



# Pomeranian Medical University in Szczecin

## SYLLABUS of the MODULE (SUBJECT) General Information

Code	LK.3.C.001	Title	Immunology
Module type			<i>Obligatory</i>
Faculty			<i>Faculty of Medicine (WLA)</i>
Field of Study			<i>medicine (KL)</i>
Major			<i>Not applicable</i>
Level of study			<i>II level/ long-cycle (2J)</i>
Mode of study			<i>intramural</i>
Year of Study			<i>II</i>
Semester			<i>winter</i>
ECTS points			<i>4</i>
Form of classes			<i>seminars/practical classes</i>
Tutor responsible for the module			<i>Bartosz Wojciuk MD, PhD e-mail: barciuk@interia.pl</i>
Tutors conducting the subject			<i>Title/degree/ e-mail address Iwona Koszko-Wojciechowska PhD/IwonaKoszko@interia.pl Barbara Krasnodębska-Szponder PhD/kapibarka1@wp.pl Paulina Roszkowska PhD/paulinaroszkowska@poczta.fm</i>
WWW			<a href="http://www.pum.edu.pl">www.pum.edu.pl</a>
Language			English

## Detailed information

<b>Module objectives</b>		Explanation of basic and clinical immunology issues, in particular: mechanisms of proper immune reactions as well as immune system disorders, prevention and treatment of immune-mediated diseases, principles of immunological laboratory diagnostics.
<b>Prerequisite /essential requirements</b>	Knowledge	Lymphoid organs histology, protein translation, principles of intracellular signal transduction at the level of secondary school graduate.
	Skills	Microscope operating, biological samples safe handling.
	Competences	Integration of the knowledge obtained on other preclinical courses.

Description of the learning outcomes for the subject /module			
Number of learning outcome	Student, who has passed the (subject) Knows /is able to /can:	SYMBOL (referring the standards) EKK	Method of verification of learning outcomes
W01	Knows the basic concepts of genetics.	C.W.1	Test
W02	Describes the phenomena of coupling and genes cooperation.	C.W.2	Test
W03	Knows genetic conditions of human blood groups and Rh complex serologic incompatibility.	C.W.6	Test
W04	Knows principles of diagnostics of genetical and chromosomal mutations responsible for hereditary diseases, including tumors.	C.W.9	Test
W05	Knows influence of abiotic and biotic environmental factors (viruses, bacteria) on human body and population and ways they penetrate to human organism; is able to describe consequences of exposure to different chemical and biological agents and the rules of prophylaxis.	C.W.14	Test
W06	Knows the bases for disinfection, sterilization and aseptic procedures.	C.W.19	Test
W07	Knows the principles of immune system development and function including innate and adaptive, cellular and humoral immunity.	C.W.20	Test
W08	Describes major histocompatibility complex.	C.W.21	Test
W09	Knows the types of hypersensitivity, sorts of immune deficiencies and the principles of immunomodulation.	C.W.22	Test, Individual protocol
W10	Knows the issues of tumor immunity.	C.W.23	Test, Individual protocol

W11	Recognizes the genetic background of graft donor-recipient matching and the principles of transplant immunology.	C.W.24	Individual protocol
W12	Knows patomorphological terminology.	C.W.25	Test
W13	Knows the basic mechanisms of cells and tissues injury.	C.W.26	Test
W14	Recognizes the clinical course of specific as well as nonspecific. inflammation, describes the mechanisms of the cells and tissues regeneration.	C.W.27	Individual protocol
U01	Applies the current modifications of an antigen-antibody reaction in the diagnostics of contagious, allergic, autoimmune diseases, haematological diseases and solid tumors.	C.U.8	Individual protocol
U02	Analyzes reactive, defensive and adaptive phenomena as well as regulation disturbances released by etiological agent.	C.U.12	Individual protocol
K01	Systematically develops skills and knowledge aiming at full professionalism.	D.K.2	Individual protocol
K02	Honestly performs professional tasks.	D.K.6	Individual protocol

