

Opis zajęć (syllabus)

Module title :	Immunology	ECTS	4
Polish translation :	Immunologia		
Course:	Veterinary Medicine		

Module language:	English	Poziom studiów:1	
Form of studies:	<input checked="" type="checkbox"/> intramural <input type="checkbox"/> extramural	Type of module:	<input checked="" type="checkbox"/> mandatory <input type="checkbox"/> directional <input type="checkbox"/> elective
		Semester: 4.	<input type="checkbox"/> winter semester <input checked="" type="checkbox"/> summer semester
Academic year:		2022/23	Catalogue number: FVM-V-JMSS-04S-B45_22

Module coordinator:	Małgorzata Gieryńska PhD, DSc, Associate professor
Teachers responsible for the module:	Academic teachers of Department of Preclinical Sciences; PhD students in accordance to the internal legal acts; visiting professors; other specialists in the field of study
Objectives of the module:	<p>Basic (contemporary) immunology has its roots in microbiology, genetics, biochemistry, molecular biology, biotechnology, pathology, and clinical observations. The major goal of this course is to impart understanding of the relations between host defence mechanisms and infectious agents, also the ability of the immune system to recognize the altered self-cells. Effort is focused on understanding mechanisms that enable to design of efficacious vaccines that eventually control animal infectious diseases. The expected learning outcomes of this course is acquisition, by students, the working knowledge of immunological principles as they relate to the cells and molecules of immune system, how they develop and acquire the ability to recognize foreign antigens, and finally how they malfunction in autoimmune diseases and how they become inadequate in immunodeficiencies. Upon completion of this course student should be able to explain innate body defences and the adaptive immune responses and apply this understanding to the pathogenesis of infectious diseases as well as to prophylactic and control measurements. Furthermore, student will be able to discuss the types and explain the basis of hypersensitivity as well as the causes and effects of primary and secondary immunodeficiencies, and autoimmune diseases. Intention of the course is presentation of methods suitable for immunity assessment and the possibility of using these assays in the diagnosis of infectious diseases as well as teaching basic serological techniques and evaluation of serological test results. Additionally, demonstration of the techniques of isolation and culture of the lymphocytes and measurement their activity <i>in vitro</i> will be included. Students should develop the ability to work both independently and within the team in the laboratory, draw appropriate conclusions from experimental results and develop an information base for undertaking appropriate decision in regard to animal diseases</p> <p><u>Lectures content: the following issues will be presented during 15 lecture hours</u></p> <ol style="list-style-type: none"> 1. Introduction to the veterinary immunology: primary and secondary lymphoid organs. Types of immunity: innate and adaptive immunity. Pattern recognition receptors (PRR) - their distribution and functions during induction of the immune response. Cell signaling: chemokines and cytokines and their receptors; 2h 2. Innate immunity. Inflammation: vascular and cellular reactions. Humoral and cellular factors of innate immunity (mast cells, phagocytes [monocytes/ macrophages, granulocytes], natural killer cells, dendritic cells). Phagocytosis, complement system – their role in stimulation of the immune response; 2h 3. Acquired immunity – definition of antigen. Antigen presenting cells (macrophages, dendritic cells, B cells); the role of major histocompatibility complex (MHC) and CD1 molecules in antigen presentation as well as immune response induction. Definition of the antigen and superantigen; definition and significance of immunological synapse; 2h 4. Acquired immunity: Formation and maturation of $T\gamma\delta$ cells and $T\alpha\beta$ ($CD4^+$ and $CD8^+$) cells, as well as NKT cells. Structure and role of TCR. Induction and effector mechanisms of adaptive cell-mediated immune response. B cell formation and maturation; structure and role of BCR. Structure and classes of immunoglobulins. B cells as effector cells of the humoral immune response. Polyclonal and monoclonal antibodies. The development of central tolerance; 2h 5. Primary and secondary immune response and their regulation, immunological memory. Humoral and cell-mediated mechanisms of local immunity; immunity at body surfaces – mucosal and skin immunity; 2h 6. Protective immunity – bacterial, viral fungal infectious diseases; immune evasion by bacteria, viruses and fungi. Vaccine – active immunization against infectious diseases, introduction to prophylactic vaccination; 2h 7. Peripheral tolerance. Regulation of the acquired immunity. Regulatory cells. Autoimmunity. Immunosuppression. Immunity of transplantation; 2h 8. Immunity to tumors. Humoral (antibodies) and cellular (NK cells, $CD8^+$ T cells) anti-tumor defenses. Failure of anti-tumor immunity. Immunotherapy in neoplastic diseases; 1h <p><u>Laboratory practicals content; 5 meetings of 3 hours each, the following topics will be presented within 15 hours</u></p> <ol style="list-style-type: none"> 1. The introduction to serology. Definition of the serum. Immunodiagnostic techniques. Reagents used in serological qualitative and quantitative tests. Titration of the antibodies. Secondary binding tests: agglutination. 2. Secondary binding tests (cont.). Precipitation. Immunodiffusion and immunoelectrophoresis tests. 3. Immunodiagnostic techniques. Assays that use indicator systems. Serum neutralization and complement fixation tests. Application of serological tests in diagnostics. 4. Primary binding tests. Application of monoclonal antibodies: immunofluorescence, immunoenzyme (ELISA, Western Blotting, immunohistochemistry) assays and radioimmunoassay. 5. Immunophenotyping qualitative and quantitative evaluation of immune cells. Flow cytometry, magnetic separation. Methods of cell mediated immunity (CMI) evaluation: proliferation test and cytotoxicity test. Assays for cytokine profile assessment. <p><u>Seminars content; 5 meetings of 3 hours each, the following topics will be presented within 15 hours</u></p> <ol style="list-style-type: none"> 1. Transfer of the immunity from mother to the young. Maternally derived antibody (MDA) in protection of the offspring; 3h 2. Primary and secondary immunodeficiencies of innate and adaptive immunity; 3h

