

# Module Handbook Master "Medical Immunosciences and Infection"

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

As of May 24<sup>th</sup> 2022

Stand 2024-04-08

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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:
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# Methods in life sciences and statistics



Module ID/Code: LIMES-001

		•					
1. Content and intende	d learning ou	itcomes					
Content	Dealing with	DNA, RNA, pro	teins and	l lipids, electrop	horesis, w	estern b	olotting, RT-
	PCR, protein	purification, clo	oning teo	hnologies, analy	/sis of lipid	s,	
	immunopred	cipitation, histol	ogy, ELIS	SA, Flow cytome	try, FRET, r	nicrosco	ору
	Statistics: Ba	tistics: Basic test theory, Chi <sup>2</sup> -tests for contingency tables, t-tests, Non-parametric					
	tests, Power	ts, Power calculations, Calculation rules for probabilities, Correlation, Regression,					
	Software im	plementations,	Graphics	and visualizatio	n		
Learning outcomes	Students sho	ould learn theor	etical ba	ckground of con	nmon tech	niques a	and
	methodolog	ical approaches	from the	e area of life scie	ences. Add	itionally	, students will
	gain an unde	erstanding of hy	pothesis	testing and cor	rect interp	retation	of different
	types of test	statistics. They	will imp	rove their skills i	n statistica	al calcula	ations and
	adequate pla	anning of experi	ments.				
	Key compete	ences: Profound	knowle	dge on methodo	ology in life	science	es
	Being able to	o perform statis	tical ana	lysis of obtained	l results		
2. Teaching and learnin	g methods						
	Turner			1	Current	Week	ly Markland
	Type of	Topic		Language of	Group	conta	ct
	instruction				size	time	[n]
	Lecture	Methods in	Life	English	85	2 SW	S 90
		sciences a	ind	0			
		statistic	S				
3. Prerequisites for the	module			•	•		<b>I</b>
compulsory	none						
recommended	recommended none						
4. Degree program allo	4. Degree program allocation						
	Study program compulsory/ Semester						
					elective		
	Medical Imm	nunosciences an	d Infecti	ion (MSc)	compulsory		1
	Immunobiol	ogy: from moled	cules to i	ntegrative	compulsory		1
	systems (MS	c)		0	•	,	
	Biochemistry	/ (MSc)			elective		1
5. Requirements for the	award of cr	edits (FCTS)					6. Credits
Required achievements	See assessm	ent					
Assessment (incl	Written exar	n (100%)					3 FCTS
weighting) and	Duration: 12	0 min					
examination language	Language ex	amination <sup>.</sup> Engl	ish				
7. Frequency	Language ex		8.	Workload		9. Dur	ation
Winter semester $\checkmark$	Winter and s	ummer		90		1 te	rm
Summer semester	semester					1 (0	
Module coordination							
Module coordinator	Prof. Dr. Ma	tthias Schmid, P	rof. Dr. (	Christoph Thiele			
	Institute of N	Aedical Biometr	y, Media	al Informatics a	nd Epidem	iology .	Medical
Institute/Department	Faculty; LIM	ES-Institute Fac	ulty of M	lathematis and I	Natural Sci	ences	
Further information							
(Reading lists,	Recommen	ded Reading: I	Reviews	provided on e	-Campus	at the l	peginning of
1	1.	ne term					

# Module Title: Immunology I



1 Contont and intender	d loorning ou	teomos					
1. Content and intended				1 1 1 1 1 1			
Content	Evolution of	the immune sys	stem fror	n bacteria to hig	gher vertet	orates. C	ellular and
	humoral con	umoral components of the immune system, different model organisms, basic					
	principles of	Immune respor	ises, anti	l-microbial pept	Ides, effect	Domog	tions of
	molecular p	s, Falleni-assuc		recognition rec	contors (DE	Pc) at th	
	membrane a	and in the cyton	lasm sig	naling nathways	of PRRs a	nd other	r recentor's
	signaling nat	gnaling pathways, inflammasomes, complement system.					
Learning outcomes	At the end o	f this module th	e studen	ts have acquire	d detailed	and diff	erentiated
	knowledge t	he cellular and l	humoral	components of	the immur	ne syster	m and the
	necessary ar	nd sufficient con	ditions t	o mount an imn	nune respo	nse. Fu	rthermore.
	they can des	cribe current m	odel syst	ems and techni	ques used	to study	the immune
	system. Stud	lents have acqu	ired adva	anced conceptua	al and met	hodolog	ical thinking
	skills based o	on the discussio	n of curr	ent scientific lite	erature in i	mmuno	logy.
	Key compete	ences: Understa	nding th	e principles of th	ne immune	e system	; Know the key
	methods and	d their application	ons; Bein	g able to read, ι	understand	and pr	esent
	fundamenta	l issues in innate	e immun	ity in a foreign la	anguage		
2. Teaching and learning	g methods				1	•	
	Type of			Language of	Group	Week	ly Workload
	instruction	Topic		instruction	size	contac	t [h]
						time	
	Lecture					2 SW3	s 90
	<b>T</b> 1 1			En altala		4.614	- 45
	Tutorial			English	55	1 SW3	5 45
	Constructor					4 014/0	
	Seminar					15005	5 45
3. Prerequisites for the	module						
compulsory	none						
recommended	none	none					
4. Degree program allo	4. Degree program allocation						
		Study pro	gram		compulse	ory/	Semester
					elective		
	Medical Imm	nunosciences an	id Infecti	on (MSc)	compulse	ory	1
	Immunobiol	ogy: from moled	cules to i	ntegrative	compulse	ory	1
	systems (MS	c)					
5. Requirements for the	award of cr	edits (ECTS)					6. Credits
Required achievements	Attendance	of seminars and	one ora	l presentation o	f 20.min. iı	n	
	literature se	minar in English	, (non- g	raded)			6 ECTS
	Successful p	articipation in w	ritten ex	am (graded)			
Assessment (incl.	Written exar	n (100%) in Eng	lish				
weighting) and	Duration: 60 min.						
examination language	Language examination: English						
7. Frequency			8. \	Workload		9. Dur	ation
Winter semester $\checkmark$ Summer semester $\Box$	Winter and s	ummer		180 h		1 te	rm
	semester						
ividule coordination	<b>D</b> ( <b>D</b> )						
wodule coordinator	Prot. Dr. Sve	n Burgdorf, PD	Dr. Bernh	hard Fuls, Prot. D	pr. Felix Me	eissner	
	Institute of I	nnate Immunity	, Medica	I Faculty	<u>.</u> .		
Institute/Department	LIMES-Institu	ute, Faculty of N	/lathema	tics and Natural	Sciences		
Funth on informer that							
Further information							