**Matrix presenting the learning outcomes of the subject/module in relation to the form of classes**

Number of learning outcome	Student, who has passed the (subject) Knows /is able to /can:	types of courses							
		Lecture	Seminar	Laboratory classes	Project work	Clinical classes	classes	Practical classes	Other
W01	Knows the basic concepts of genetics.		X					X	
W02	Describes the phenomena of coupling and genes cooperation.		X					X	
W03	Knows genetic conditions of human blood groups and Rh complex serologic incompatibility.		X					X	
W04	Knows principles of diagnostics of genetical and chromosomal mutations responsible for hereditary diseases, including tumors.		X					X	
W05	Knows the impact of biotic and abiotic factors on an individual as well as the population, knows the ways of ingestion into the organism, describes the consequences of the exposure to different chemical and biological factors, knows the principles of prophylaxis.		X					X	
W06	Knows the bases for disinfection, sterilization and aseptic procedures.		X					X	
W07	Knows the principles of immune system development and function including innate and adaptive, cellular and humoral immunity.		X					X	

W08	Describes major histocompatibility complex.		X					X	
W09	Knows the types of hypersensitivity, sorts of immune deficiencies and the principles of immunomodulation.		X					X	
W10	Knows the issues of tumor immunity.		X					X	
W11	Recognizes the genetic background of graft donor-recipient matching and the principles of transplant immunology.		X					X	
W12	Knows patomorphological terminology.		X					X	
W13	Knows the basic mechanisms of cells and tissues injury.		X					X	
W14	Recognizes the clinical course of specific as well as nonspecific inflammation, describes mechanisms of the cells and tissues regeneration.		X					X	
U01	Applies the current modifications of an antigen-antibody reaction in the diagnostics of contagious, allergic, autoimmune diseases, haematological diseases and solid tumors.							X	
U02	Analyzes reactive, defensive and adaptive phenomena as well as regulation disturbances released by etiological agent.							X	
K01	Systematically develops skills and knowledge aiming at full professionalism.							X	
K02	Honestly performs professional tasks.							X	

Module (subject) contents		
Symbol of teaching programme	Content of teaching programme	Reference to learning outcomes
KL2JPW01	<p><b>Humoral mechanisms of innate immunity.</b>  <u>Immunity</u>: innate and adaptive (acquired), active and passive, specific and nonspecific, natural and artificial, cellular and humoral. Immunity and immune response.  <u>The lymphoid system</u>: primary (central) and secondary (peripheral) lymphoid organs, circulation of lymphocytes.  <u>Cells of the immune system</u> and their functions: stem cells, B, T, NK lymphocytes, macrophages, granulocytes, dendritic cells, mast cells, platelets.  Soluble mediators: complement, antibodies, cytokines, interferons, inflammatory mediators.  <u>Innate immunity</u>: exterior defences and physical and biochemical barriers, the role of normal flora, nonspecific factors humoral (complement, interferones, lysozyme, lactoferrin, C-reactive protein, heat shock proteins..) and cellular (mononuclear and polymorphonuclear phagocytes, NK cells).  <u>Complement</u>: classical and alternative pathways, biological effects (vascular permeability increasing, chemotaxis, neutrophils activation, opsonization, lysis). Complement receptors.</p>	W01, W02, W06, W07, U01, U02, K01, K02

