

IMMUNOLOGY

Study program	Veterinary Medicine
Year of study	III
Semester	I
Regime of discipline	DOB
Category of discipline	Dsf
Number of lectures hours per week	2
Number of seminar/laboratory/project hours per week	2
Total number of hours according to the curriculum: lectures/seminars/laboratory/project	28 hours of course/ 28 hours of laboratory
Number of transferable credits	4

SPECIFIC SKILLS

Professional Competence	<p>C₁ Acquiring knowledge about immune mechanisms (natural and acquired immunity, specific and non specific immunity, the role of humoral and cellular effectors, mechanisms of immune response in bacterial, viral, mycotic, parasitic, and tumoral diseases, mechanisms of immunological tolerance and autoimmune diseases etc), important for understanding of pathogenesis, diagnosis and prophylaxis of infectious and parasitic diseases.</p> <p>C₂ Development of specific prevention and control protocols and methods in order to reduce the disease risks in animals and humans.</p> <p>C₃ Classification and description of veterinary biological products (vaccines, immunomodulatory products, sera, etc.), their characteristics, possible associations, incompatibilities, secondary and side effects, action modes.</p>
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LEARNING OUTCOMES

Knowledge	The student understands and recognizes the concepts regarding the study of the immune system, immunological diagnosis, diseases specific to the immune system, the evolution of immune diseases and the basis of immunopathological conditions and vaccination.
Skills	The student applies immunological diagnostic methods and identifies the main immunological parameters and also can estimate the evolution of a disease at the population level and its zoonotic potential.
Responsibility and autonomy	The student determines and identifies pathogenic microorganisms in animals, evaluates the immunological status of the animal organism and also analyzes and estimates the evolution of a disease at the population level.

COURSE OBJECTIVES

General objective of the course	<p>Acquiring knowledge regarding the natural and acquired immunity.</p> <p>Understanding the mechanisms underlying the reactions between antigens and immune effectors, both <i>in vivo</i> and <i>in vitro</i> and their applications.</p> <p>General principles about immunoprophylaxis and immunotherapy.</p> <p>Modern trends in immunological diagnostic techniques.</p>
Specific objectives	<p>The course is designed to achieve the following specific objectives:</p> <ol style="list-style-type: none"> 1. To describe the cellular and molecular components of the innate and adaptive immune systems and explain their interactions in the immune response. 2. To understand the mechanisms of antigen recognition, processing, and presentation, as well as the development and regulation of immune responses. 3. To identify and explain the immunological basis of hypersensitivity, autoimmunity, immunodeficiency, and other immune-mediated disorders in animals. 4. To understand the principles and mechanisms of vaccination, immunoprophylaxis, and immunotherapy in the prevention and control of animal diseases. 5. To acquire practical skills in performing and interpreting immunological and serological techniques used in veterinary diagnosis and research. 6. To correlate immunological principles with pathological,

	microbiological, and clinical findings for a comprehensive understanding of animal diseases. 7. To promote responsible and ethical application of immunological knowledge in diagnostic, therapeutic, and preventive veterinary practice, ensuring animal welfare and public health protection.
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COURSE CONTENT

LECTURES	Number of hours
Topic no. 1 Introductory notions. Short history. The immunity and the immune system. Definition and fundamental data about the immune system. The natural and artificial immunity. Participating cells and molecules.	1
Topic no. 2 Structure of the immune system. Organs and tissues participating in the immune response. Central and peripheral organs. Immunocompetent cells and molecules. Antigen presenting cells. Maturation of immunocompetent cells.	1
Topic no. 3 Cellular effectors of the immune system. T and B cells. Monocyte-macrophage system. Polymorphonuclear leukocytes. Large granular lymphocyte.	2
Topic no. 4 Antigens and immunogens. The concept of <i>self</i> and <i>non-self</i> . General characteristics, biochemical structure, classification. Self-qualities of immunogens that ensure the development of the immune response. Bacterial, viral, parasitic and tumor antigens. Practical applications.	1
Topic no. 5 Humoral effectors of the immune system. Immunoglobulin and antibodies: chemical structure, classification and functions. Immunoglobulin classes. The generation of antibody diversity and receptor for antigens diversity. Practical applications.	2
Topic no. 6 The complement system: structure, functions. Complement receptors. Regulating molecule system of the complement activity. The biological role of the complement.	2
Topic no. 7 Cytokines: definition, classification, general characteristics. Regulatory functions. Receptors for cytokines. Implications in immunotherapy and immune prevention. The major histocompatibility complex: definition, classification, functions. MHC molecules class I and II. The regulation of the immunological mechanisms: cellular and molecular mechanisms.	3
Topic no. 8 Cellular activation. The activation of T and B cells. Biochemical processes that involve in the activity of T and B cells. Consequences of the cellular activation: proliferation and secretion. The selection and clonal expansion.	1
Topic no. 9 Immune response. <i>The cell-mediated immune response.</i> Cells and molecules involved. Mechanisms. Effectors. The cell-mediated cytotoxicity. The effector role of macrophages and lymphocytes. <i>The antibody-mediated immune.</i> Cells and molecules involved. Mechanisms. Effectors. Phases of the humoral immune response. Primary and secondary immune response. Dynamics of the immune response. <i>The regulation of the immune response:</i> mechanisms, cellular and molecular effectors. Immuno-neuroendocrinic correlations. The genetic regulation. Unspecific mediators of the immune reactions and immune pathological reactions. Pathological consequences	4
Topic no. 10 The immune status. Definition. Characteristics. Factors that influence the immune profile. Diagnosis methods. The usage of the immune profile. Consequence of the immune status changes. Primary and secondary immunodeficiency disorders. Classification. Etiology. Methods of diagnosis. Therapeutically strategies. Prevention programs.	3
Topic no. 11 The immunological tolerance and autoimmunity. Definition. Etiology and mechanisms. Diseases with autoimmune etiology. Methods of diagnosis. Prevention and treatment methods	2
Topic no. 12 Hypersensitivity states. Classification (I, II, III, IV, V). General characteristics. Etiology and mechanisms. Pathological manifestation. Methods of diagnosis. Strategies of preventions and treatment.	2
Topic no. 13 The immune response in bacteriosis, virosis, parasitosis, mycosis and tumors. The antigenic structures involved. Elements of pathogenesis. Cells and molecules involved. Strategies of protection of the etiological agents. The specific immune response. Immunopathological phenomenon. Methods of immune diagnosis. Prevention and treatment by immunological methods.	2
Topic no. 14 Methods and immunoprophylaxis products. The active immunization. The description of the main types of vaccines. The vaccination. The immunological adjuvants. The passive immunization. Revealing products.	2

