Module Handbook
Master "Medical Immunosciences and Infection"

Medical Faculty
of the
Rheinische Friedrich-Wilhelms-University of Bonn

As of May 24th 2022

Stand 2023-09-12

Content

Inhaltsverzeichnis

Examination dates and time are announced by the Examination Committee at the beginning of the semester according to §12. 2 and §16.3 of the Examination Regulations of 14 July (Amtl. Bek. 1716, 01 Aug. 2017).

Compulsory modules

Module Title: Methods in life sciences and statistics Module ID/Code: LIMES-001	UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	Dealing with DNA, RNA, proteins and lipids, electrophoresis, western blotting, RT-PCR, protein purification, cloning technologies, analysis of lipids, immunoprecipitation, histology, ELISA, Flow cytometry, FRET, microscopy Statistics: Basic test theory, Chi²-tests for contingency tables, t-tests, Non-parametric tests, Power calculations, Calculation rules for probabilities, Correlation, Regression, Software implementations, Graphics and visualization
Learning outcomes	Students should learn theoretical background of common techniques and methodological approaches from the area of life sciences. Additionally, students will gain an understanding of hypothesis testing and correct interpretation of different types of test statistics. They will improve their skills in statistical calculations and adequate planning of experiments. Key competences: Profound knowledge on methodology in life sciences Being able to perform statistical analysis of obtained results

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Methods in Life sciences and statistics	English	85	2 SWS	90

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	1
	Immunobiology: from molecules to integrative systems (MSc)	compulsory	1
	Biochemistry (MSc)	elective	1

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Successful participation in written exam (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) Duration: 120 min. Language examination: English	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☑	Winter and summer semester	☐	**90**	**1 term**
Summer semester	☐				

Module coordination

Module coordinator	Prof. Dr. Matthias Schmid, Prof. Dr. Christoph Thiele
Institute/Department	Institute of Medical Biometry, Medical Informatics and Epidemiology , Medical Faculty; LIMES-Institute Faculty of Mathematis and Natural Sciences

Further information

(Reading lists, information links etc.)	Recommended Reading: Reviews provided on e-Campus at the beginning of the term.

Module Title: Immunology I Module ID/Code: Immuno-001	UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	Evolution of the immune system from bacteria to higher vertebrates. Cellular and humoral components of the immune system, different model organisms, basic principles of immune responses, anti-microbial peptides, effector functions of immune cells, Pattern-associated molecular patterns (PAMPs), Damage-associated molecular patterns (DAMPs), Pattern recognition receptors (PRRs) at the cell membrane and in the cytoplasm, signaling pathways of PRRs and other receptor's signaling pathways, inflammasomes, complement system.
Learning outcomes	At the end of this module the students have acquired detailed and differentiated knowledge the cellular and humoral components of the immune system and the necessary and sufficient conditions to mount an immune response. Furthermore, they can describe current model systems and techniques used to study the immune system. Students have acquired advanced conceptual and methodological thinking skills based on the discussion of current scientific literature in immunology. Key competences: Understanding the principles of the immune system; Know the key methods and their applications; Being able to read, understand and present fundamental issues in innate immunity in a foreign language

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture		English	55	2 SWS	90
	Tutorial				1 SWS	45
	Seminar				1 SWS	45

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	1
	Immunobiology: from molecules to integrative systems (MSc)	compulsory	1

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Attendance of seminars and one oral presentation of 20.min. in literature seminar in English with an accompanying written handout/ 1 to 2 pages has to be done in Immuno-001 or MedImmun-04), (non- graded) Successful participation in written exam (graded)	6 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) in English Duration: 60 min. Language examination: English	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☑	Winter and summer semester	☐	**180 h**	**1 term**
Summer semester	☐				

Module coordination

Module coordinator	Prof. Dr. Sven Burgdorf, PD Dr. Bernhard Fuß, Prof. Dr. Felix Meissner
Institute/Department	Institute of Innate Immunity, Medical Faculty LIMES-Institute, Faculty of Mathematics and Natural Sciences

Further information	
(Reading lists, information links etc.)	Recommended Reading: Janeway's Immunobiology; Kenneth Murphy, Paul Travers, Mark Walport, Charles Janeway; New York: Garland Science, 9E, 2016 Roitt's Essential Immunology; Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt; Wiley-Blackwell 12th Edition 2011

Module Title:
Infection I

Module ID/Code: Medimmun-01

UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	This module provides students with profound knowledge in virology and microbiology. The seminar "Virology" gives an advanced insight into classification, structure and replication of viruses as well as virus ecology, emerging viruses and reservoirs. Additionally, host - virus interactions and recognition and clearance of viral infections are covered. The seminars "Microbiology" and "Parasitology" are designed to convey a sound knowledge of medical bacteriology and parasitology with an introduction into the structure of bacteria and parasites and give a broad overview of all microorganisms with relevance to human health (bacteria, fungi, parasites), their morphology, physiology, epidemiology, the treatment of infectious disease and the role of the human microbiome as well as methods used in research. The diagnostic procedures used in the clinical laboratory are addressed in the respective seminars.
Learning outcomes	At the end of this module students are able to identify and classify pathogens including viruses, bacteria and parasites. The students have acquired thorough knowledge of genomic, replicative and structural viral diversity, bacteria and parasites, and are familiar with symptoms, outcome and treatment of important human infections. Furthermore, they are able to evaluate infection research projects based on their knowledge of current scientific literature and model pathogens. Key competences: Profound knowledge on different pathogens, infection cycle and immune reaction. Being able to understand and present fundamental issues in infectiology in English. Learn how to constructively discuss in an intercultural context.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Seminar	Virology	English	20	3 SWS	120
	Seminar	Microbiology			1,5 SWS	60
	Seminar	Parasitology			1,5 SWS	60

