cells by T-cytotoxic lymphocytes; mechanisms of immune protection during inflammation and fever; characteristics of antigen-recognition receptors of lymphocytes.</p> <p>To be able to evaluate the functional activity of neutrophils and macrophages in animal blood by determining their phagocytic activity in the opson-phagocytic reaction</p>	
Topic 4. Mechanisms of regulation of the immune response. Immune tolerance		
Lecture 4	<p>To know a range of issues related to neurohumoral regulation of the immune response (regulation of the immune response by the autonomic nervous system, neuropeptides, hormones); features of the immune response depending on the nature of the antigen; the role of immunoglobulins in the regulation of the humoral immune response; classification and characterization of cytokines and their role in the regulation of the immune response; the role of T-lymphocytes and programmed death of immunocompetent cells in the regulation of the immune response; the concept of «immune tolerance», characteristics of central and peripheral immune tolerance and mechanisms of its implementation, theories of immune tolerance breakdown.</p> <p>To be able to determine the stability of complement to a temperature of 56 °C. To conduct a morphological analysis of animal blood during immunological studies</p>	-
Laboratory work 4		15
Self-study 4		3
Modular test 1		30
Total Module 1		100
Module 2. Immunological reactivity in normal and pathological conditions, immunoprophylaxis and immunodiagnosis		
Topic 1. Immune system and microbiome. Immunity of fetus and newborn animals		
Lecture 5	<p>To know a range of issues related to the influence of the microbiome of the gastrointestinal tract, skin, and respiratory tract of animals on immunity; general mechanisms of colonization resistance and data on the influence of the microbiome of the gastrointestinal tract on the homeostasis of the liver and central nervous system; the ontogenesis of the immune system</p>	-
Laboratory work 5		15
Self-study 5		3

	of animals, features of transplacental and colostrum immunity in different animal species; the mechanisms of passive immune protection of chicks. To be able to examine T- and B-cell immunity using the method of spontaneous rosette formation with sheep erythrocytes	
Topic 2. Antiviral, antibacterial, antifungal and antiparasitic immunity. Antitumor immunity		
Lecture 6	To know a range of issues related to the periods of anti-infectious immune response and its features; information about the mechanisms of immune protection in viral, bacterial, fungal and parasitic (helminthic and protozoan) diseases of animals; questions on the classification of tumor antigens and their characteristics, mechanisms of innate and adaptive anti-tumor immune response, as well as mechanisms of evasion of the immune response by tumor cells. To be able to determine the content of γ -globulins and other protein fractions in animal blood serum by the refractometric method. To perform the complement fixation reactions and immunochromatographic analysis during the diagnosis of animal diseases; to determine the presence of antigen in biological fluids of animals using an immunochromatographic rapid test	-
Laboratory work 6		15
Self-study 6		3
Topic 3. Allergy. Autoimmune diseases. Immunodeficiencies of animals		
Lecture 7	To know a range of issues related to the concepts of «allergen» and «allergic reactions», their classification, pathogenesis and clinical manifestations in different species of animals, depending on the type of allergic reaction; information about erythrocyte antigens and blood groups of animals of different species; the characteristics and classification of autoantigens and autoantibodies, stages and pathogenesis of various autoimmune diseases of animals and factors that contribute to their development, classification of autoimmune diseases of animals; the concept of «immunodeficiency», classification of immunodeficiencies of animals, as well as the causes of primary and secondary immunodeficiencies; the methods of detecting of diseases that run as allergic reactions; to know the features of the course of anaphylaxis in guinea pigs. To be able to determine the resistance of antibodies to a temperature of 56 °C; to conduct the Danish test; to know the theoretical foundations of the mechanism of the agglutination reaction and its modification	-
Laboratory work 7		15
Self-study 7		2
Topic 4. Immunoprophylaxis and immunotherapy. Immunodiagnostics		
Lecture 8	To know a range of issues related to the methods of acquiring immunity by animals, the mechanisms of their active and passive immunization; classification of vaccines and characteristics of its various classes; information on the advantages and disadvantages of	-
Laboratory work 8		15
Self-study 8		2

	live and inactivated vaccines; characteristics of adjuvants for inducing an immune response to a vaccine antigen and factors that affect the effectiveness of vaccination, as well as adverse reactions during vaccination; issues related to immunodiagnosis of animal diseases using basic serological methods: agglutination reactions, precipitation, complement fixation reactions, methods using chemical and physical labels, as well as immunochromatographic diagnostic methods. To be able to detect a specific antibodies against antigens in animal biological fluids using enzyme-linked immunosorbent assay; to know the theoretical foundations of enzyme-linked immunosorbent assay methods and its types. To know the principle of obtaining of an immune sera, hybridomas and monoclonal antibodies	
Modular test 2		30
Total Module 2		100
Class work	$(M1 + M2)/2 * 0,7 \leq 70$	
Exam/credit	30	
TOTAL for discipline	$(\text{Class work} + \text{exam}) \leq 100$	

8.2. Scale for assessing the knowledge of a higher education student

Higher education student rating, point	National grade based on credit / exam results
90-100	Excellent
74-89	Good
60-73	Satisfactory
0-59	Unsatisfactory

8.3. Assessment policy

Deadlines and exam retaking rules	Works that are submitted late without valid reasons will be assessed with a lower grade. Module tests may be retaken with the permission of the lecturer if there are valid reasons (e.g. a sick leave).
Academic integrity rules	Cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct references to the literature used.
Attendance rules	Attendance is compulsory. For good reasons (e.g. illness, international internship), training can take place individually (online by the faculty dean's consent).

9. Teaching and learning aids:

- e-learning course of the discipline :
<https://elearn.nubip.edu.ua/course/view.php?id=434>;
- textbooks, manuals, workshops:
 1. Ветеринарна імунологія : підручник (2-е вид.) / Мазуркевич А. Й., Харкевич Ю. О., Малюк М. О., Ковпак В. В., Савчук Т. Л. – К.: НУБіП України, 2024 – 410 с.
 2. Практикум з ветеринарної імунології [навчальний посібник, 2 видання] / А. Й. Мазуркевич, Ю. О. Харкевич, М. О. Малюк, В. В. Ковпак, Т.Л. Савчук. – К.: НУБіП України, 2025 – 176.
- lecture notes and their presentations (in electronic form);
- educational charts, educational films, video clips, and a multimedia system;
- workbooks for laboratory works;
- methodological materials on studying the academic discipline for full-time higher education applicants.

10. Recommended sources of information

1. Handbook of vertebrate immunology. Edited by: Paul-Pierre Pastoret, Philip Griebel, Herve Bazin, Andre Govaerts. – Academic Press. – 1998. – p. 698.
2. Ian Tizard. Veterinary immunology. Tenth edition / Tizard, Ian R. – St. Louis, Missouri, Elsevier. – 2018. – P. 539.
3. Immunobiology: the immune system in health and disease Edited by: Charles A. Janeway Jr., Paul Travers, Mark Walport, Mark J. Shlomchik. – Garland Publishing. – 5th ed. – 2001. – p. 884.
4. Manual of Canine and Feline Clinical Pathology. Edited by: Elizabeth Villiers and Jelena Ristić. – 3rd ed. – BSAVA. – 2016. – p. 614.
5. Pathologic basis of veterinary disease. Edited by: James F. Zachary. – Elsevier. – 6th ed. – 2017. – p. 1835.
6. Vaccines in Veterinary Medicine / Isabel Myers. – Syrawood Publishing House, 2022. – P. 225.