



Subject card

Subject name and code	MOLECULAR VIROSOLOGY, PG_00063477						
Field of study	WIRUSOLOGIA MOLEKULARNA						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	second-cycle studies		Subject group		Optional subject group Specialty subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Biotechnology and Microbiology -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Beata Zalewska-Piątek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		2.0		18.0	50
Subject objectives	The aim of the course is to familiarize students with basic issues related to molecular virology, such as the mechanisms of pathogenicity of animal and plant viruses, unusual subviral factors and the use of bacteriophages in medicine and biotechnology.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_K02] is aware of the potential risks and opportunities associated with the development of science and technology for the natural environment and society		The student analyzes the potential threats and benefits of scientific and technological development, with particular emphasis on the risk of global epidemics associated with newly emerging viral infections.		[SK3] Ocena umiejętności organizacji pracy [SK2] Ocena postępów pracy		
	[K7_U06] plans research and designs biotechnological products and processes taking into account legal regulations and bioethical principles		The student defines the use of phage preparations in the treatment of antibiotic-resistant bacterial infections, with particular emphasis on experimental therapy and current research trends.		[SU4] Ocena umiejętności korzystania z metod i narzędzi [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU2] Ocena umiejętności analizy informacji		
	[K7_W05] identifies crucial developments in research, apparatus and technology in biotechnology and related fields		The student analyzes available biotechnological solutions, including vaccine technologies, identifying their role in the development of modern methods of prevention and health protection.		[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym		

Subject contents	Course content – lecture LECTURE 1. Protective antiviral vaccines in the context of emerging viral diseases. 2. Atypical pathogenic forms of viruses, subviral agents (satellites, viroids, prions genetic organization, replication mechanisms, pathogenicity, examples of diseases). 3. Atypical pathogenic forms of viruses, subviral agents - prions (characteristics of prion proteins, species specificity, prion diseases, transmission of infections). 4. Bacteriophages and phage therapy as a potential method of prevention and treatment of infectious diseases in humans and animals. 5. Bacteriophages as a tool of modern biotechnology, potential applications. 6. Mechanisms of pathogenicity of plant viruses (circulating and non-circulating viruses) and animal viruses (inhibition of transcription and translation, cell membrane fusion, apoptosis, immune deficiency, immortalization, and virus-induced cell transformation mechanisms). 7. Final exam. Course content – seminar 1. Learning about viral genome sequences. Analysis of nucleotide and amino acid sequences of viral proteins. 2. Evolution of viruses. The concept of pseudotypes. Mutations, recombination, pseudorecombination, gene duplication, genetic variability of viruses, natural selection. 3. Use of the immunostimulatory and adjuvant properties of phages in cancer therapy. 4. Personalized phage therapy as a last-resort treatment for resistant bacterial infections in humans. 5. Treatment of bacterial infections using phages in transplant patients. 6. Treatment of resistant and recurrent UTIs. Mono- and polyphage therapy, genetically modified phages, combination therapy. Clinical trials determining the safety and validity of the treatment. 7. Baculoviruses as an insecticide used in plant protection. Enzootic and epizootic viral diseases. Production of viral insecticides. 8. COVID-19 vaccines: types, design, efficacy. 9. Viruses contributing to the decline in bee populations. Phenomena and mechanisms of anti-infectious immunity in honey bees. 10. Hemorrhagic fevers and tropical viruses: a contemporary challenge for infectious medicine (<i>Arenaviridae</i> , <i>Filoviridae</i> , <i>Bunyaviridae</i> , <i>Flaviviridae</i>). 11. Viral diseases of animal origin and zoonotic viruses threatening humans (rabies, avian and swine influenza, SARS, Nipah disease). 12. Global viral epidemics as a new threat to humanity (definitions, historical background, examples of contemporary viral epidemics, factors contributing to new epidemics, bioethical and social aspects). 13. Occurrence, genetic variability, and significance of Usutu virus infections. Diagnosis, specific prophylaxis, and treatment. 14. Genetic modifications of viruses (e.g., CRISPR system, homologous recombination, RNA interference system) and their potential use in the treatment of bacterial infections. 15. Orpuche virus (OROV) and Orpuche fever (routes of infection, symptoms, treatment and prevention, cases in Europe).		
Prerequisites and co-requisites	Knowledge of basic virology and molecular biology is required.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Composite assessment comprising a seminar and a lecture. Final result (%) = seminar result – presentation and class participation (%) x 0.5 + lecture – multiple-choice test (%) x 0.5.	60.0%	100.0%
Recommended reading	Basic literature	Piekarowicz, A. Fundamentals of Molecular Virology. PWN. 2021.	
	Supplementary literature	Flint S.J., Enquist L.W., Racaniello V.R., Skalka A.M. Principles of virology. ASM Press. 2009.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Antiviral vaccines. Use of bacteriophages in phage therapy and biotechnology. Prion spongiform encephalopathies, diagnostics, and potential therapy. Sequence analysis of viral genomes.		
Practical activities within the subject	Not applicable		

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