ЦЕНТЪР ЗА ОБУЧЕНИЕ – БАН

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Basic Information:

Course Title: Viruses and Immunity – Challenges and Opportunities

Lecturer: Prof. Radostina Alexandrova, PhD
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Total Teaching Hours: 30 academic hours

Annotation (up to 150 words):

The course will provide a brief overview of the biology of innate and adaptive immunity, including the cells, molecules, and mechanisms involved in cellular and humoral immune responses, as well as the systems regulating and controlling immune processes. The role of viruses in certain immunopathologies, such as hypersensitivity reactions and immune deficiencies, will also be discussed. How do viruses escape the immune response? Can they trigger autoimmune reactions? What is their role in organ and tissue transplantation? Part of the lectures will familiarize students with the application of immunological, molecular biological, and genetic methods in experimental and clinical virology. Special attention will be paid to the challenges posed by emerging viruses, epidemics, and pandemics, as well as to the opportunities and prospects of nonspecific and specific immunoprophylaxis and immunotherapy of viral infections.

Course content (brief description by topics or modules):

Topic / Module 1: General overview of the structure and function of the immune system. Central and peripheral lymphoid organs. Antigens and antibodies. Major histocompatibility complex. Immune response. Types. Kinetics of the immune response – 1 hour

Topic / Module 2: Main cell populations of the immune system – 1 hour

Topic / Module 3: Molecules involved in intercellular interactions. Receptor molecules. Adhesion molecules. Cytokines – 1 hour

Topic / Module 4: Nonspecific immune factors. Physiological barriers. Cellular populations. Humoral factors. Complement system. Viruses and interferon – 1 hour

Topic / Module 5: Antibody-dependent and cell-mediated immune response. Immune inflammation – 1 hour

Topic / Module 6: Characteristics of antiviral immune response. Viral immune evasion. Viruses and cell death. Apoptosis and autophagy – 1 hour

Topic / Module 7: Immunological tolerance and autoimmune reactions. Viruses and autoimmunity – 1 hour

Topic / Module 8: Immunodeficiencies. HIV and AIDS – 1 hour

Topic / Module 9: Participation of viruses in hypersensitivity reactions – 1 hour

Topic / Module 10: Transplantation immunity. Viruses and transplantation – 1 hour

Topic / Module 11: Tumor immunology. Oncogenic viruses and immunity. Tumor cell evasion from immune response – 1 hour

Topic / Module 12: Microbiome / Virome – 1 hour

Topic / Module 13: Antibody-dependent enhancement (ADE) of immune response – 1 hour

Topic / Module 14: Immunological and molecular biological/genetic methods in virology. Molecular epidemiology – 2 hours

Topic / Module 15: Emerging and re-emerging viruses. Epidemics and pandemics. Origins of new viruses. Climate change and infections – 4 hours

Topic / Module 16: Lessons from the COVID-19 pandemic. The avian influenza A (H5N1) panzootic. Challenges on the horizon (Ebola disease, hantaviruses, henipaviruses, etc.). The (un)known arboviruses. Disease X – 3 hours

Topic / Module 17: Specific and nonspecific immunoprophylaxis and immunotherapy of viral infections. Sera. Monoclonal antibodies. Vaccines. Adjuvants. Immunoglobulin preparations. Interferon – 5 hours

Topic / Module 18: Synthetic biology and the synthetic human genome: challenges and hopes – 1 hour

Topic / Module 19: Viruses as vectors for gene therapy – advantages and disadvantages. Oncolytic viruses in cancer treatment – 2 hours

Teaching and assessment methods:
Written assignment and oral interview

Competencies acquired as a result of training (3–5 points):
Updating and expanding knowledge in the fields of virology, immunology, infectious immunity, and molecular epidemiology; understanding the lessons learned from pandemics humanity has experienced and the challenges of the present time, as well as the preparedness of the scientific community to address them.

Literature:

- Lectures continuously updated based on new scientific publications
- *Clinical Immunology. Student Guide.* Edited by Elisaveta Naumova, Central Medical Library, Medical University of Sofia, 2021.
- *Clinical Virology.* Edited by S. Dundarov, D. Dundarova, R. Argirova, V. Rusev. Medicina i Fizkultura, Sofia, 2009.
- *About Vaccines.* R. Argirova, R. Komitova. Medicina i Fizkultura, Sofia, 2012.
- *Manual of Molecular and Clinical Laboratory Immunology*, 8th Edition. Barbara Detrick, Robert G. Hamilton, John L. Schmitz (Editors). Wiley, 2016. ISBN: 978-1-555-81871-5
- *Cellular and Molecular Immunology*, 9th Edition. Abul Abbas, Andrew Lichtman, Shiv Pillai. Elsevier, 2017.
- *Roitt's Essential Immunology*, 13th Edition. Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley-Blackwell, 2017. ISBN: 978-1-118-41577-1
- *Kuby Immunology*, 8th Edition. Jenni Punt, Sharon A. Stranford, Patricia P. Jones, Judith A. Owen. W. H. Freeman and Company, 2019.
- *Janeway's Immunobiology*, 9th Edition. Kenneth Murphy, Casey Weaver. Garland Science, Taylor & Francis Group, 2017.
- *Immunology for Medical Students*, 4th Edition. Matthew Buckland. Elsevier, 2026.

- *Fields Virology* (Two Volumes), 4th Edition. Edited by Bernard N. Fields et al. Lippincott Williams & Wilkins, 2001.
- *Principles of Molecular Virology*, 4th Edition. Alan J. Cann. University of Leicester, UK, 2005. ISBN: 0-12-088787-8
- *Encyclopedia of Virology*, 3rd Edition, 2007.
- *Viral Genome Replication.* Editors: Craig E. Cameron, Matthias Götte, Kevin D. Raney. Springer, 2009. e-ISBN 978-0-387-89456-0
- *Plotkin's Vaccines*, 7th Edition. Elsevier, 2017.