SEMINAR/LABORATORY	Number of hours
Topic no. 1 Laboratory safety procedures applied in Immunology laboratory. Equipments and materials necessary for the immunology practical works. Sampling and processing of the animal blood.	2
Topic no. 2 Organs, cells and tissues involved in the immune response. Primary and secondary lymphoid organs.	2
Topic no. 3 Cells involved in the immune response (lymphocytes, plasma cells, monocytes, macrophages, and polymorphonuclear cells).	2
Topic no. 4 The determination of the non-specific immune factors. Lysozyme. Complement system. Properdin. Interferons.	2
Topic no. 5 The determination of the specific immune factors. Non-specific methods for dosage of immunoglobulins.	2
Topic no. 6 Antigen-antibody reactions. Agglutination reactions: rapid slide agglutination, rapid slide agglutination with whole blood. Slow agglutination in tubes. Milk ring test. Microscopic agglutination test.	2
Topic no. 7 Precipitation assays in liquid (Ascoli's precipitation test, Uhlenhuth assay) and solid medium (simple and double diffusion assays). Immunoelectrophoresis. Counter current Immunoelectrophoresis.	2
Topic no. 8 Reactions used to show the antiviral antibodies. The hemagglutination assay. The hemagglutination inhibition assay.	2
Topic no. 9 Complement fixation reaction	2
Topic no. 10 Immunofluorescence assays. The direct immunofluorescence test. The indirect immunofluorescence test.	2
Topic no. 11 Immunoenzymatic assays. Indirect ELISA. Direct ELISA	2
Topic no. 12 Tests to indicate and quantify the T and B cells: rosette tests, cell proliferation assay.	2
Topic no. 13 Methods for determination of the immune status. Diagnosis tests for immunodeficiencies. The diagnosis of the autoimmune diseases.	2
Topic no. 14 Hypersensitivity tests. The diagnosis methods in allergic diseases. Methods to detect nucleic acids.	2

BIBLIOGRAPHY:

- Bucur, I. Tîrziu, E. (2021) - Veterinary Immunology – Course notes, Waldpress, Timișoara.
- Tizzard, I.R. (2009) – Veterinary Immunology. An Introduction, 8th edition, Ed. Saunders Elsevier, Missouri, USA.
- Delves, P.J., Martin, S.J, Burton, D.R., Roitt, I.M. (2012) - Roitt's Essential Immunology, 12th edition, Wiley-BlackWell, UK.
- Șeres, M., Tîrziu, E., (2022) – Laboratory methods in immunology

ASSESSMENT

Activity type	Assessment criteria	Assessment methods	Percentage of final grade
Lectures	Communication of information using the correctly scientific language used in the field of Immunology. Knowledge of basic concepts of the discipline. Originality and correctness of answers used to build arguments pro / con. Application of theoretical knowledge in conducting analyzes and problems solving in sustaining of some arguments.	Exam - oral assessment (two subjects)	60%
Seminar/laboratory/clinical sessions	Using discipline procurement in addressing inter-, intra-, multi-and / or transdisciplinary issues / problem situations. Using the Immunological knowledge in addressing inter-, intra-, multi-and / or transdisciplinary issues / problem	Periodic evaluation (through oral assessment, written and practical tests) and presentations, individual	30%
Other activities		Participation in course	10%

Course coordinator: S. Lect. PhD Iulia-Maria BUCUR

Practical activities coordinator L/S/P: S. Lect. PhD Iulia-Maria BUCUR