(Reading lists,	Recommended Reading: Janeway's Immunobiology; Kenneth Murphy, Paul Travers,
information links etc.)	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 12 <sup>th</sup> Edition 2011

#### Module Title: Infection I



1. Content and intended learning outcomes							
Content	This modulo	nrovides studo	nts mith	a profound know		irology ar	od .
Content	microhiology	/ The seminar "	Virolog	y" gives an adva	nced insig	ht into cla	assification
	structure an	tructure and replication of viruses as well as virus ecology, emerging viruses and					
	reservoirs. A	eservoirs. Additionally, host - virus interactions and recognition and clearance of					
	viral infectio	ns are covered.	The se	minars "Microbi	ology" and	l "Parasito	ology" are
	designed to	convey a sound	knowle	edge of medical	bacteriolo	gy and pa	rasitology with
	an introduct	introduction into the structure of bacteria and parasites and give a broad overview					
	of all microo	rganisms with r	elevano	ce to human hea	lth (bacte	ria, fungi,	parasites),
	their morpho	ology, physiolog	y, epid	emiology, the tr	eatment o	f infectiou	us disease and
	the role of th	ne human micro	biome	as well as meth	ods used ir	n research	n. The
	diagnostic pi	rocedures used	in the c	clinical laborator	y are addr	essed in t	he respective
	seminars.						
Learning outcomes	At the end o	f this module st	udents	are able to iden	tify and cla	assify patl	nogens
	including vir	uses, bacteria ai	nd para	isites. The stude	nts have a	cquired th	horough
	knowledge c	of genomic, repli		and structural v	iral diversit	ty, bacter	la and
	parasites, an	id are familiar w	oro th	nptoms, outcom	e and trea	tment of	important
	hased on the	ir knowledge of	f curror	ey alle able to ev	ature and i	nodel nat	thogens
	based on the	in knowledge of	reunei	it scientine itter		nouer par	inogens.
	Key compete	ences: Profound	knowl	edge on differer	nt pathoge	ns. infecti	on cycle and
	immune rea	ction. Being able	e to un	derstand and pr	esent fund	amental i	ssues in
	infectiology in English. Learn how to constructively discuss in an intercultural context.						
2. Teaching and learning	ning methods						
					6	Weekly	/ I
	Type of	Topic		Language of	Group	contact	Workload
	Instruction			Instruction	size	time	լոյ
	Seminar	Virology				3 SWS	120
	Sominar	Microbiolo	<b>a</b> u			1 E C\A/	60
	Seminar		бу	English	20	1,5 500.	5 00
	Seminar	Parasitolog	3Y			1,5 SWS	5 60
2 Droroquisitos for the	modulo						
5. Prerequisites for the	nodule						
recommended	none						
A Degree program allocation							
4. Degree program compulsory/ Somester							
		Study pro	Riqui		elective	sury/	semester
	Medical Imm	unosciences an	d Infec	tion (MSc)	compul	sorv	1
5 Requirements for the	award of cr	edits (FCTS)			compu	301 y	6 Credits
Required achievements	Attendance	of all seminars	oral nre	esentation of 30	min in lite	erature	0. creats
Required demovements	seminar in F	nglish with an a	ccomp	anving written h	andout/1	to 2	8 FCTS
	pages (non-	graded)	ccompt			10 2	0 2015
	Successful participation in written exam (graded)						
Assessment (incl.	Written exam (100%)						
weighting) and	Duration: 18	0 min.					
examination language	Language ex	amination: Engl	ish				
7. Frequency			8	. Workload		9. Dura	ation
Winter semester	Winter and s	ummer _		240 h		1 te	rm
Summer semester	semester						
Module coordination							
Module coordinator	Prof. Dr. Gab	oriele Bierbaum.	, Prof. [	Dr. Achim Hörau	f		
	Institute of M	edical Microbiolo	gy, Imm	unology and Para	sitology; Ins	titute of V	irology, Medical
Institute/Department	Faculty						

Further information	
(Reading lists,	Bacterial Pathogenesis, B.A. Wilson, M.E. Winkler, 4 <sup>th</sup> edition Juli 2019, Wiley & Sons
information links etc.)	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