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	1

5. Requirements for the award of credits (ECTS)		6. Credits
Required achievements	Attendance of all seminars, oral presentation of 30 min. in literature seminar in English with an accompanying written handout/ 1 to 2 pages (non- graded) Successful participation in written exam (graded)	8 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) Duration: 180 min. Language examination: English	

7. Frequency				8. Workload	9. Duration
Winter semester	☑	Winter and summer semester	☐	**240 h**	**1 term**
Summer semester	☐				

Module coordination

Module coordinator	Prof. Dr. Gabriele Bierbaum, Prof. Dr. Achim Hörauf
Institute/Department	Institute of Medical Microbiology, Immunology and Parasitology; Institute of Virology, Medical Faculty

Further information	
(Reading lists, information links etc.)	Bacterial Pathogenesis , B.A. Wilson, M.E. Winkler, 4th edition Juli 2019, Wiley & Sons Ltd// Principles of Virology: Pathogenesis and Control, Volume 1, Jane Flint, Wiley & Sons Ltd // Up to date reviews are provided on eCampus each term

Module Title: Clinical Immunology and Immunopharmacolgoy I Module ID/Code: MedImmun-02	UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	This module encompasses a series of seminars to cover mechanisms underlying inflammatory and immune-mediated diseases including sterile inflammation, allergy and auto-immunity as well as cause, symptoms, diagnosis and treatment of specific immune-mediated and inflammatory diseases. The first seminar introduces anatomy and physiology of different organs and organ systems like kidney, lung, skin, hematopoietic system, metabolic system, endocrine system, nervous system, cardio-vascular system, hepato-gastroenterological system, skeletal and locomotor system. Based on this knowledge, the seminar on specific diseases aims at elaborating causes, symptoms and treatment of specific immune-mediated and inflammatory diseases of these organs and organ systems. The seminar "Immune diagnostics" provides knowledge about methods for detecting autoantibodies, cytokines, chemokines, immune cells, inflammatory and endocrine parameters and the importance of those parameters. Finally, the seminar "Immunopharmacology" gives an overview of the immune stimulatory and immune inhibitory potential and the immune toxicity of different drugs used to manipulate immune responses, practical immunopharmacology and therapeutic drug monitoring as well as clinical studies and regulations.
Learning outcomes	At the end of this module students are acquainted with inflammatory immune diseases and basic anatomy and physiology and pathophysiology of the human body's organs and organ systems, with a special focus on immune-pathophysiology. The students can differentiate immune-mediated and inflammatory diseases based on their knowledge about symptoms and causes and know genetic, molecular and cell biological mechanisms that underlie inflammatory and immune-mediated diseases Students have acquired detailed and differentiated knowledge about the mode of action, potential and toxicity of immune modulatory drugs and can explain the advantages and disadvantages of current treatment approaches of inflammatory and immune-mediated diseases. Furthermore, students can measure medication concentrations in the blood and are familiar with the therapeutic range. They are aware of the parameters that influence the interpretation of drug concentration data and they can apply their knowledge for controlling patient compliance. Furthermore, students can apply current immune diagnostic methods to determine autoantibody titers, cytokines, chemokines, immune cells and inflammatory and endocrine parameters. Finishing this module enables students to develop ideas for translational and clinical immunology research projects. Students will have learned how to plan clinical studies according to regulations. Key competences: Understanding the role of the immune system in the development and progression of disease. Critical evaluation and presenting new literature in English. Classifying new information and combining it with current knowledge in scientific discussions. Learn how to constructively discuss in an intercultural context.

2. Teaching and learning methods

Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
Seminar	Specific immune mediated and inflammatory diseases	English	20	3,5 SWS	160
Blended learning	Basic Anatomy			1 SWS	60
Seminar	Immunopharmacology			1 SWS	35
Seminar	Immune Diagnostics			1,5 SWS	45

3. Prerequisites for the module			
compulsory	None		
recommended	None		
4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	1
5. Requirements for the award of credits (ECTS)			**6. Credits**
Required achievements	Attendance of all seminars, oral presentation of 20 min. in literature seminar in English with an accompanying written handout/ 1 to 2 pages (non- graded) Successful participation in written exam (graded)		10 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) Duration: 180 min. Language examination: English		

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☑	Winter and summer semester	☐	**300**	**1 term**
Summer semester	☐				

Module coordination	
Module coordinator	Prof. Dr. Gunther Hartmann
Institute/Department	Institute of Clinical Chemistry and Clinical Pharmacology, Medical Faculty
Further information	
(Reading lists, information links etc.)	Recommended reading: - Janeway's Immunobiology; Kenneth Murphy, Paul Travers, Mark Walport, Charles Janeway; New York: Garland Science, 9E, 2016 - Up to date reviews will be provided in eCampus two weeks before the start of the module.

Module Title: Research ethics and Scientific Writing Module ID/Code: MedImmun-03	UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	<u>Scientific Writing:</u> Introduction into general guidelines and rules for scientific writing Introduction into the elements of style Analysis and discussion of scientific texts How to improve and correct a text Practices in writing: Students will write their own texts and correct and make suggestions for improvements of the texts of others <u>Research ethics:</u> Main approaches and methods in current research ethics Ethical standards of good scientific practice Ethical issues related to research: with humans ; animals; with biological material
Learning outcomes	Scientific Writing: Improvement of the competence for scientific writing. This includes the writing of protocols, master thesis, Ph.D. thesis, and manuscripts. First, students will learn about the structure of a manuscript and the function and importance of each section (abstract, introduction, methods, results, discussion, references). They will develop the ability for a clear and elegant writing style. Students will familiarize with the ethical implications of scientific writing. Research ethics: Knowledge of main approaches and methods in current bioethics and research ethics. Students will learn to understand central ethical questions raised by research, in particular immunological and clinical research and to analyze ethical issues in the context of the life sciences and to apply standard arguments developed by research ethics. They will gain the ability to evaluate ethical arguments related to immunological research. Key competences: Scientific writing skills, knowledge of the ethical principles in bioscience, Evaluation and application of ethical arguments in immunological research. Intercultural competences: acknowledge diverse opinions and accept differences.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Scientific Writing	English	20	1 SWS	15
	practical course				1 SWS	20
	Lecture	Research Ethics	English	40	2 SWS	60