KL2JPW02	<p><b>Cellular mechanisms of innate immunity.</b>  <u>Phagocytosis</u>: migration and chemotaxis of phagocytes, adhesive molecules (integrins, selectins), chemotactic factors (complement proteins, chemokines), phagocytes receptors, opsonization, ingestion, digestion (killing), oxygen-dependent and oxygen-independent killing activity. Pathological barrier - inflammation.</p> <p><u>Natural cytotoxicity</u> – NK cells characteristic and function.</p>	W01, W02, W07, U01, U02, K01, K02
KL2JPW03	<p><b>Cellular mechanisms of adaptive immunity.</b>  <u>Antigen</u>, hapten, chemical structure, thymus-dependent and thymus-independent antigens, heterophilic antigens, cross-reactivity, superantigens. Antigenic determinants epitopes, immunogenicity, specificity.  <u>The main phases of the immune response</u>: induction (recognition of antigen), central phase (activation, clonal selection and proliferation of T and B lymphocytes), effector phase (antigen elimination mediated by antibody and effector cells).  <u>Lymphocytes</u>: subpopulations: B (B1, B2), T (Th1, Th2, Ts, Tc), NK, NC, CD markers, receptors for antigen (B-Ig, T – TCR), circulation of lymphocytes.  <u>Processing and presentation of antigen</u>, antigen presenting cells.  <u>Adaptive cellular response</u>: cell-mediated cytotoxicity (recognition of antigen: T CD8 – I class MHC restriction), delayed type of hypersensitivity (T CD4 – II class MHC restriction, effector phase – activated macrophage)..</p>	W01, W02, W07, U01, U02, K01, K02
KL2JPW04	<p><b>Humoral mechanisms of adaptive immunity.</b>  <u>Adaptive humoral response</u>: B lymphocytes recognition, T and B cooperation in the antibody response, plasma cells – antibody production, primary and secondary humoral response.  <u>Antibodies</u>: structure, Fab and Fc role, sequence differences (isotypic, allotypic, idiotypic, paratop), biological functions, Fc receptors on cells, monoclonal and idiotypic antibodies, specificity, affinity, avidity, cross-reactivity. Types of immunoglobulins.  <u>Antigen-antibody interactions</u>: in vivo – neutralization, immunological complexes, opsonisation, lysis; in vitro – agglutination, precipitation.  <u>Cooperation of specific humoral and cellular response</u>: immunophagocytosis, antibody dependent cellular cytotoxicity (ADCC) – NK CD16, macrophages, neutrophils  Useful (defense against infections, pre-cancer growth control) and damaging (allergy, autoimmunity, transplant rejection) effects of specific response.  <u>The immune system of skin and mucosa</u>- SALT, MALT- GALT, NALT, BALT -similarity and diversity, food tolerance.  <u>Regulation</u> of the immune response (the role of complement, antigen, immunoglobulins, T-cell antigen receptors, idiotypic antibodies). Neuroendocrine-immune interactions. Immunological tolerance, mechanisms. The cytokines network.</p>	W01, W02, W07, U 01, U02, K01, K02

KL2JPW05	<b>Immunological diagnostics.</b> Basic and combined serological assays – procedure, mode of action, result interpretation, advantages and disadvantages: slide and tube agglutination, ring precipitation, double gel diffusion, radial diffusion, lytic test, complement fixation test, IF, RIA, Elisa, immunoblotting.	W07,U01,U02, K01,K02
KL2JPW06	<b>Primary immunodeficiencies:</b> B-cell dependent , T-cell dependent, defects in complement proteins and in phagocytes. <b>Secondary immunodeficiencies:</b> caused by drugs, nutrition, other diseases (AIDS). Infections typical for different types of immunodeficiency.	W01, W02, W07, W09, W12, W13, W14,U01,U02, K01,K02
KL2JPW07	<b>Hypersensitivity.</b> Mechanisms of hypersensitivity. Early reactions: type I – anaphylaxis, allergens, IgE antibody, IgE receptors,involved cells (mast cells, basophiles), mediators, clinical effects (hay fever, asthma, eczema, anaphylaxis); type II – cytotoxic and cytolytic reactions (posttransfusion, drug-induced reactions); type III – immune-complex diseases (Arthus reaction, serum sickness); late reactions: type IV – tuberculin (bacterial allergy, contact hypersensitivity)	W01, W02, W03, W07, W09, W12, W14,U01,U02, K01,K02
KL2JPW08	<b>Autoimmunity.</b> Immunological memory and tolerance. Autoimmunity: autoantigens, autoantibodies, factors inducing disorders of self-antigens tolerance. Mechanisms of autoimmune diseases arising – type II and III hypersensitivity, influence of genetic factors, specificity of autoimmune response – organ-specific and non organ-specific diseases. Antigenic mimicry (rheumatic fever). Positive role of IgE, autoimmunity and tolerance.	W0, W02, W07, W09, W12, W13, W14,U01,U02, K01,K02
KL2JPW09	<b>Ontogeny and phylogeny of the immune system.</b> <b>Infection immunity.</b> <u>Phylogenesis and ontogenesis</u> of the immune system: development and maturation of the immune system: fetus, newborn, child, adult, old age, immunobiology of aging. Species – dependent, individual and other immunity-affecting factors. Immune response for different antigens. Types of infections and parasites: obligatory intracellular parasites, facultative intracellular parasites, extracellular parasites. The role of particular mechanisms of specific and nonspecific defense in infections caused by: bacteria (immune response to extracellular and intracellular bacteria, bacterial evasion of host-defense mechanisms), fungi, viruses (viral neutralization by antibody, cell-mediated and humoral antiviral mechanisms), protozoa and worms.	W05, W06, W07, W13, W14,U01,U02, K01,K02
KL2JPW10	<b>Transplantation immunology.</b> General organization and inheritance of the MHC/HLA complex, transplantation antigens HLA class I and II, bone marrow transplants, organ transplants, relationship between the donor and recipient, immunologic mechanisms involved in allograft rejection graft-versus-host response (GVHD). HLA antigens and susceptibility to diseases.	W01, W02, W07, W08, W11, W12, W13, W14,U01,U02, K01,K02