1 SWS

1,5 SWS

35

45

1. Content and intended	Content and intended learning outcomes					
Content	Inis 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 o diseases and organs and o students car their knowle biological m Students hav action, pote advantages immune-me concentratic aware of the and they car students car titers, cytoki parameters. and clinical i clinical studi Key compete and progress English. Clas scientific dis	f this module students are f this module students are basic anatomy and physic organ systems, with a spec a differentiate immune-me edge about symptoms and echanisms that underlie in ve acquired detailed and d ntial and toxicity of immur and disadvantages of curre diated diseases. Furthermo ons in the blood and are fa e parameters that influence a apply their knowledge fo apply current immune dia nes, chemokines, immune Finishing this module enal mmunology research proje es according to regulation ences: Understanding the sion of disease. Critical eva sifying new information ar cussions. Learn how to cor	acquainted w ology and path ial focus on in ediated and info causes and kn flammatory and ifferentiated k one modulatory ent treatment ore, students ore, students ore, students e the interpret r controlling p agnostic meth cells and infla bles students ects. Students s. role of the imr aluation and p and combining in structively dis	vith inflami nophysiolog nmune-pat flammatory now genetic nd immune knowledge drugs and approache can measu tation of dr datient com ods to develop will have l mune syste resenting r it with curr scuss in an	matory immu gy of the hur hophysiolog y diseases ba c, molecular e-mediated o about the m can explain es of inflamm re medicatio tic range. Th rug concentr pliance. Furt ermine autor and endocrir ideas for tra earned how em in the dev new literatur rent knowled intercultura	une man body's y. The ased on and cell diseases node of the natory and on ey are ration data thermore, antibody ne anslational to plan velopment e in lge in l context.
2. Teaching and learning	g methods				NAC 11	
	Type of instruction	Торіс	Language of instruction	Group size	weekly contact time	Workload [h]
	Seminar	Specific immune mediated and inflammatory diseases			3,5 SWS	160
	Blended learning	Basic Anatomy	English	20	1 SWS	60

Immunopharmacology

Immune Diagnostics

Seminar

Seminar

3. Prerequisites for the	module					
compulsory	None					
recommended	None					
4. Degree program alloc	ation					
	Study pro	gram	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, seminar in English with an a pages (non- graded) Successful participation in w	10 ECTS				
Assessment (incl. weighting) and examination language	Written exam (100%) Duration: 180 min. Language examination: Engl	Written exam (100%) Duration: 180 min. Language examination: English				
7. Frequency		8. Workload	9. Dui	iration		
Winter semesterImage: ConstructionSummer semesterImage: Image: Construction	Winter and summer semester	300	1 term			
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.				lport, Charles le start of the		

#### Ethical and Regulatory Aspects in Life Science and

Scientific Presentation

Module ID/Code: MedImmun-30



1. Content and intended learning outcomes Content Ethical and Regulatory Aspects in life scienes 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 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. Scientific Writing: 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 During this module, students will gain knowledge about the legal framework and Learning outcomes 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. 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. 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. 2. Teaching and learning methods Weekly Type of Group Workload Language of contact Topic instruction instruction size [h] time Lecture Scientific Writing 1 SWS 15 English 20 20 practical 1 SWS course Ethical and English 40 4 SWS 120 Lecture Regulatory aspects 3. Prerequisites for the module compulsory none

recommended	none					
4. Degree program allo	4. Degree program allocation					
	Study pro	compulsory/ elective	Semester			
	Medical Immunosciences an	compulsory	2			
	Molecular Cell Biology (MSc	) (only Research	elective	2		
	ethics)					
5. Requirements for the	6. Credits					
Required achievements	Practical exercise on scientif					
Assessment (incl.	Written Examination (60 mi	6 ECTS				
weighting) and						
examination language						
7. Frequency	8. Workload 9. Dura			ration		
Winter semester	Winter and summer	155 h	1 te	erm		
Summer semester	semester					
Module coordination						
Module coordinator	Prof. Bernardo Franklin, Pro	f. Dr. Martin Schlee, Pro	f. Dr. D. Lanzrath			
	Institutes of Clinical Chemist	ry and Clinical Pharmaco	ology, Institute of			
Institute/Department	Uni Bonn Institute of Science	e and Ethics (IWE); Germ	an Reference Cen	tre for Ethics in		
	the Life Sciences (DRZE)					
	the Life Sciences (DNZE)					
Further information						
Further information (Reading lists,	Recommended Reading:					

#### Module Title: Immunology II



1. Content and intended learning outcomes								
Content	B cell develo Immunoglob rearrangeme TCR signal tr lymphocyte immunologio rearrangeme	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						
Learning outcomes	At the end o molecular m immunogene rearrangeme chemokine a Students are acquired adv discussion of Key compete Being able to English.	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	g methods			1				
	Type of instruction	Торіс		Language of instruction	Group size	Week conta time	ly v ct v	Norkload [h]
	Lecture Seminar Tutorial	Advanced concepts in immunology English		55	2 SW 1 SW 1 SW	s s s	90 45 45	
3. Prerequisites for the	module							
compulsory	none	none						
recommended	none							
4. Degree program alloc	cation							
		Study program compulsory/ Semester elective					mester	
	Medical Imm	nunosciences an	id Infecti	on (MSc)	complu	sory		2
	Immunobiol systems (MS	ogy: from moleo c)	cules to i	ntegrative	complul	lsory		2
5. Requirements for the	award of cr	edits (ECTS)					6.	Credits
Required achievements Assessment (incl. weighting) and examination language	Attendance of all seminars and one oral presentation of 20.min. in         literature seminar in English.         Successful participation in written exam (graded)         Written exam (100%) ,         Duration: 90 min.							
7. Frequency	00	0	8. \	Workload		9. Dur	ation	
Winter semester□Summer semester✓	Winter and s semester	ummer		180 h		1 te	rm	
Module coordination								
Module coordinators	Prof. Dr. Irm Andreas Sch	gard Förster, Pr litzer,	of. Dr. Na	atalio Garbi, Pro	f. Dr. Chris	tian Ku	rts, Pro	of. Dr.
Institute/Department	Institute of E LIMES-Institu	xperimental Im ute, Faculty of N	munolog ⁄lathema	gy, Medical Facu tics and Natural	lty; Sciences			
<b>Further information</b>								
(Reading lists, information links etc.)	Recommend Mark Walpo	ed Reading: Jan rt, Charles Jane	ieway's li way; Nev	mmunobiology; v York: Garland	Kenneth N Science, 9E	/lurphy, E, 2016	Paul 1	Fravers,