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	2
	Molecular Cell Biology (MSc) (only Research ethics)	elective	2

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Research Ethics: Written examination (graded) Scientific Writing: Writing of an abstract and introduction for a scientific paper (1 to max 2 pages) (graded)	4 ECTS
Assessment (incl. weighting) and examination language	Written Examination (60 min.) in English (50%) Written abstract and introduction in English (50%)	

7. Frequency				8. Workload	9. Duration
Winter semester Summer semester	☐ ☑	Winter and summer semester	☐	**95 h**	**1 term**
Module coordination					
Module coordinator	Prof. Dr. Dieter Sturma, PD. Dr. Sebastian Knell, Dr. Meghan Lucas				
Institute/Department	Institutes of Clinical Chemistry and Clinical Pharmacology, Medical Faculty; Uni Bonn Institute of Science and Ethics (IWE); German Reference Centre for Ethics in the Life Sciences (DRZE)				
Further information					
(Reading lists, information links etc.)	Recommended Reading: - Up to date reviews will be provided on eCampus two weeks before the course.				

Module Title: Immunology II Module ID/Code: Medimmun-04	UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	B cell development, T cell development and thymic selection; organization of the Immunoglobulin and T cell receptor locus; mechanism of somatic gene rearrangement, immunoglobulin class switch and somatic hypermutation; BCR and TCR signal transduction; B cell subsets, T helper cell subsets, regulatory T and B cells; lymphocyte migration; intercellular communication; tolerance mechanisms, immunological memory; epigenetic patterns, genetic predisposition, gene rearrangement and polymorphisms.
Learning outcomes	At the end of this module students have acquired comprehensive knowledge of molecular mechanisms of lymphocyte development and differentiation, and in immunogenetics, covering epigenetic patterns, genetic predisposition, gene rearrangement and polymorphisms. Students can explain cell-cell interactions, chemokine and cytokine mediated cross-talk. Students are familiar with the relevant methodology applied in the field and have acquired advanced conceptual and methodological thinking skills based on the discussion of current scientific literature in immunology. Key competences: Know the key methods and their applications Being able to read, understand and present fundamental issues in innate immunity in English.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Advanced concepts in immunology	English	55	2 SWS	90
	Seminar				1 SWS	45
	Tutorial				1 SWS	45

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	complulsory	2
	Immunobiology: from molecules to integrative systems (MSc)	complulsory	2

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Attendance of all seminars and one oral presentation of 20.min. in literature seminar in English with an accompanying written handout/ 1 to 2 pages this has to be done in Immuno-001 or MedImmun-04, (non- graded) Successful participation in written exam (graded)	6 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) , Duration: 90 min. Language examination: English	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☐	Winter and summer semester	☐	**180 h**	**1 term**
Summer semester	☑				

Module coordination	
Module coordinators	Prof. Dr. Irmgard Förster, Prof. Dr. Natalio Garbi, Prof. Dr. Christian Kurts, Prof. Dr. Andreas Schlitzer,
Institute/Department	Institute of Experimental Immunology, Medical Faculty; LIMES-Institute, Faculty of Mathematics and Natural Sciences
Further information	

(Reading lists, information links etc.)	Recommended Reading: Janeway's Immunobiology; Kenneth Murphy, Paul Travers, Mark Walport, Charles Janeway; New York: Garland Science, 9E, 2016 Roitt's Essential Immunology; Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt; Wiley-Blackwell 12th Edition 2011 - Up to date reviews /short introduction videos will be provided on eCampus two weeks before the course.

Module Title:
Clinical Immunology and Immunopharmacology II

Module ID/Code: MedImmun-05

UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	This module covers rheumatology, tumor immunology and the related immunopathological principals. Principles of pathology and histology and specific application to immune-mediated disease are part of this module. Further contents are the pharmacological treatment of clinical issues related to transplantation, wound healing, trauma and cancer.
Learning outcomes	At the end of this module students have gained expertise in the field of organ and bone marrow transplantation immunology and are aware of the immunological prerequisites and necessary medication to minimize the risk of graft versus host disease and organ rejection. Students can explain the immunological mechanisms involved in wound healing and the consequences of organ trauma. Students learn about pathology and histopathology of diseases. Students have gained knowledge in the immunobiology of tumors, and learned about the different tumor entities and their characteristics. Students are familiar with the diagnosis and medication of rheumatic diseases and autoimmune-mediated diseases in general. Key competences: Understanding the role of the immune system in the development of human diseases. Familiarize with the state of the art treatment of immunological diseases, as well as the activation of the immune system to treat diseases. Understanding and presenting new literature in english. Critical evaluation of new information and combining it with current knowledge in scientific discussions.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Seminar	Regeneration and translplantation	English	20	2,5 SWS	100
	Seminar	Pathology and Histopathology of disease			2,5 SWS	110
	Seminar	Tumorimmunology			2 SWS	90

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	2

5. Requirements for the award of credits (ECTS)		6. Credits
Required achievements	Attendance of all seminars, oral presentation of 20 min. in literature seminar in English with an accompanying written handout/ 1 to 2 pages (non- graded) Successful participation in written exam (graded)	10 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) Duration: 180 min. Language examination: English	

7. Frequency				8. Workload	9. Duration
Winter semester	☐	Winter and summer semester	☐	**300 h**	**1 term**
Summer semester	☑				

Module coordination

Module coordinator	Prof. Dr. Peter Brossart, Prof. Dr. Katrin Paeschke
Institute/Department	Medical Faculty- Medizinische Klinik und Poliklinik III (Department of Internal Medicine III)

Further information	
(Reading lists, information links etc.)	Recommended reading: - Janeway's Immunobiology; Kenneth Murphy, Paul Travers, Mark Walport, Charles Janeway; New York: Garland Science, 9E, 2016 - Up to date reviews will be provided in eCampus two weeks before the start of the module.