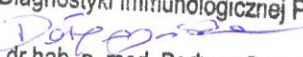


KL2JPW11	<p><b>Immunoprophylaxis, immunomodulation, immunotherapy.</b></p> <p><u>Active immunization:</u> types of vaccines – whole organisms inactivated and attenuated, purified molecules (toxoids, capsular polysaccharide, surface antigens), recombinant antigen vaccines, DNA vaccines; recommended vaccinations, vaccinations in risk groups. Adjuvants. Non-specific vaccines and immunotherapy (cytokines).</p> <p><u>Passive immunization:</u> indications, complications.</p> <p><u>Active immunization:</u> types of vaccines – whole organisms inactivated and attenuated, purified molecules (toxoids, capsular polysaccharide, surface antigens), recombinant antigen vaccines, DNA vaccines; recommended vaccinations, indications and contraindication and side effects. Vaccinations in groups of risk. Adjuvants - mechanism of action. Recommended vaccines - group of risk</p> <p><u>Passive immunization:</u> indications, complications.</p> <p><u>Autovaccines</u>– indications, way of administration.</p> <p><u>Desensitization:</u> vaccines used in the atopic diseases.</p> <p>Non-specific vaccines and immunotherapy (cytokines). Nonspecific immunotherapy (bacterial, plantal, cytokines), immunosuppression.</p>	W03, W05, W06, W07, W13, W14, U01, U02, K01, K02
KL2JPW12	<p><b>Tumor immunology and immunology of reproduction. Immunological diseases diagnostic procedures.</b></p> <p><u>Cancer and the immune system:</u> malignant transformation of cell, oncogens and cancer induction, tumor antigens, differentiation of tumor-antigens, human immune response to tumor and escape mechanisms. Immunotherapy of tumors.</p> <p><u>Immunology of reproduction:</u> immunological base of infertility in man and woman, gravidity as an allogenic transplant, pregnancy maintenance, pregnancy loss, immunotherapy of recurrent abortions.</p>	W01, W02, W03, W04, W07, W10, W12, W13, W14, U01, U02, K01, K02
KL2JPW13	<p><b>Diagnostics of immune diseases – case reports</b></p> <p>Analysis of clinical cases of immunological disorders.</p>	W01, W02, W07, W09, W12, W13, W14, U01, U02, K01, K02
KL2JPW14	<b>Repetition</b>	W01, W07, W09, W10, W12, W13, W14, U01, U02, K01, K02
KL2JPW15	<b>Absences making up.</b>	W01, W07, W09, W12, W13, W14, U01, U02, K01, K02
<b>References and educational resources</b>		
1. David Male, Jonathan Rostoff, David Roth, Ivan Roitt, Immunology, ed. 8, Elsevier, 2008		

Form of student's activity (in-class participation; activeness, produce a report, etc.)	Workload [h]		
	Tutor	Student	Average
Activities that require direct participation of tutors		55	
Preparation to the classes		60	
Reading of the indicated/specified literature		10	
Report writing/project making		10	
Time spent to prepare for the exam		10	
Other		0	
Student's workload in total		145	
ECTS points for the subject	4		
Remarks at the end			

**Methods of assessment, for example:**

E – exam- problem resolving  
S – verifying of practical skills  
R – report  
D – discussion  
P – presentation  
Others-

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