Roitt's Essential Immunology; Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt; Wiley-Blackwell 12 <sup>th</sup> 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



1. Content and intended	d learning ou	itcomes								
Content	This module immunopath	covers rheumat nological princip	tology, tu als. Princ	umor immunol ciples of patho	logy and th logy and h	e related istology a	l and specific			
	are the phar	macological trea	atment o	of clinical issue	s related to	o transpla	antation,			
	wound heali	ng, trauma and	cancer.							
Learning outcomes	At the end o	f this module st	udents h	ave gained ex	pertise in t	he field c	of organ and			
	bone marrov	w transplantatio	n immur	hology and are	aware of 1	the immu	inological			
	prerequisite	s and necessary	medicat	ion to minimiz	e the risk (	of graft v	ersus nost			
	disease and	organ rejection.	. Student	s can explain t	ne immun	ological r	nechanisms			
	involved in v	vound nealing a	nd the co	of discasos St	n organ tra	iuma. Stu	idents learn			
	the immuno	hiology of tumo	actiology	earned about t	he differe	ve ganiet nt tumor	entities and			
	their charact	their characteristics. Students are familiar with the diagnosis and medication of								
	rheumatic di	iseases and auto	oimmune	e-mediated dis	eases in ge	eneral.				
	Key compete	ences: Understa	nding th	e role of the in	nmune sys	tem in th	e development			
	of human di	seases. Familiar	ize with t	the state of the	e art treatr	nent of ir	mmunological			
	diseases, as	well as the activ	ation of	the immune sy	ystem to tr	eat disea	ises.			
	Understandi	ng and presenti	ng new l	iterature in en	glish. Critio	al evalua	ation of new			
	information	and combining	it with cu	irrent knowled	lge in scier	ntific disc	ussions.			
2. Teaching and learning	g methods									
	Type of			Language	Group	Weekl	y Workload			
	instruction	Topic		of	size	contac	t [h]			
	Causinan	Deserventio		instruction		time	100			
	Seminar	transinianta	n and ation			2,5 500	5 100			
	Seminar	Pathology	2.5 SW	'S 110						
		Histopatholo	ogy of	English	20	_)0 0 11				
		disease	2	_						
	Seminar	Tumorimmur	nology			2 SWS	5 90			
3. Prerequisites for the	module									
compulsory	none									
recommended	none									
4. Degree program alloc	ation									
		Study pro	gram		compul	sory/	Semester			
					elective	2				
	Medical Ir	nmunosciences	and Infe	ction (MSc)	comp	ulsory	2			
5. Requirements for the	award of cr	edits (ECTS)					6. Credits			
Required achievements	Attendance	of all seminars,	oral pres	entation of 20	min. in lite	erature	40 5070			
	seminar in E	ngiish with an a	ccompar	iying written n	andout/ 1	to 2	TOECIS			
	Successful p	graueu) articination in w	ritton ov	(graded)						
Assessment (incl	Written exa	m (100%)	/inten ex	ann (graueu)						
weighting) and	Duration: 18	0 min.								
examination language	Language ex	amination: Engl	ish							
7. Frequency			8. \	Workload		9. Dui	ration			
Winter semester	Winter and s	summer		300 h		1 te	erm			
Summer semester	semester									
Module coordination										
Module coordinator	Prof. Dr. Pet	er Brossart, Pro	f. Dr. Kat	rin Paeschke						
Institute/Department	Medical Face Medicine III)	ulty- Mediziniscl	he Klinik	und Poliklinik	III (Departı	ment of l	nternal			

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.

#### Module Title: Infection II



1. Content and intende	d learning oເ	utcomes					
Content	This module seminars: "S The seminar for specific v Herpesvirida Norovirus, P The seminar as well as op inherited or and fungal in The second mechanisms research and includes hel parasites an public healtl vaccination	encompasses three maj specific Virology", "Specific "Specific Virology" cove viral infections like HIV, h ae (CMV, HHV6, HHV8, El apillomaviruses. encompasses anti-viral oportunistic infections ur acquired immune deficient fections (candidiasis, as seminar "Specific Microl of bacteria that promot y with the immune syste of antibiotic resistance d animal models are also minths and parasites like d other pathogens. The s h, including industrial ani- and prophylaxis.	or topics which fic Microbiology rs symptoms, tr eepatitis viruses BV, HSVI) Influe therapies, vacci- nder immune su encies, organ tra- pergillosis, derr biology and Par- te colonisation, em of the host. <i>A</i> as well as meth part of this sen e Plasmodium as seminar "Hygier d hospital hygie	are repres & Parasito reatment a (HAV, HBV nza, RSV, M nation and ppressive ( ansplantati natophytes asitology" a adhesion, i Antibiotic t ods used ir ninar. The p s well as im- ne" treats t ne, drinkin	ented i ology" a nd clini '/HDV, Aeasles prophy condition, che s). address nvasion reatme patho parasito mune he topi g wate	n threand "H cal im HCV a , Rota ylactic ons (e emoth ses vir n and genicio ology regula cs hygi r hygi	e lygiene". iplications ind HEV), ivirus, c measures .g. ierapy) rulence resistance d ity part ation by giene and ene,
Learning outcomes	At the end of clinical impli specific viral herpesvirida effects of an by which me the host def have acquire how antibio Students can system and students can questions. Key compete treatment o literature an	and prophylaxis. If this module students a ications of specific infect infections including, but ie and Influenza and have iti-viral drugs and highly echanisms the pathogens iends itself and learn the ed basic knowledge of ph tic resistance evolves and he explain how parasites a the influence of the micr h apply their knowledge i ences: Familiarize with p f infectious diseases in h id combining it with curr	re acquainted v ious diseases. T t not limited to, e profound kno active antiretro s interact with t mechanisms of narmaceutical m d why some ant and bacteria infl obiome on imm in hygiene and p athogens and th umans. Classify ent knowledge	vith sympto hey can ex HIV, hepat wledge abo viral therap he host and opportuni nicrobiolog i-infective uence and nune respo public healt ne state of ing new infi in scientifio	oms, tro plain th itis viru out effe oy. The d cause stic infe y and h treatm regulat nses. Fi th to sc the art formati c discus	eatme ne effe uses, ects ar stude edisea ection ave u ents f te the urthen ientifi in the on fro sions.	ent and ects of nd adverse ents know ase, how ase, how ase, how as. They nderstood ail. immune rmore, ic research e om
	Type of instruction	Торіс	Language of instruction	Group size	Wee cont tim	ekly act ne	Workloa d [h]
	Seminar	Specific Virology			3 S\	NS	120
	Seminar	Specific Microbiology and Parasitology	English	20	2,5 S	SWS	100
	Seminar	Hygiene			0,5 S	WS	20
3. Prerequisites for the	module						
compulsory	none						
recommended	none						
4. Degree program allo	cation						
		Study program		compulse elective	ory/	S	emester
	Medical II	mmunosciences and Infe	ction (MSc)	complu	lsory		2

