Module name	**Molecular mechanisms of defense**
Module code	B-BTO.080
ISCED code	
Study cycle	II^{o}
Semester	Summer semester
Responsible for this module	dr hab. Iwona Wojda, prof. UMCS (wojda@poczta.umcs.lublin.pl)
Language of instruction	English
Website	
Prerequisites	Basic knowledge in biochemistry and zoology
ECTS	4.0
ECTS points hour equivalents	Contact hours (work with an academic teacher) – lecture (15 hrs), laboratory (30 hrs), consultations (5 hrs) Total number of hours with an academic teacher – 50 hrs Number of ECTS points with an academic teacher – 2.5 Non-contact hours (students' own work) – preparing to classes, including study of recommended scientific papers (10), preparing to exam (20 hrs) Total number of non-contact hours – 30 hrs Number of ECTS points for non-contact hours – 1.5 **Total number of ECTS points for the module – 4.0**
Educational outcomes verification methods	written exam (lecture), continuous evaluation of the laboratory classes
Description	The module covers the knowledge in the area of immunology on molecular level. Antagonist host-pathogen co-evolution. Main features of innate and adaptive immunity. Antimicrobial peptides as elements of innate immunity: division and main mechanisms of action. Co-stimulation of lymphocytes: Janeway, Matzinger and integrative models. Bacterial CRISP/Cas system and its usage in genetic engineering. Celomocytes and bioactive compounds in annelids. Extracellular traps as the way of pathogen entrapping. Molecular associated molecular patterns (PAMPs) and pattern recognition particles (PRRs). Biotechnological aspects of research concerning insect immunity. Signaling pathways regulating insect immune response and their homology to human pathways. Mechanisms and immune role of hemolymph coagulation. Biotechnological usage of hemolymph coagulation in horseshoe crab- Limulus test. Diversity of receptors and different way of "remembering infection" in invertebrates. Molecular mechanisms of diversity of Dscam receptors in insects, VLR receptors in jaweless vertebrates, diversity or antibodies and T-cell receptors in mammals. Characteristic of fibrinogen related proteins and particles binding pathogens. The use of in vivo RNA interference for investigation immunity mechanisms.
Reading list	recommended review papers of the current scientific literature.
Educational outcomes	**KNOWLEDGE**

	The student has knowlege of essential mechanisms of defense in different organisms: from one-cellular bacteria, through invertebrates and vertebrates. Can distinguish between innate and adaptive immunity knows the currents knowledge concerning innate immune priming. Knows examples of the use of molecular defense mechanisms in biotechnology. **SKILLS** The student can use integrative knowledge to compare molecular defense mechanisms and virulence mechanisms of pathogens in the light of molecular, host-pathogen arm-races. **ATTITUDES** The student understands the need for continuous updating of knowledge.
Practice	

Information about classes in the cycle

Website	
Educational outcomes verification methods	continuous evaluation of the laboratory classes
Comments	
Reading list	recommended papers of the current scientific literature
Educational outcomes	**KNOWLEDGE** Student knows and understands the techniques and methods used in research on molecular defense mechanisms. **SKILLS** The student applies the techniques and methods used in research on molecular mechanisms of defense, properly uses laboratory equipment and properly interprets the empirical data. **ATTITUDES** The student follows ethical principles.
A list of topics	*Galleria mellonella* (Lepidoptera) as a model organism (isolation of fat body; microscopic observation of hemocytes). Analysis of phenoloxidase activity in hemolymph of naive and immune-challenged insects. Detection of antimicrobial activity (lysozyme, defense peptides) in *G. mellonella* hemolymph. The role of proteases of entomopathogenic bacteria in overcoming the insect immune response.
Teaching methods	practical laboratory, presentation, discussion
Assessment methods	continuous evaluation