Module Title:
Infection II

Module ID/Code:MedImmun-06

UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	This module encompasses three major topics which are represented in three seminars: "Specific Virology", "Specific Microbiology & Parasitology" and "Hygiene". The seminar "Specific Virology" covers symptoms, treatment and clinical implications for specific viral infections like HIV, hepatitis viruses (HAV, HBV/HDV, HCV and HEV), Herpesviridae (CMV, HHV6, HHV8, EBV, HSVI) Influenza, RSV, Measles, Rotavirus, Norovirus, Papillomaviruses. The seminar encompasses anti-viral therapies, vaccination and prophylactic measures as well as opportunistic infections under immune suppressive conditions (e.g. inherited or acquired immune deficiencies, organ transplantation, chemotherapy) and fungal infections (candidiasis, aspergillosis, dermatophytes). The second seminar "Specific Microbiology and Parasitology" addresses virulence mechanisms of bacteria that promote colonisation, adhesion, invasion and resistance and interplay with the immune system of the host. Antibiotic treatment and mechanisms of antibiotic resistance as well as methods used in pathogenicity research and animal models are also part of this seminar. The parasitology part includes helminths and parasites like Plasmodium as well as immune regulation by parasites and other pathogens. The seminar "Hygiene" treats the topics hygiene and public health, including industrial and hospital hygiene, drinking water hygiene, vaccination and prophylaxis.
Learning outcomes	At the end of this module students are acquainted with symptoms, treatment and clinical implications of specific infectious diseases. They can explain the effects of specific viral infections including, but not limited to, HIV, hepatitis viruses, herpesviridae and Influenza and have profound knowledge about effects and adverse effects of anti-viral drugs and highly active antiretroviral therapy. The students know by which mechanisms the pathogens interact with the host and cause disease, how the host defends itself and learn the mechanisms of opportunistic infections. They have acquired basic knowledge of pharmaceutical microbiology and have understood how antibiotic resistance evolves and why some anti-infective treatments fail. Students can explain how parasites and bacteria influence and regulate the immune system and the influence of the microbiome on immune responses. Furthermore, students can apply their knowledge in hygiene and public health to scientific research questions. Key competences: Familiarize with pathogens and the state of the art in the treatment of infectious diseases in humans. Classifying new information from literature and combining it with current knowledge in scientific discussions.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Seminar	Specific Virology	English	20	3 SWS	120
	Seminar	Specific Microbiology and Parasitology			2,5 SWS	100
	Seminar	Hygiene			0,5 SWS	20

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	complulsory	2

5. Requirements for the award of credits (ECTS)		6. Credits
Required achievements	Attendance of all seminars, oral presentation of 20 min. in literature seminar in English with an accompanying written handout/ 1 to 2 pages (non- graded) Successful participation in written exam (graded)	8 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) Duration: 180 min. Language examination: English	

7. Frequency				8. Workload	9. Duration
Winter semester Summer semester	☐ ☑	Winter and summer semester	☐	**240 h**	**1 term**

Module coordination	
Module coordinator	Prof. Dr. Christian Strassburg, Prof. Dr. Jacob Nattermann
Institute/Department	Medizinische Klinik und Poliklinik I (Department of Internal Medicine I), Institute of Medical Microbiology, Immunology and Parasitology, Institute for Hygiene and Public Health, Medical Faculty
Further information	
(Reading lists, information links etc.)	Recommended Reading: - Bacterial Pathogenesis , B.A. Wilson, M.E. Winkler, 4th edition Juli 2019, softcover, Wiley & Sons Ltd - Essential Human Virology; Jennifer Louten, Elsevier, Academic press - Principles of Virology: Pathogenesis and Control, Volume 2, Jane Flint, Wiley & Sons Ltd - Up to date reviews will be provided in eCampus two weeks before the start of the module

Module Title: Regulations and legal aspects in life sciences Module ID/Code: MedImmun-07	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	This course will focus on the legal framework and regulations of drug development and medical devices. Students will learn about the duties of the EU commissions, the European Medicines Agency (EMA), relevant EU legislation, and procedures for the regulation of human medicines. The course syllabus covers the legal and practical aspects of drug development, including the topics reimbursement, the requirements to establish clinical studies, pharmacovigilance and the adverse effects of drugs. In addition, the course will touch upon the legal framework surrounding the development of modern biotechnology and GMOs.
Learning outcomes	During this module, students will gain knowledge about the legal framework and regulations of drug development, medical devices and modern biotechnology. Furthermore, they will learn which commissions and agencies are responsible for the different steps in the approval process of medications in the EU. In summary, the students will learn how to plan and execute a translational research project conforming to the respective regulations. Key competences: Knowing the current legal framework and regulations for medical research in Europe and Germany. Competences in designing experiments taking into account the current rules. Learning how to find and apply applicable regulations.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Regulation and legal aspects in life sciences	English	20	2 SWS	60

3. Prerequisites for the module	
compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	2

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Successful participation in written exam (graded)	2 ECTS
Assessment (incl. weighting) and examination language	Written exam (100%) Duration: 90 min. Language examination: English	

7. Frequency		**8. Workload**	**9. Duration**
Winter semester ☐ Summer semester ☑	Winter and summer semester ☐	**60 h**	**1 term**

Module coordination	
Module coordinator	Prof. Dr. Martin Schlee
Institute/Department	Institute of Clinical Chemistry and Clinical Pharmacology, Medical Faculty in cooperation with the Federal Institute for Drugs and Medical Devices (BfArM)

Further information	
(Reading lists, information links etc.)	Up to date reviews will be provided in eCampus two weeks before the start of the module. Links to the current official regulations will be provided by the tutors before the lecturs.