5. Requirements for the	e award of credits (ECTS)			6. Credits					
Required achievements	Attendance of all seminars,	oral presentation of 20 n	nin. in literature						
	seminar in English with an a	ccompanying written ha	ndout/ 1 to 2	8 ECTS					
	pages (non- graded)								
	Successful participation in w	uccessful participation in written exam (graded)							
Assessment (incl.	Written exam (100%)	Written exam (100%)							
weighting) and	Duration: 180 min.								
examination language	Language examination: Eng	lish							
7. Frequency		8. Workload 9. Duration							
Winter semester	Winter and summer	240 h	1 te	erm					
Summer semester	semester								
Module coordination									
Module coordinator	Prof. Dr. Christian Strassbur	g, Prof. Dr. Jacob Natterr	mann						
	Medizinische Klinik und Poli	klinik I (Department of Ir	nternal Medicine I	), Institute of					
Institute/Department	Medical Microbiology, Immunology and Parasitology, Institute for Hygiene and Public								
	Health, Medical Faculty								
Further information									
(Reading lists,	Recommended Reading:								
information links etc.)	- Bacterial Pathogenesis, B.	A. Wilson, M.E. Winkler,	4th edition Juli 20	19, softcover,					
	Wiley & Sons Ltd								
	- Essential Human Virology;	Jennifer Louten, Elsevier	, Academic press						
	- Principles of Virology: Path	ogenesis and Control, Vo	olume 2, Jane Flin	t, Wiley & Sons					
	Ltd								
	- Up to date reviews will be	provided in eCampus tw	o weeks before th	e start of the					
	module								

#### Module Title: Research Project I



1. Content and intende	d learning ou	itcomes							
Content Content Learning outcomes	<ul> <li>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.</li> <li>During this module students will acquire key competences for the successful preparation of their thesis.</li> <li>Topics covered are:</li> <li>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</li> <li>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.</li> <li>Key Competences: Scientific writing, presentation skills, critical evaluation and</li> </ul>								
	Key Compet	ences: Scientific	writing,	presentation sk	ills, critical	l evalua	tion and		
2. Teaching and learnin	g methods				i project m	lanagen	nent.		
	Type of instruction	n Topic Language of Gro instruction siz		Group size	Week conta time	ct [h]			
	Seminar			1	1 SW	'S 75			
	Practical course					9 SW	S 375		
3. Prerequisites for the	module								
compulsory	none; only fo	or externally cor	nducted i	research project	ts a learnin	g agree	ement is		
recommended	Participation	of MedImmun	1-03, Med	dImmun-04, Lim	es-001 in a	advance	5		
4. Degree program allo	cation		-						
		Study pro	gram		compulso elective	ory/	Semester		
	Medical Ir	nmunosciences	and Infe	ction (MSc)	compul	sory	3		
5. Requirements for the	e award of cr	edits (ECTS)					6. Credits		
Assessment (incl. weighting) and examination language	Oral present experiment grading) Written prot	ation (graded), C ation (20 min.) and reference o cocol of 10 to 40	in English f current pages in	based on the p publications (5 English with in	a) performed 0% of mod terpretatic	ule on of	15 ECTS		
	original data	and conceptua 50% of module	l classific grading)	ation in the setu	up of a scie	entific			
7. Frequency			8. \	Norkload		9. Dui	ration		
Winter semester	Winter and s semester	summer		450h		1 te	erm		
Module coordination					I				
Module coordinator	Prof. Dr. Gu	nther Hartmann	, Dr. Corr	nelia Hömig-Höl	zel				
Institute/Department	Institutes an	d departments	of the tea	aching staff to t	he MSc pro	ogram			
Further information					•				

