

Advanced Lectures in Molecular Medicine (Molecular Medicine, Master of Science)

Part 1: „Immunology“

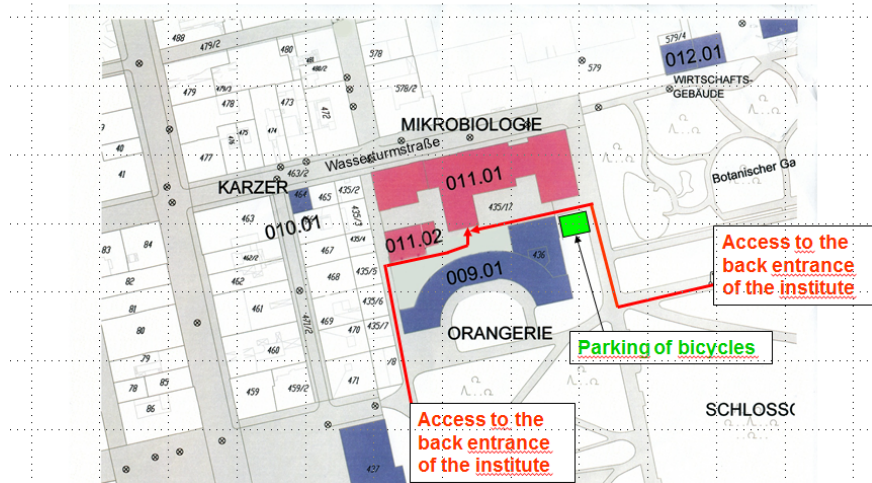
Seminar room (2nd floor), Institut für klinische Mikrobiologie, Immunologie und Hygiene, Wasserturmstraße 3, 91054 Erlangen

(entrance: Schlossgarten, opposite of the Orangery building)

Please note that in accordance with the hygiene rules of FAU and the Bavarian government the lectures in the winter term 2021/2022 will be given in person.

The lectures will take place every Thursday from 2.15 p.m. until 3.45 p.m., except for October 21, when the lecture will start only at 2.45 p.m.

Access to the seminar room of the Institute of Clinical Microbiology, Immunology and Hygiene



Lectures	Lecturer	Date
1. Introduction: Evolution – Components – Function – Dysfunction <ul style="list-style-type: none"> • Evolution of the immune system • Tissues, cells, humoral components and functional anatomy of the immune system (including historical account) • Overview: Function of the immune system (anti-infectious defense – anti-tumor-defense – transplant rejection) • Overview: Dysfunction of the immune system (Autoimmunity – Autoinflammation – Immunopathology – Allergy - Immunodeficiency) 	CB	21.10.2021 (please note that this lecture will start on 2.45 p.m.)
2. The anti-infectious immune response (II): The basics of innate immunity <ul style="list-style-type: none"> • dermal and epithelial barriers • soluble factors: complement, cytokines, chemokines • myeloid cells: types, development, diversity (granulocytes, macrophages, dendritic cells) • concepts of pathogen recognition; pathogen recognition receptors • antimicrobial effector functions of phagocytes • natural killer cells, innate lymphoid cells • principles of innate antiviral responses (type I IFNs) 	CB	28.10.2021 (2.15 p.m.)
3. The anti-infectious immune response (I): The basics of T cell-mediated immunity <ul style="list-style-type: none"> • principle modes of thymic T cell development 	DV	04.11.2021 (2.15 p.m.)

<ul style="list-style-type: none"> • antigen processing and presentation by MHC molecules • signals for T cell activation (TCR signaling, costimulatory molecules, cytokines; signals 0, 1, 2, 3) • T cell differentiation and T cell subpopulations (CD4; CD8; Th1, Th2, Th17, Tregs; memory T cells) • Functions of T cells (B cell help [follicular T helper cells]; macrophage activation [IFN-g, TNF]; cytotoxicity; regulatory) 		
<p>4. The anti-infectious immune response (III): The basics of B cell- and antibody-body mediated immunity</p> <ul style="list-style-type: none"> • principles of B cell- and plasma cell development; B cell-driving cytokines • types and functions of B cells (B1a, B1b; innate response activator B cells; B2; follicular B cells; marginal zone B cells; B cells with regulatory function; memory B cells) • long-lived plasma cells • antibody diversification and affinity maturation • antibody classes and functions • signals for B cell activation (T cell-dependent vs. –independent antigens), BCR signaling 	DV	11.11.2021 (2.15 p.m.)
<p>5. Methods for phenotypic and functional characterization of immune responses</p> <p>5.1. in vitro and ex vivo methodologies</p> <ul style="list-style-type: none"> • flow cytometry and cell sorting, immunophenotyping • cell proliferation (3H, CFSE) following antigen-specific or polyclonal stimulation • mixed lymphocyte reactions • cytotoxicity assays • determination of antigen-specificity using tetramer technology • cytokine expression analysis: intracellular cytokine staining; cytokine secretion assays; ELISPOTs; ELISA • signal transduction analyses (immunoprecipitations, Western blots) <p>5.2. in vivo methodologies</p> <ul style="list-style-type: none"> • genetic mouse models (knock-out, cell-specific knockouts [Cre/lox], BAC transgenics; reporter-mice; fate-mapping) • mixed bone marrow chimeras 	DV	18.11.2021 (2.15 p.m.)
<p>6. The anti-tumor response of the immune system</p> <ul style="list-style-type: none"> • immune surveillance • tumor antigenicity • effector cytokines (type I IFNs, IFN-g, TNF) • effector cells: NK cells (activation vs. inhibition); CTLs; NKT cells; macrophages, dendritic cell subtypes • tumor associated macrophages, myeloid suppressor cells and regulatory T cells block anti-tumour immune responses 	DD	25.11.2021 (2.15 p.m.)
<p>7. Dysfunction of the immune system/immune-related diseases (I): Allergies</p> <ul style="list-style-type: none"> • Mechanisms of type I hypersensitivity reactions (IgE reactions) • role of mast cells • role of leukotrienes • atopy, allergic rhinitis, bronchial asthma, food allergies: mechanisms of disease and treatment • genetic factors 	DV	02.12.2021 (2.15 p.m.)

