Module title:	Experimental immunology	ECTS	1
Polish translation:	Immunologia eksperymentalna		
Course:	**Veterinary Medicine**		

Module language: English			Stage: JM-FVM		
Form of studies: ■ intramural ☐ extramural	Type of module: ■ basic ☐ directional	☐ mandatory ■ elective	Semester: VI		☐ winter semester ■ summer semester
	Academic year:		Intake 2022/2023	Catalogue number:	FVM-V-JMSS-06S-EB03_20

Module coordinator:	**Dr hab. Kinga Majchrzak-Kuligowska**
Teachers responsible for the module:	**Academic teachers of the Institute of Veterinary Medicine; Department of Physiological Sciences; PhD students in accordance to the internal legal acts; visiting professors; other specialists in the field of study**
Objectives of the module:	During the experimental immunology course in the summer semester, a student of the Faculty of Veterinary Medicine acquires basic and advanced knowledge of the immunological experiments and protocols. During the lectures students are receiving advanced information about immune system, how to culture different types of immune cells (lymphocytes, NK cells, macrophages and dendritic cells), how to analyse immune cell subsets (i.e. using flow cytometry). Additionally, students learn about investigation of immune system in tumour microenvironment, inflammation and autoimmune diseases. The basic knowledge about flow cytometry, molecular biology and other modern techniques in immunological research is also provided. During seminars groups of students present review of scientific article concerning immunological research of their choice. Students learn how to search for scientific papers, how to present scientific results and discuss presented topics. During practical classes students participate in the research conducted in the laboratory including immune cells isolation, culture and flow cytometry analysis. <u>Lecture topics:</u> Investigation of immune system in tumour microenvironment, inflammation and autoimmune diseases. Exploit immune cells in anticancer adoptive cellular immunotherapy in veterinary medicine (2 hours); Flow cytometry analysis of immune cells (2 hours); Immune cells isolation, activation and culture in laboratory conditions (2 hours); <u>Laboratory classes topics:</u> Principles of Good Laboratory Practice for research laboratories. Isolation of different immune cell subsets in dogs. Culturing and counting of canine lymphocytes. Staining methods for flow cytometry analysis (extracellular and intracellular staining, proliferation and apoptosis staining assay, immunophenotyping). Analysis of samples on flow cytometer BD FACS Aria II (3 hours); <u>Seminars topics:</u> Recent scientific publications in the field of veterinary experimental immunology research. (6 hours); The content of the lectures supplements the content of the laboratory classes.
Teaching forms, number of hours:	a) Lectures; hours 6 ; b) Laboratory classes; hours 3; c) Seminars; hours 6;
Teaching methods:	**Lectures**: multimedia presentations by dr hab. Kinga Majchrzak-Kuligowska (see above - description of lectures) **Laboratory classes:** students participate in groups of 2-3 on laboratory research; introduction to the rules of Good Laboratory Practice at scientific laboratory, making notes from performed experiments including culture and counting of canine immune cells, isolation of immune cells, flow cytometry analysis of immune cells **Seminars**: students individually or in groups of 2-3 work out issues in experimental immunology based on recent scientific papers and present them in the form of a public presentation. Then the presentation is discussed in the group forum, moderated by the teacher. 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.
Formal prerequisites and initial requirements:	Required credits for the subjects: animal physiology (1) and (2), immunology, Veterinary pharmacology 1 Pathomorphology 1

Learning effects		Course outcomes:	Learning outcomes relative to the course outcomes	Impact on the course outcomes*
Knowledge:	1	knows the differences between immune cells subsets and their function in inflammation process, tumour microenvironment and autoimmune diseases	B.W1,	1
	2	knows the principles and staining methods for flow cytometry analysis and basic techniques for immunological assessments	B.W1, B.W6,	3