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

Module Title:								
Research Project II								
Module ID/Code: Medir	00_nmun_00				UNIVE	ERSIT	AT BONN	
1. Content and intender	d learning ou	utcomes						
Content	Students car	n choose a resea	arch proi	ect. which will b	e conducte	ed withi	n the institute	es
	and departn	nents of the tea	ching sta	ff to the Msc pro	ogram. In d	consulta	tion with the	2
	program coo	ordinator and af	ter concl	uding a learning	agreemer	nt, resea	rch projects	
	may also be	performed exte	rnally e.	g. in institutes al	oroad or ir	dustry.		
	During this r	nodule students	s will acq	uire key compet	ences for	the succ	essful	
	preparation	of their thesis.	fornori	monte consideriu	ag all rolo	ant con	trals and the	
		d scientific pract	tice: Met	hodological con	rents and	nractica	l expertise	
	Documentat	ion. analysis an	d interpr	etation of origin	al data: Pr	esentati	ion and	
	classification	n of data in acco	rdance v	vith current scie	ntific litera	ture in o	oral and	
	written form	ı						
Learning outcomes	At the end o	f this module st	udents a	re able to solve	a well-defi	ined and	l time-	
	restricted re	cent scientific q	uestion i	in the field of Im	munoscier	nces, Inf	ection or	-I -
	independent	unology and Im	munopna nont data	armacology. The	y learn to with the ri	apply sp	ood scientific	as
	practice. Stu	idents can critic	ally refle	ct their own rese	earch and	have acc	ouired in-dep	, http://www.com/com/com/com/com/com/com/com/com/com/
	theoretical k	nowledge of th	eir proje	ct by independe	nt literatu	re resea	rch and	••••
	discussions	within the work	ing group	).				
	Key Compet	ences: Scientific	writing,	presentation sk	ills, critica	l evaluat	ion and	
	discussion o	f scientific resul	ts. Basics	s in planning and	project m	anagem	ient.	
2. Teaching and learning	g methods							
	Type of	Topic		Language of	Group	Week	Workloa	ad
	instruction	горіс		instruction	size	time	[h]	
	Seminar	Current Topics	s in Life			1 SW3	5 75	
		science	s	English	1			
	Practical					9 SW3	\$ 375	
	course							
3. Prerequisites for the	module							
compulsory	none; only f	or externally col	nducted	research project	s a learnin	ig agree	ment is	
recommended	Participation	MedImmun-03	8 MedIm	mun-04 Limes-	001			
4. Degree program allo	cation		.)cu					
		Study pro	gram		compulse	ory/	Semester	
			-		elective			
	Medical I	mmunosciences	and Infe	ection (MSc)	compul	sory	3	
5. Requirements for the	award of cr	edits (ECTS)					6. Credits	5
Required achievements	Written prot	tocol (graded), C	Dral pres	entation (graded	(k		45 5070	
Assessment (incl.	Oral present	ation (20 min.)	in English	h based on the p	erformed	:	15 ECTS	
examination language	Written prot	and reference o	n current	Epublications (50	J% OF grad	ing)		
examination language	original data	and conceptua	l classific	cation in the setu	up of a scie	entific		
	publication	(50% of grading)						
7. Frequency			8.	Workload		9. Dur	ation	
Winter semester	Winter and s	summer		450h		1 te	rm	
Summer semester	semester	V						
Module coordination								
Module coordinator	Prof. Dr. Gu	nther Hartmann	, Dr. Cor	nelia Hömig-Höl	zel			
Institute/Department	Institutes an	d departments	of the te	aching staff to th	ne MSc pro	ogram		
Further information								

Stand 2024-04-08

Module Title:										
Master thesis										
Module ID/Code: Medir	nmun-MA				UNI\	/ERSIT	ÄT BONN			
1. Content and intende	d learning οι	itcomes								
Content	The Master	Thesis is the fina	al part o	of the studies. T	ne student	ts work ir	a laboratory			
	environmen	t in the scientifi	c group	s of the departr	nents invo	lved in th	ne study			
	program. Th	eir work usually	/ contril	outes to a projec	ct leading	to a scier	ntific			
	publication.	Students will de	esign ar	d perform their	experime	nts consi	dering all			
	relevant con	trols and the ru	iles of g	ood scientific pr	actice. The	ey docum	ient, analyze			
	and interpre	and interpret their data in accordance with current scientific interature. During								
	learn how to	earn how to evaluate also less defined scientific problems.								
Learning outcomes	Students ha	ve gained exper	ience ir	ned selentine pr	orming an	d analvzi	ng experiments			
	independen	tly. They can ap	ply all p	reviously acquir	ed knowle	edge and	skills to solve a			
	well-defined	l scientific probl	lem. At	the end of the n	nodule stu	dents ca	n critically			
	reflect and i	nterpret data ar	nd evalu	uate scientific re	search pro	blems. A	t the end of			
	this module	students are aw	vare of	the principles fo	r defining	and deve	eloping scientific			
	research pro	ojects.								
	Key compete	ences: Scientific	: writing	g, presentation s	kills, critic	al evalua	tion and			
2 Tooching and loarnin	a mothode	r scientific resul	ts. Basi	cs in planning ar	ia project	manager	nent.			
2. reaching and learnin	g methous					Wook	N I			
	Type of	Type of Topic Language of				contac	Workload			
	instruction	instruction instruction					[h]			
	Master	Master Immunosciences English 1					S 900			
	project	and Infecti	on							
3. Prerequisites for the	module									
compulsory	Minimum 75	5 credit points fi	rom pre	vious examinati	ons (inclu	ding com	pulsory			
	modules), re	gistration of the	e projeo	ct and approval	by the Cha	irman of	the Board of			
	Examiners.									
recommended	If the studer	nt is working wit	th anim	als for the first t	ime: cours	se in basi	cs of laboratory			
	animal scien	ce according to	FELASA	A B guidelines.						
4. Degree program allo	cation	<u> </u>								
		Study pro	gram		compu	lsory/	Semester			
	Modical I	munoscioncos	and In	faction (MSc)	elective		1			
5 Requirements for the	award of cr	adite (FCTS)			Comp	uisory	4 6 Credits			
Bequired achievements	Master's the	sis (graded) Or	al nrese	entation (20 min	) of final	results	0. credits			
Required demevements	of the resea	rch project in Fr	nglish(n	on-graded):		results	30 FCTS			
	Attendance	at 15 scientific s	seminar	s or lectures in t	the field of	f	56 2015			
	medical rese	earch (study elei	ment ca	an be completed	l from the	first				
	semester on	wards).		-						
Assessment (incl.	Master thes	is of up to 80 pa	ages in E	English describe	d in detail	in the				
weighting) and	examination	regulations. (10	00%)							
examination language										
7. Frequency			8	. Workload		9. Du	ration			
Winter semester	Winter and s	summer		900		1 te	erm			
Summer semester	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										
Institute/Department	Prof. Dr. Gui Institutes an	nther Hartmann d departments	n, Dr. Co of the t	ornelia Hömig-Hö eaching staff to	blzel the MSc p	orogram				