Module Title: Research Project I Module ID/Code: MedImmun-08	UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	Students can choose a research project, which will be conducted within the institutes and departments of the teaching staff to the MSc program. In consultation with the program coordinator and after concluding a learning agreement, research projects may also be performed externally e.g. in institutes abroad or industry. During this module students will acquire key competences for the successful preparation of their thesis. Topics covered are: Design of experiments considering all relevant controls and the rules of good scientific practice; Methodological concepts and practical expertise; Documentation, analysis and interpretation of original data; Presentation and classification of data in accordance with current scientific literature in oral and written form
Learning outcomes	At the end of this module students are able to solve a well-defined and time-restricted recent scientific question in the field of Immunosciences, Infection or Clinical Immunology and Immunopharmacology. They learn to apply specific methods independently and to document data in accordance with the rules of good scientific practice. Students can critically reflect their own research and have acquired in-depth theoretical knowledge of their project by independent literature research and discussions within the working group. Key Competences: Scientific writing, presentation skills, critical evaluation and discussion of scientific results. Basics in planning and project management.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Seminar	Current Topics in Life sciences	English	1	1 SWS	75
	Practical course				9 SWS	375

3. Prerequisites for the module

compulsory	none; only for externally conducted research projects a learning agreement is required
recommended	Participation of MedImmun-03, MedImmun-04, Limes-001 in advance

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	3

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Written protocol (graded), Oral presentation (graded)	15 ECTS
Assessment (incl. weighting) and examination language	Oral presentation (20 min.) in English based on the performed experiment and reference of current publications (50% of module grading) Written protocol of 10 to 40 pages in English with interpretation of original data and conceptual classification in the setup of a scientific publication (50% of module grading)	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☐	Winter and summer semester	☑	**450h**	**1 term**
Summer semester	☐				

Module coordination

Module coordinator	Prof. Dr. Gunther Hartmann, Dr. Cornelia Hömig-Hölzel
Institute/Department	Institutes and departments of the teaching staff to the MSc program

Further information

(Reading lists, inf links etc.)	Recommended reading: Current literature in the field of study

Module Title: **Research Project II** Module ID/Code: MedImmun-09	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	Students can choose a research project, which will be conducted within the institutes and departments of the teaching staff to the Msc program. In consultation with the program coordinator and after concluding a learning agreement, research projects may also be performed externally e.g. in institutes abroad or industry. During this module students will acquire key competences for the successful preparation of their thesis. Topics covered are: Design of experiments considering all relevant controls and the rules of good scientific practice; Methodological concepts and practical expertise; Documentation, analysis and interpretation of original data; Presentation and classification of data in accordance with current scientific literature in oral and written form
Learning outcomes	At the end of this module students are able to solve a well-defined and time-restricted recent scientific question in the field of Immunosciences, Infection or Clinical Immunology and Immunopharmacology. They learn to apply specific methods independently and to document data in accordance with the rules of good scientific practice. Students can critically reflect their own research and have acquired in-depth theoretical knowledge of their project by independent literature research and discussions within the working group. Key Competences: Scientific writing, presentation skills, critical evaluation and discussion of scientific results. Basics in planning and project management.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Seminar	Current Topics in Life sciences	English	1	1 SWS	75
	Practical course				9 SWS	375

3. Prerequisites for the module	
compulsory	none; only for externally conducted research projects a learning agreement is required
recommended	Participation MedImmun-03, MedImmun-04, Limes-001

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	3

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Written protocol (graded), Oral presentation (graded)	15 ECTS
Assessment (incl. weighting) and examination language	Oral presentation (20 min.) in English based on the performed experiment and reference of current publications (50% of grading) Written protocol of 10 to 40 pages in English with interpretation of original data and conceptual classification in the setup of a scientific publication (50% of grading)	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☐	Winter and summer semester	☑	**450h**	**1 term**
Summer semester	☐				

Module coordination	
Module coordinator	Prof. Dr. Gunther Hartmann, Dr. Cornelia Hömig-Hölzel
Institute/Department	Institutes and departments of the teaching staff to the MSc program
Further information	
(Reading lists, inf. links etc.)	Current literature of the field of study

Module Title: **Master thesis** Module ID/Code: Medimmun-MA	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	The Master Thesis is the final part of the studies. The students work in a laboratory environment in the scientific groups of the departments involved in the study program. Their work usually contributes to a project leading to a scientific publication. Students will design and perform their experiments considering all relevant controls and the rules of good scientific practice. They document, analyze and interpret their data in accordance with current scientific literature. During discussions within the working group they will critically reflect their own data and learn how to evaluate also less defined scientific problems.
Learning outcomes	Students have gained experience in designing, performing and analyzing experiments independently. They can apply all previously acquired knowledge and skills to solve a well-defined scientific problem. At the end of the module students can critically reflect and interpret data and evaluate scientific research problems. At the end of this module students are aware of the principles for defining and developing scientific research projects. Key competences: Scientific writing, presentation skills, critical evaluation and discussion of scientific results. Basics in planning and project management.

2. Teaching and learning methods						
	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Master project	Immunosciences and Infection	English	1	30 SWS	900

3. Prerequisites for the module	
compulsory	Minimum 75 credit points from previous examinations (including compulsory modules), registration of the project and approval by the Chairman of the Board of Examiners.
recommended	If the student is working with animals for the first time: course in basics of laboratory animal science according to FELASA B guidelines.