	<p>3. Types of hypersensitivity. Immune based diseases; 3h 4. Systemic and organ-specific autoimmune diseases; 3h 5. Vaccines and vaccination strategies in control of infectious diseases. Adjuvants. Modern vaccine technology; 3h</p> <p>The training content of lectures and seminars are a supplement to the content of training exercises</p>			
Teaching forms, number of hours:	<p>a) Lectures; number of hours: 15; b) Laboratory practicals; number of hours 15; c) Seminars; number of hours 15</p>			
Teaching methods:	<p><u>Lectures</u>: multimedia presentations discussing selected topics in immunology (see 'Lecture content'), prepared by employees of Department of Preclinical Sciences, responsible for conducting lectures <u>Laboratory practicals</u>: introduction to the current topic: original multimedia presentations, focused on the topic of laboratory practicals (see 'Laboratory practicals content'), prepared by the academic teachers; students individually or in 2 persons team, perform basic serological diagnostics assays (using provided material); interpretation of the assay in the context of the immune response mechanisms responsible for the observed results, discussion with the teacher. <u>Seminars</u>: introduction to the subject of the seminar - original multimedia presentations prepared by teachers conducting seminars related to the topic implemented in class (see – 'Seminar content'); seminars prepared by students related to the topic of classes, prepared in the form of multimedia presentations, based on materials provided by the teacher or based on materials of their own choice accepted by the teacher, combined with discussion</p> <p>Additional meetings with students – consultations: 2h / week. Detailed schedule will be defined by the coordinator of the course at the beginning of semester. Detailed organization of consultations will be defined by the coordinator of the course at the beginning of semester</p>			
Formal prerequisites and initial requirements:	Completed and passed exams in biochemistry, histology and embryology, animal anatomy, and progressive knowledge in microbiology and physiology according to the schedule			
Outcome category:	Course outcome:	Learning outcomes relative to the course outcomes	Impact on the course outcomes	
Knowledge:	1	Student understands the structure and functions of individual parts of the immune system in the context of the physiology of other systems of the host	A.W.2 A.W.4	3 2
	2	Student knows and describes the mechanisms of innate and adaptive immunity	A.W.2 A.W.4, A.W.13 A.W.10	3 2 1
	3	Student knows and describes methods of inducing and assessing systemic and local immune response	A.W.11, A.W.13 A.W.12, A.W.15	3 3
	4	Student understands the mechanisms regulating the immune response induced by infectious agents and cancer	A.W.13 A.W.11, A.W.18 B.W.1	3 2 1
	5	Student knows the types of vaccines, understands mechanisms of their mode of action and the demand for human and animal infectious diseases immune-prophylaxis	A.W.10, A.W.12 A.W.11, A.W.15 B.W.3	3 2 2
	6	Student knows the mechanisms associated with the transmission of passive immunity from the mother, understands the causes of immune disorders associated with maternal antibodies	A.W.13 A.W.11, A.W.12	3 2
	7	Student knows the mechanisms and describes the development of all types of hypersensitivity, is aware of the consequences arising from these mechanisms	A.W.2, A.W.10 A.W.11, A.W.12 B.W.1	3 2 2
	8	Student knows and describes the causes and consequences of innate and adaptive immunity deficiencies and disorders	A.W.2, A.W.10 A.W.3, A.W.4 B.W.2	3 2 2
	9	Student knows the basis of autoimmune diseases in humans and animals	A.W.2, A.W.4, A.W.10, A.W.12 B.W.2	3 2
	10	Student understands the importance of serological (qualitative and quantitative) tests for the diagnosis of infectious diseases	A.W.10, A.W.15 B.W.3	3 2
Skills:	1	Student can prepare animal serum for serological tests	A.U.2, B.U.6 B.U.16	3 1
	2	Student can independently perform a simple serological test (quantitative and qualitative test: agglutination, passive immunodiffusion and neutralization) and interpret the results of serological tests in the context of the diagnosis of infectious diseases	A.U.10, B.U.6	3
	3	Student is able to use conjugates of monoclonal antibodies in the context of infectious diseases diagnostic tests and assessment of the patient's state of health (immunofluorescence assay, enzyme immunoassay and radioimmunoassay) - for detection of antibodies in the patient's serum and for identification of an infectious agent	A.U.2, B.U.6 B.U.19	3 1
	4	On the basis of acquired knowledge, student can isolate specific populations of immunocompetent cells as well as determine their activity using enzyme immunoassay and immunofluorescence assays and molecular biology methods.	A.U.2, A.U.21, B.U.6 B.U.16	3 1
Competences:	1	Student formulates opinions in the context of the importance of immunology and serological tests in the diagnosis of infectious diseases, immune mediated diseases and identification of immunodeficiencies	KS.1, KS.2 KS.5, KS6	3 2
	2	Student is aware of the need for immune-prophylaxis of human and animal infectious diseases	KS.1 KS.5	3 2