<p>8. Vaccination</p> <ul style="list-style-type: none"> • types of vaccines • mechanisms of vaccine-induced immunity and protection • role of B cell, plasma cell and T cell memory depending on the vaccine antigen • mechanisms of action of adjuvants (e.g. Al(OH)₃: induction of cell death and DNA release; release of uric acid; direct activation of inflammasomes) 	CB	09.12.2021 (2.15 p.m.)
<p>9. Dysfunction of the immune system/immune-related diseases (II): Autoimmunity</p> <ul style="list-style-type: none"> • central and peripheral T cell tolerance • central and peripheral B cell tolerance • organ-specific autoimmune diseases (diabetes, thyroiditis, multiple sclerosis) • systemic autoimmune diseases (rheumatoid arthritis, systemic lupus erythematoses) • mechanisms of pathogenesis (infection breaks tolerance: antigenic mimicry vs. by-stander activation, lowering T cell receptor thresholds; defective phagocytosis of apoptotic cells; TLR9-BCR-crosstalk) • mechanisms of tissue damage (type II, type III, type IV hypersensitivity) 	GK	16.12.2021 (2.15 p.m.)
<p>10. Immune-related diseases (III): Graft vs. host diseases</p> <ul style="list-style-type: none"> • principles of tissue compatibility and transplantation immunology • Autografts, isografts, allograft, xenograft • pregnancy as a case of natural transplantation (mechanisms of tolerance) • organ transplantation and transplant rejection (examples: solid organs vs. bone marrow vs. erythrocytes vs. cornea) 	DD	13.01.2021 (2.15 p.m.)
<p>11. Dysfunction of the immune system/immune-related diseases (IV): immunodeficiencies</p> <ul style="list-style-type: none"> • T cell disorders • B cell/antibody disorders • myeloid cell disorders • cytokine (receptor) deficiencies • signalling defects 	DD	20.01.2022 (2.15 p.m.)
<p>12. Dysfunction of the immune system/immune-related diseases (V): Chronic inflammatory and autoinflammatory diseases</p> <ul style="list-style-type: none"> • chronic inflammatory bowel diseases (IBD; e.g. Crohn's disease): role of genetics. vs. microbiota • autoinflammatory diseases: micromilieu triggers (e.g. gout); environmental triggers (e.g. silicosis, asbestosis); genetic (hereditary periodic fevers: gain of function mutations); inflammasomes: composition, types, function; mechanisms of inflammasome activation 	GK	27.01.2022 (2.15 p.m.)
<p>13. Termination of immune responses and immunotherapy</p> <p>13.1. Resolution of inflammation and tissue repair</p> <ul style="list-style-type: none"> • macrophage deactivation and alternative macrophage activation • regulatory T cells (and their effectors) • lipoxins, resolvins • transforming growth factor b • protease inhibitors (e.g. SLPI) • reactive oxygen and nitrogen intermediates <p>13.2. Immunotherapy of allergic, autoimmune, GvH and malignant diseases</p> <ul style="list-style-type: none"> • desensitization • Immunosuppressants (e.g. CsA, FK506, steroids, mycophenolat) • cell transfer (dendritic cells, T cells, B cells) • antibodies (biologicals) 	GK	03.02.2022 (2.15 p.m.)

<p>Written examination (joint exam together with imaging and neuroscience) 180 minutes (60 minutes per subject) mixture of MC questions and open questions (free text answers) Examination site: Seminar room of the Institut für klinische Mikrobiologie, Immunologie und Hygiene, Wasserturmstraße 3, 91054 Erlangen</p>		<p>10.02.2022 (10 a.m. until 1 p.m.)</p>
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