4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (MSc)	compulsory	4

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Master's thesis (graded), Oral presentation (20 min.) of final results of the research project in English(non-graded); Attendance at 15 scientific seminars or lectures in the field of medical research (study element can be completed from the first semester onwards).	30 ECTS
Assessment (incl. weighting) and examination language	Master thesis of up to 80 pages in English described in detail in the examination regulations. (100%)	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☐	Winter and summer semester	☐	**900**	**1 term**
Summer semester	☑				

Module coordination	
Module coordinator	Prof. Dr. Gunther Hartmann, Dr. Cornelia Hömig-Hölzel
Institute/Department	Institutes and departments of the teaching staff to the MSc program

Further information	
(Reading lists, information links etc.)	Recommended Reading: Current literature of the field of study. We highly recommend the participation in the course "Introduction to R" if corresponding methods are used in the project.

Elective Lecture in Medical Sciences (Elective Compulsory)

Module Title: Klinische Chemie und Hämatologie Module ID/Code: MedImmun-10	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	Sepsis, serology, erythrogram, leukogram, gastroenterological and urine diagnostics
Learning outcomes	Students have learned advanced principles in hematology and laboratory diagnostics Key competences: Understanding principle of laboratory diagnostics and related methods.

2. Teaching and learning methods						
	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Clinical chemistry and hematology	German	Not limited	1	90

3. Prerequisites for the module	
compulsory	none
recommended	none

4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Humanmedizin	compulsory	5
	Medical Immunosciences and Infection (MSc)	elective	1

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Passing written exam (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Written examination (100%) Duration: 90 min Examination language: German	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☑	Winter and summer semester	☐	**90 h**	**1 term**
Summer semester	☐				

Module coordination	
Module coordinator	Prof. Dr. Birgit Stoffel-Wagner
Institute/Department	Institute of Clinical Chemistry and Clinical Pharmacology, Medical Faculty

Further information	
(Reading lists, information links etc.)	Regular participation in the lectures is highly recommended Up to date reviews will be provided in eCampus two weeks before the start of the module.

Module Title:
Klinische Prüfung von Arzneimitteln

Module ID/Code: Medimmun 11

UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	Introduction into planning, implementation and analysis of clinical trials Pharmaceutical assessment Ethical aspects of clinical trials Documentation Trial protocols Quality management Practical implementation of clinical trials Particularities Drug safety
Learning outcomes	Students have learned requirements for clinical trials and could implement trials for medicinal products and pharmaceuticals. Key competences: Understanding the basic regulations and procedures of clinical studies. Learning how to find and apply applicable regulations.

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Clinical trials for medicinical products	German	180	2 SWS	90 h

3. Prerequisites for the module

compulsory	none
recommended	none

4. Degree program allocation

Study program	compulsory/ elective	Semester
Humanmedizin	compulsory	5
Medical Immunosciences and Infection (MSc)	elective	1

5. Requirements for the award of credits (ECTS)		6. Credits
Required achievements	Passing written exam or oral examination (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Written Exam or oral examination (100%) Time: Exam 180 min. or Oral examination 10 to 30 min. Examination language: German	

7. Frequency				8. Workload	9. Duration
Winter semester	☑	Winter and summer semester	☐	**90h**	**1 term**
Summer semester	☐				

Module coordination

Module coordinator	Prof. Dr. Gunther Hartmann
Institute/Department	- Institute of Clinical Chemistry and Clinical Pharmacology, Medical Faculty in cooperation with the BfArM

Further information

(Reading lists, information links etc.)	Regular participation in the lectures is highly recommended Up to date reviews and information about clinical trials will be provided in eCampus two weeks before the start of the module.

Module Title:
Developmental Neurobiology, Stem Cells and Neuroregeneration
Module ID/Code: MedImmun-12

UNIVERSITÄT BONN

1. Content and intended learning outcomes

Content	From Neurulation to Early Patterning of the Nervous System Fate Instruction and Regional Determination In vitro Models of Neural Development and Disease Models Circuit Formation in the Developing Central Nervous System Molecular and Cellular Aspects of Cortical Development Glia Cells and Myelin Self-Organization and 3D Cultures Neural Cancer Stem Cells Neuropathology of the Developing Central Nervous System Transgenic Animal Models Principles of Neural Cell Replacement Stem Cell Niches and Recruitment into the CNS
Learning outcomes	Students learn about the development of the nervous system and the role and features of stem cells. Key competences: Understanding the principles of Neurobiology and development of neural cells.

2. Teaching and learning methods

Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
Lecture	Developmental Neurobiology, Stem Cells and Neuroregeneration	English	180	2 SWS	90

3. Prerequisites for the module

compulsory	None
recommended	None

4. Degree program allocation

Study program	compulsory/ elective	Semester
Neurosciences (M. Sc.)	elective	2
Humanmedizin (Wahlfach 1)	elective	1-5
Immunbiology: from molecules to integrative systems (M. Sc.)	elective	2
Molecular Cell Biology (M. Sc.)	elective	2
Medical Immunosciences and Infection (M. Sc.)	elective	2

5. Requirements for the award of credits (ECTS) / 6. Credits

Required achievements	Passing written exam (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Written examination (100%) Duration: 90 min. Language examination: English	

7. Frequency	8. Workload	9. Duration
Winter semester ☐ Summer semester ☑ Winter and summer semester ☐	**90 h**	**1 term**

Module coordination

Module coordinator	Prof. Dr. Oliver Brüstle
Institute/Department	Medical Faculty-Institute of Reconstructive Neurobiology, Life and Brain Center

Further information

(Reading lists, information links etc.)	Regular participation in the lectures is highly recommended Recommended Reading: Current literature, Review articles mentioned during lecture

Module Title: **Cellular Neurobiology of Disease** Module ID/Code: Medimmun-13	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	▯ Cytology of neurons and axonal transport ▯ Microglia and neuroinflammation ▯ Neurotrophic factors and cytokines ▯ Cell adhesion and migration ▯ Guidance molecules ▯ Glyconeurobiology ▯ Neuroregeneration ▯ Neurodegeneration ▯ Neuro-Ophthalmology ▯ Neuroimmunology
Learning outcomes	Students have learned advanced principles in the cellular neurobiology of diseases. They know how and when the immune system is involved in the pathology of specific neurologic diseases. Key competences: Understanding the role of neurobiology in the development of disease