	3	Student is ready to apply obtained knowledge and skills in further stages of education	KS.4, KS.7, KS.8, KS.9 KS.6	3 2
	4	Student is aware of being knowledgeable and understands benefits from exchanging opinions and is ready to share self-competences with colleagues and animal owners	KS.7, KS.9	3

Objectives of the module required to obtain learning effects:

Basic (contemporary) immunology has its roots in microbiology, genetics, biochemistry, cytology, molecular biology, biotechnology, pathology, and clinical observations. The major goal of this course is to impart understanding of the relations between body defence mechanisms and infectious agents, and the ability of the immune system to recognize the altered self-cells. Introduce the role of the non-specific defense mechanisms (pathogen recognition, inflammation etc.), in initiating the host specific defenses, presentation the importance of the immune cells in the induction and regulation of the innate and adaptive immune response, methods of assessing humoral and cell-mediated immunity, also in the context of vaccination induced protective immunity. Effort is focused on: understanding the mechanisms that enable to design of safe and efficacious vaccines that eventually control animal infectious diseases, presentation of the basic types of vaccines and the principles of their construction; introducing the mechanisms of immunity in the course of infectious and neoplastic diseases, presentation of the transmission and role of naturally acquired passive immunity in animals, explanation of the mechanisms of different types of hypersensitivity as well as the causes and consequences of primary and secondary immune deficiencies, the background of immune-mediated diseases in animals, practical training in basic serological techniques and evaluation the results of these tests.

Basic (contemporary) immunology has its roots in microbiology, genetics, biochemistry, cytology, molecular biology, biotechnology, pathology, and clinical observations. The major goal of this course is to impart understanding of the relations between body defence mechanisms and infectious agents, and the ability of the immune system to recognize the altered self-cells. Effort is focused on understanding mechanisms that enable to design of efficacious vaccines that eventually control animal infectious diseases

Assessment methods:

- Attendance to the practical classes and active participation in classes are mandatory, according to the general academic regulations, the student can be absent on 20% of classes (Immunology course: 1 absence during laboratory training and 1 absence during seminars).
- The final grade, allowing to the final exam admittance, consists of grades obtained from progressive written assessments during semester, and evaluation of the student activity.
- The 3 progressive assessments and the final exam are conducted in the in-contact form. However, in cases depending on the current external conditions determined by the published legal acts, the form of evaluation tests as well as the exam will be modified from the in-contact form to the remote form, applying either Moodle platform or MS Teams platform. In such a case, the evaluation tests and the exam will be conducted in the form of a **multiple-choice test**. The students will be informed in advance about the changes regarding the evaluation tests and the exam. Otherwise, the tests will be carried out in the in-contact form with open-ended questions.
- 3 progressive assessments per semester are scheduled at the beginning of the course and are carried out in the in-contact form. Each written progressive assessment consists of 6 open questions (2 points per question), maximum grade 12 points. The knowledge that student acquired by participating in lectures and practical classes will be evaluated. The scope of the material for the partial written assessments will be given at the beginning of the semester. There is 1 retake for each assessment. The same criteria apply to both terms (1 and 2).