	3	knows the methods of immune cells isolation, activation and culture in laboratory conditions	B.W1,	2
Skills:	1	can explain the principles and requirements of immunological research studies	B.U6	2
	2	can analyze information from publicly available databases, especially scientific papers	B.U6	2
	3	can perform a simple staining of immune cells for flow cytometry analysis, count immune cells, handle immune cells in the laboratory condition	B.U6	2
Competences:	1	is ready to evaluate and interpret the functioning of the immune cells in the context of antitumor immune response and inflammation	KS.4, KS.5	2
	2	is ready to critically analyse scientific papers, present it and discuss it among his peers	KS.4, KS.7, KS.8, KS.9	3
	3	uses scientific sources to expand and updates his knowledge	KS.8	2

Objectives of the module required to obtain learning effects:	Familiarize students with the methods of searching for current scientific knowledge Developing the ability to present scientific information through presentations on the selected topics from the experimental immunology field Familiarize students with the methods of immune cells isolation, activation and culture in laboratory conditions Familiarize students with the principles and staining methods for flow cytometry analysis and basic techniques for immunological assessments Transfer of knowledge in the field of current veterinary experimental immunology
Assessment methods:	Test (written or computer based) - 75% Presentation of scientific paper - 20% Assessment of work in the laboratory - 5% In case of unforeseen, unusual circumstances mandatory remote teaching and remote assessment methods might be adopted.
Detail description of assessment methods; Formal documentation of learning outcome:	**Test**: Students are required to complete the test at the end of semester (test contains 15 test questions, 1 point per question; 8 points necessary to pass the test). The retake of the test is in the same form. For the test all material from the lectures and seminar as well as relevant material from supportive literature applies. **Presentation**: Each student is required to prepare and deliver a presentation during the seminar classes. The seminars are concerning topic of chosen scientific publication. Seminar topics are proposed by the teacher in the form of the list of newest scientific publication to be analysed. Students select one publication from the proposed pool according to their interests or propose their own seminar topic, that need to approve by the teacher. Students work on the one publication individually or in the small group (2-3 persons). Positive evaluation of the seminar is one of the conditions for passing the semester. The seminar is scored on a scale of 0-5 points (explanation of the scientific topic of the publication, appropriate description of scientific background, discussion of results, manner of presentation, formulation of opinions, conducting discussions, appropriate answers to questions). **Laboratory class:** The student is required to participate in the research conducted in the laboratory and take notes from the experiments performed, in accordance with the instructions of the teacher. At the end of the class, the teacher checks laboratory notes and asks verification questions. The condition of passing the classes is the teacher's approval of the individual laboratory notes prepared by the student during laboratory class. No extra assessment methods are anticipated. eHMS entry. Records collected in the course portfolio i.e. individual records of student results, presence lists, database of oral and written questions, written assessments of the students.
Elements impelling final grade:	**Final grade:** During the semester, the student may receive a maximum of 20 points (15 points from the test; a minimum of 8 points is required) and a seminar (max. 5 points) + additional points for activity (discussion, answers to questions, completion of tasks) - max. 3 points. Student must get a minimum of 51% of points to pass the semester (excluding points for activity). Criterion for issuing the final grade: 10.5 - 12 points - satisfactory (3.0) 12.5 - 14 points - satisfactory plus (3.5) 14.5 - 16 points - good (4.0) 16.5 - 18 points - good plus (4.5) 18.5 - 20 points - very good (5.0)
Teaching base:	Classrooms and laboratories of the Department of Physiological Sciences. No. 238, 239 and 209 (building 24)

Mandatory and supportive materials :
1. Day Michael J. Veterinary Immunology. Principles and Practice 2014 by CRC Press
2. Callahan Gerald N. Basic Veterinary Immunology, University Press of Colorado, 2014
3. the National Center for Biotechnology Information database - www.pubmed.com
4. Materials provided by teacher i.e. flow cytometry protocols
Relevant scientific publications including those of the module coordinator.

ANNOTATIONS Lab coat is required during laboratory classes. Maximum of 12 students per course.

* 3 – complete and detailed, 2 – moderate, 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:	**30 h**
Total ECTS points, accumulated by students during contact learning:	**1 ECTS**