2. Teaching and learning methods

	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Cellular Neurobiology of Disease	English	180	2 SWS	90

3. Prerequisites for the module	
compulsory	none
recommended	none

4. Degree program allocation

	Study program	compulsory/ elective	Semester
	Neurosciences (M. Sc.)	elective	2
	Humanmedizin (Wahlfach 1)	elective	2-5
	Immunobiology: from molecules to integrative systems (M. Sc.)	elective	2
	Molecular Cell Biology (M. Sc.)	elective	2
	Medical Immunosciences and Infection (M. Sc.)	elective	2

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Passing written exam (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Written examination (100%) Duration: 90 min. Examination Language: English	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☐	Winter and summer semester	☐	**90 h**	**1 term**
Summer semester	☑				

Module coordination	
Module coordinator	Prof. Dr. Harald Neumann
Institute/Department	Institute of Reconstructive Neurobiology, Medical Faculty

Further information	
(Reading lists, information links etc.)	Recommended Reading: 1. Molecular Biology of the Cell, from Alberts, Bruce; Johnson, Alexander; Lewis, Julian; 2015. 2. Principles of Neural Science, 5th ed., Eric R. Kandel, J. H. Schwartz, T. M. Jessell et al; 2012. 3. Janeway's Immunobiology; from Kenneth Murphy, 2011.

Module Title: Grundzüge der Anatomie für Pharmazeuten Module ID/Code: MeImmun-14	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	Nussbauprinzip Metamerie Extremitäten Bewegungsapparat Rumpfwand
Learning outcomes	Students have learned the most important principles in human anatomy for pharmacists Key competences: Knowledge in the basic anatomy of humans

2. Teaching and learning methods						
	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture	Anatomy (macroscopy and topology)	German	180	2 SWS	90

3. Prerequisites for the module	
compulsory	None
recommended	None

4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (M. Sc.)	elective	1; 2
	Pharmazie (Staatsexamen)	compulsory	1-5

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Written examination (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Written Examination (100%) Duration: 120 min; Examination language: German	

7. Frequency		**8. Workload**	**9. Duration**
Winter semester ☐ Summer semester ☐	Winter and summer semester ☐	**90**	**1 term**

Module coordination	
Module coordinator	Prof. Dr. Rujin Huang
Institute/Department	Anatomisches Institut, Medical Faculty

Further information	
(Reading lists, information links etc.)	Regular participation in the lectures is highly recommended Recommended Reading: Current literature, Der Mensch - Anatomie und Physiologie J.S. Schwegler, Runhild Lucius, Thieme Auflage 7, 2022

Module Title: Immunometabolism Module ID/Code: Medimmun-15	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	Introduction in the emerging field of cellular metabolism and immune function. Detailed instructions on how to present and discuss primary research articles. Overview about new scientific development in the field, by analyzing latest literature. Novel concepts of immunometabolism will be described and discussed. State of the art techniques that are used in the analysis of immunometabolism will be presented and the advantages and disadvantages will be discussed.
Learning outcomes	The aim of this course is that students understand the impact of metabolism on immune responses and how this knowledge could be used to manipulate immune responses and treat disease. Key competences: Gaining profound knowledge on the role of the metabolism on the immune system. Presentation skills, evaluation and critical discussion of primary literature, intercultural scientific discussion, Integrating new scientific findings into scientific models

2. Teaching and learning methods						
	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Seminar	Immunometabolism	English	20	2 SWS	90

3. Prerequisites for the module	
compulsory	none
recommended	none

4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Humanmedizin (Wahlfach 1)	elective	1-5
	Medical Immunosciences and Infection (M. Sc.)	elective	1 ; 2

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Oral presentation (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Attendance in seminars and participation in scientific discussions. Oral presentation: 40 min. as part of seminar(100%) Language of presentation : English	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☐	Winter and summer semester	☑	**90 h**	**1 term**
Summer semester	☐				

Module coordination	
Module coordinator	Prof. Dr. Christoph Wilhelm
Institute/Department	Institute of Clinical Chemistry and Clinical Pharmacology, Medical Faculty

Further information	
(Reading lists, information links etc.)	Recommended Reading: A guide to immunometabolism for immunologists. O'Neill LA, Kishton RJ, Rathmell J. Nat Rev Immunol. 2016 Sep;16(9):553-65 - Current literature will be provided on eCampus

Module Title: Immuno-oncology Module ID/Code: Medimmun-16	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	• General introduction in immuno-oncology and overview of the basic concepts and treatment strategies currently used in the clinic. • Detailed instructions on how to present and discuss primary research articles. • Overview about new scientific development in the field, by analyzing latest literature. • Discussion of novel therapeutic concepts, immune monitoring/-scoring and experimental methodologies in immune-oncology. • Introduction in state of the art techniques that are used in the analysis of immunological processes will be presented and the advantages and disadvantages will be discussed.
Learning outcomes	The goal of this course is that students understand the various determinants of anti-tumor immune responses and how this knowledge could be used to improve cancer immunotherapy. Key competences: Gaining profound knowledge on the role of the Immunsystem in oncology and possible intervention and activation in treatment. Presentation skills, evaluation and critical discussion of primary literature, intercultural scientific discussion on basis of examples from literature, integrating new scientific findings into scientific models

2. Teaching and learning methods						
	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture/ Seminar	Immuno-oncology	English	20	2 SWS	90

3. Prerequisites for the module	
compulsory	none
recommended	none

4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (M. Sc.)	elective	1

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Oral presentation (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Attendance in seminars and participation in scientific discussions. Oral presentation: 40 min. as part of seminar (100%) Language of presentation : English	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☑	Winter and summer semester	☐	**90 h**	**1 term**
Summer semester	☐				