The grade obtained from three partial written assessments (average of positive grades) constitutes 75% of the grade admitting to the final exam.

Possible grades to obtain from one assessment	
Grade	Number of points
5	12
4.5	11
4.0	10
3.5	8-9
3.0	7
2	6,5 or less

Seminar – evaluation of student activity

One per semester individually prepared and presented multimedia presentation. The presentation should be composed on the basis of materials provided by the teacher or based on materials of his choice, accepted by the teacher; the topic concerns a seminar subject. Assessment based on the presentation of information on the subject, correct reasoning and participation in the discussion. The grade obtained in the seminar part constitutes 25% of the final grade admitting to the exam

Final exam

Only those students, who participated in the practical classes and obtained a positive grade (grade at least 3.0) from three partial written tests and a positive grade from the seminar presentation, will participate in the final exam. The final grade admitting to the final Immunology exam is the result of grades for partial tests (75%) and assessment of student activity (25%).

The final exam consists of 8 open questions (maximum 2 points per question) and includes the knowledge the student acquired during lecture, practical classes and seminar throughout the semester. It is possible to obtain 16 points during the exam. There is foreseen one retake with the same criteria applied for both deadlines. In case of excused absence at the final exam, the student does not lose the deadline.

Grades from the final exam	
Grade	Number of points
5	15-16
4.5	13-14
4.0	11-12
3.5	9-10
3.0	8.5
2	8 or less

No extra assessment methods are anticipated.

	In case of unforeseen, unusual circumstances mandatory remote teaching and remote assessment methods might be adopted.														
Formal documentation of learning outcomes:	Entry in the EHMS and Immunology course documentation: individual student evaluation cards, attendance lists, sets of questions for written partial assessments and the final exam, signed students written test, and signed students written final exam, Immunology course regulations)														
Elements impelling final grade:	<p>The final grade of the Immunology course consists of the grade obtained from practical classes (50%) and exam final grade (50%). There is foreseen one retake with the same criteria applied for both deadlines. In case of excused absence at the final exam, the student does not lose the deadline.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Grades to complete the Immunology course</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>4,75-5</td> </tr> <tr> <td>4.5</td> <td>4,25-4,5</td> </tr> <tr> <td>4.0</td> <td>3,75-4,0</td> </tr> <tr> <td>3.5</td> <td>3,25-3,5</td> </tr> <tr> <td>3.0</td> <td>3,0</td> </tr> <tr> <td>2</td> <td>2</td> </tr> </tbody> </table>	Grades to complete the Immunology course		5	4,75-5	4.5	4,25-4,5	4.0	3,75-4,0	3.5	3,25-3,5	3.0	3,0	2	2
Grades to complete the Immunology course															
5	4,75-5														
4.5	4,25-4,5														
4.0	3,75-4,0														
3.5	3,25-3,5														
3.0	3,0														
2	2														
Teaching base:	Lecture facilities and laboratories of the Institute of Veterinary Medicine														
<p>Mandatory and supportive materials :</p> <p>There are many reference books that should be used to supplement lectures and laboratory practicals. A wide variety of general, applied health and health profession immunology textbooks are available in the Faculty and University libraries. Various veterinary medical textbooks have large sections devoted to infectious diseases and immune response.</p> <p>The following immunology textbooks are suggested for further reading:</p> <ul style="list-style-type: none"> - Veterinary immunology. An introduction – Ian Tizard; 8th, 9th, 10th Editions (2009, 2013, 2017) - The Immune Response. Basic and Clinical Principles - Tak W. Mak and Mary E. Saunders, 2005 - Basic Immunology. Functions and Disorders of the Immune System - Abul K. Abbas and Andrew H. Lichtman, 6th Edition, 2019 - Janeway's immunobiology - Kenneth P. Murphy, Paul Travers, Charles Janeway, Mark Walport; 8th, 9th, 10th editions (2011, 2016, 2017) - Roitt's Essential Immunology - Delves P.J., Martin S.J., Burton D.R., Roitt I.M, 12th, 13th editions - Kubly Immunology, J. Punt, S. Stranford, P. Jones, J. Owen, 9th Ed, publisher by W. H. Freeman, 2018 - Relevant scientific publications, including those of the module coordinator 															
ANNOTATIONS															

*) 3 – detailed and advanced, 2 – significant, 1 – basic.

Quantitative summary of the module:

Estimated number of work hours per student (contact and self-study) essential to achieve presumed learning outcomes of the module - base for quantifying ECTS:	100 h
Total ECTS points, accumulated by students during contact learning:	2 ECTS