Module coordination	
Module coordinator	Prof. Dr. Michael Hölzel
Institute/Department	Medical Faculty- Institute of Experimental Oncology (IEO)

Further information	
(Reading lists, information links etc.)	Recommended Reading: Oncology meets immunology: the cancer-immunity cycle. Chen DS, Mellman I. Immunity. 2013 Jul 25;39(1):1-10. - Current literature will be provided on eCampus

Module Title: Nucleic acid recognition in antiviral Innate Immunity and autoinflammation Module ID/Code: Medimmun-18	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	The innate immune system comprises all innate cell-autonomous and cellular mechanisms that recognize and defend an organism against invading pathogens. Some innate pattern recognition receptors (PRR) recognize foreign microbial molecules from bacteria, fungi or parasites. By contrast, viruses are produced by the host cell itself and do not harbor completely foreign structures. Viruses are recognized by nucleic acid receptors which detect unusual localization, structures or modifications of the viral DNA or RNA. Recognition of viral RNA/DNA leads to signaling cascades, cytokine/chemokine induction and upregulation of antiviral effector proteins which also frequently target viral RNA or DNA. High sensitivity of this first line of defense is crucial for a successful antiviral response. Since there exist endogenous RNA/DNA structures which resembles viral structures, self-tolerance mechanisms are required to prevent receptor activation by self-DNA/RNA. A dysregulated balance between receptor activity and self-tolerance mechanisms leads to autoinflammatory diseases. In student presentations of previous or current experimental studies state-of-the art methods, reasonable experimental setups and data interpretation will be discussed.
Learning outcomes	The aim of this course is to get insight into nucleic acid receptor activation and self-tolerance mechanisms in infections and autoinflammatory diseases and applications/impact in (immune) therapeutic approaches. Furthermore the participant should become able to critically read and interpret data from experimental studies. Key competences: Understanding the role of nucleic acid recognition in innate Immunity and autoinflammation. Presentation skills, evaluation and critical discussion of primary literature, intercultural scientific discussion, integrating new scientific findings into scientific models.

2. Teaching and learning methods						
	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture/ Seminar	Nucleic acid recognition in antiviral Innate Immunity and autoinflammation	English	20	2 SWS	90

3. Prerequisites for the module	
compulsory	none
recommended	none

4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (M. Sc.)	elective	1

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Oral presentation (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Attendance in seminars and participation in scientific discussions. Oral presentation: 40 min. as part of seminar in English (100%)	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☑	Winter and summer semester	☐	**90 h**	**1 term**
Summer semester	☐				

Module coordination	
Module coordinator	Prof. Dr. Martin Schlee
Institute/Department	Institut für Klinische Chemie und Klinische Pharmakologie, Medical Faculty

Further information	
(Reading lists, information links etc.)	Recommended Reading: - Discriminating self from non-self in nucleic acid sensing. Schlee M, Hartmann G. Nat Rev Immunol. 2016 Sep;16(9):566-80. - Immune Sensing Mechanisms that Discriminate Self from Altered Self and Foreign Nucleic Acids. Bartok E, Hartmann G. Immunity. 2020 Jul 14;53(1):54-77. - Current literature will be provided on eCampus

Module Title: T cell differentiation and function Module ID/Code: Medimmun-19	UNIVERSITÄT BONN

1. Content and intended learning outcomes	
Content	Introduction to the complex field of T cell biology. Detailed instructions on how to present and discuss primary research articles. Overview about new scientific developments in the field, by analyzing hallmark research papers as well as the current literature. Novel concepts of T cell differentiation and function will be described and discussed. State of the art techniques that are used in the analysis of T cells will be presented and the advantages and disadvantages will be discussed.
Learning outcomes	The aim of this course is that students understand the differentiation and function of various T cell populations and how this knowledge could be used to boost immune responses to infections and during vaccination or to inhibit them in diseases such as autoimmunity. Key Competences: Gaining profound knowledge in T cell differentiation and function. Presentation skills, evaluation and critical discussion of primary literature, intercultural scientific discussion, critical thinking, integrating new scientific findings into current scientific models.

2. Teaching and learning methods						
	Type of instruction	Topic	Language of instruction	Group size	Weekly contact time	Workload [h]
	Lecture/ Seminar	T-Cell function	English	20	2 SWS	90

3. Prerequisites for the module	
compulsory	none
recommended	none

4. Degree program allocation			
	Study program	compulsory/ elective	Semester
	Medical Immunosciences and Infection (M. Sc.)	elective	1

5. Requirements for the award of credits (ECTS)		**6. Credits**
Required achievements	Oral presentation (graded)	3 ECTS
Assessment (incl. weighting) and examination language	Attendance in seminars and participation in scientific discussions. Oral presentation: 40 min. as part of seminar (100%) Language of presentation: English	

7. Frequency				**8. Workload**	**9. Duration**
Winter semester	☐	Winter and summer semester	☑	**90 h**	**1 term**
Summer semester	☐				

Module coordination	
Module coordinator	Prof. Dr. Dirk Baumjohann
Institute/Department	Medical Clinic III – Professorship for Autoimmunity, Medical Faculty

Further information	
(Reading lists, information links etc.)	Recommended Reading: - Heterogeneity of Human CD4(+) T Cells Against Microbes. Sallusto F. Annu Rev Immunol. 2016. PMID: 27168241 Review. - Cytokine Regulation and Function in T Cells. Dong C. Annu Rev Immunol. 2021 Apr 26;39:51-76. - CD4(+) T cells that help B cells - a proposal for uniform nomenclature. Eisenbarth SC et al.. Trends Immunol. 2021 Aug;42(8):658-669. - Repositioning T(H) cell polarization from single cytokines to complex help. Tuzlak S et al. Nat Immunol. 2021 Oct;22(10):1210-1217. - Current literature will be provided on eCampus