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



1. Content and intended learning outcomes									
Content	Sepsis, serol	ogy, erythrograi	m, leuko	gram, gastroent	erological	and urin	e diagnostics		
Learning outcomes	Students hav	ve learned adva	nced prir	nciples in hemat	ology and	laborato	ry diagnostics		
	Key competer methods.	ences: Understa	nding pr	inciple of labora	itory diagn	ostics ar	d related		
2. Teaching and learning	g methods								
	Type of instruction	Торіс		Language of instruction	Group size	Weekl contac time	y Workload t [h]		
	Lecture	Clinical chen and hemato	nistry ology	German	Not limited	1	90		
3. Prerequisites for the	module								
compulsory	none								
recommended	none								
4. Degree program alloc	ation								
	Study program compuls elective					ory/	Semester		
	Humanmedizin compulsor					lsory	5		
	Medical Imn	nunosciences an	id Infecti	on (MSc)	electi	ve	1		
5. Requirements for the	award of cr	edits (ECTS)					6. Credits		
Required achievements	Passing writ	ten exam (grade	ed)				3 ECTS		
Assessment (incl.	Written exa	mination (100%)	)						
weighting) and	Duration: 90	) min							
examination language	Examination	language: Gern	nan						
7. Frequency			8. \	Workload		9. Dura	ation		
Winter semesterImage: ConstructionSummer semesterImage: Image: Construction	Winter and s semester	summer		90 h		1 te	m		
Module coordination									
Module coordinator	Prof. Dr. Bi	rgit Stoffel-Wa	gner						
Institute/Department	Institute of 0	Clinical Chemistr	y and Cli	inical Pharmaco	logy, Medi	cal Facul	ty		
Further information									
(Reading lists, information links etc.)	Regular part Up to date r module.	icipation in the eviews will be p	lectures rovided i	is highly recomr n eCampus two	mended weeks bet	fore the	start of the		

# Module Title: Klinische Prüfung von Arzneimitteln



1. Content and intended learning outcomes									
Content	Introduction	into planning, i	mplemer	ntation and ana	lysis of clin	ical tria	ls		
	Pharmaceut	ical assessment							
	Ethical aspe	cts of clinical tria	als						
	Documentat	ion							
	Trial protoco	ols							
	Quality man	agement							
	Practical imp	plementation of	clinical t	rials					
	Particularitie	es							
	Drug safety								
Learning outcomes	Students have learned requirements for clinical trials and could implement trials for								
	medicinal pr	oducts and pha	rmaceuti	cals.					
	Key compete	ences: Understa	nding the	e basic regulatic	ons and pro	ocedure	s of clinical		
	studies. Learning how to find and apply applicable regulations.								
2. Teaching and learnin	g methods								
	Type of			Language of	Group	Week	Workload		
	instruction	Topic		instruction	size	conta	ct [h]		
			matraction	5120	time	2			
	Lecture	Lecture Clinical trials for German 180 2 SWS					S 90 h		
		medicinical products							
3. Prerequisites for the	module								
compulsory	none								
recommended	none								
4. Degree program allocation									
		Study pro	gram		compulse	ory/	Semester		
					elective				
	Humanmedi	zin			compulse	ory	5		
	Medical Imn	nunosciences an	nd Infecti	on (MSc)	elective		1		
5. Requirements for the	award of cr	edits (ECTS)					6. Credits		
Required achievements	Passing writ	ten exam or ora	l examina	ation (graded)					
							3 ECTS		
Assessment (incl.	Written Exa	m or oral examii	nation (1	.00%)					
weighting) and	Time: Exam	180 min. or Ora	l examina	ation 10 to 30 m	nin.				
examination language	Examination	language: Gern	nan						
7. Frequency			8. \	Norkload		9. Dur	ration		
Winter semester	Winter and s	summer		90h		1 te	erm		
Summer semester	semester								
Module coordination									
Module coordinator	Prof. Dr. Gu	nther Hartmann							
	- Institute of	Clinical Chemis	trv and C	linical Pharmac	ology. Med	dical Fac	culty in		
Institute/Department	cooperation	with the BfArM	- <b>,</b>		0//				
Further information									
Further information (Reading lists.	Regular part	icipation in the	lectures	is highly recomr	nended				
Further information (Reading lists, information links etc.)	Regular part Up to date r	icipation in the eviews and info	lectures i rmation a	is highly recomr about clinical tri	nended als will be	provide	ed in eCampus		

Module Title:

# Developmental Neurobiology, Stem Cells and

Neuroregeneration



1. Content and intended learning outcomes										
Content	From Neurulation to Early Patterning of the Nervous System									
	Fate Instruct	ion and Regiona	al Detern	nination						
	In vitro Mod	els of Neural De	velopme	ent and Disease	Models					
	Circuit Form	ation in the Dev	eloping (	Central Nervous	System					
	Glia Cells an	d Myelin	cts of Co	rtical Developm	ient					
	Self-Organiz	ation and 3D Cu	ltures							
	Neural Canc	Neural Cancer Stem Cells								
	Neuropatho	Neuropathology of the Developing Central Nervous System								
	Transgenic A	Transgenic Animal Models								
	Principles of	Neural Cell Rep	lacemen	t						
	Stem Cell Ni	ches and Recrui	tment in	to the CNS						
Learning outcomes	Students lea	rn about the de	velopme	nt of the nervou	us system a	and the	role and			
	features of s	tem cells.								
	Key compete	ences: Understa	nding th	e principles of N	leurobiolo	gy and o	development of			
2 Teaching and learning	a mothode									
2. reaching and learning	ginethous					Wook	dv.			
	Type of	Tonic		Language of	Group	conta	t Workload			
	instruction	Topic		instruction	size	time	[h]			
	Lecture	Developme	ental	English	180	2 SW	/S 90			
		Neurobiology, Stem								
		Cells and	d							
		Neuroregene	ration							
3. Prerequisites for the	module									
compulsory	None									
recommended	None									
4. Degree program allo	cation				1					
		Study pro	gram		compulse	ory/	Semester			
	Nourossione				elective		2			
	Humanmodi	es (IVI. Sc.) zin (Wahlfach 1	١		elective		2 1 5			
	Immunhiolo	gy: from moleci	<u>)</u> Iles to in	tegrative	elective		2			
	systems (M.	Sc.)		regrative	ciccuve		2			
	Molecular Co	ell Biology (M. S	c.)		elective		2			
	Medical Imm	nunosciences an	d Infecti	on (M. Sc.)	elective		2			
5. Requirements for the	award of cr	edits (ECTS)					6. Credits			
Required achievements	Passing write	en exam (grade	ed)							
							3 ECTS			
Assessment (incl.	Written exar	nination (100%)	)							
weighting) and	Duration: 90	min.								
examination language	Language ex	amination: Engl	ish	A/		0.0				
7. Frequency	TT7' 1		8. 1	Workload		9. Du	ration			
Winter semester	Winter and s			90 h		1 te	erm			
	semester									
Module coordination		<b>- - - - -</b>								
Module coordinator	Prof. Dr. Oliv	er Brüstle								
Institute/Department	Medical Faci	uity-Institute of	Reconstr	ructive Neurobio	biogy, Life a	and Bra	in Center			
Further information										
(Reading lists,	Regular part	icipation in the	lectures	is highly recomr	nended					
information links etc.)	Kecommend	ea Keading:	rticlos m	ontioned during	locture					
	current itter	ature, neview d		encioned during	iecture					

#### Module Title: Cellular Neurobiology of Disease

UNIVERSITÄT BONN

would ib/code. weak	IIIIuii-13									
1. Content and intende	d learning ou	itcomes								
Content	Cytology o	f neurons and a	xonal tra	nsport						
	Microglia	and neuroinflam	mation	•						
	Neurotrop	hic factors and	cytokines	5						
	Cell adhes	ion and migratio	, on							
	Guidance	molecules								
	Glyconeur	obiology								
	Neurorege	eneration								
	Neurodege	eneration								
	Neuro-Op	nthalmology								
	Neuroimm	unology								
Learning outcomes	Students ha	tudents have learned advanced principles in the cellular neurobiology of diseases								
Learning outcomes	They know h	now and when t	he immu	ne system is inv	olved in th	ne nathol	ogy of specific			
	neurologic d	neurologic diseases								
	Key competences: Understanding the role of neurobiology in the development of									
	disease		nung th		lology in t		opinient of			
2 Teaching and learnin	a mothods									
	ginethous					NA/ I-I				
	Type of	- ·		Language of	Group	weeki	y Workload			
	instruction	Горіс		instruction	size	contac	t [h]			
			1 • 1	- I' I	100	time				
	Lecture	Cellular Neuro	biology	English	180	2 5 8 5	90			
		of Diseas	se			L				
3. Prerequisites for the	module									
compulsory	none									
recommended	none									
4. Degree program allo	cation									
		Study pro	gram		compuls	orv/	Semester			
		, , , ,	0		elective					
	Neuroscienc	es (M. Sc.)			elective		2			
	Humanmedi	zin (Wahlfach 1	)		elective		2-5			
	Immunobiol	ogy: from mole	, cules to i	ntegrative	elective		2			
	systems (M	Sc )		inceBrative	cicotive		-			
	Molecular C	ell Biology (M. S	<u>()</u>		elective		2			
	Medical Imp	unosciences ar	d Infecti	on (M. Sc.)	elective		2			
E Boguiromonto for the	weater for			011 (101. 30.)	elective		- Cradita			
Dequired achievements	Dessing write	ton over (grade	\d\				o. creats			
Accessment (incl	Passing witt	mination (100%)	-u) \							
Assessment (incl.	Duration: 00	11111ation (100%)	)				5 LCI5			
examination language	Examination 90	l anguago: Engl	ich							
	Examination	Language. Engi				0.0				
7. Frequency	<b>TT</b> 7' / 1		0.	WUIKIUau		9. Dura				
Winter semester	Winter and s	summer		90 h		1 tei	rm			
Summer semester	semester									
Module coordination										
Module coordinator	Prof. Dr. Har	ald Neumann								
Institute/Department	Institute of F	Reconstructive N	leurobio	logy. Medical Fa	aculty					
Further information				- 67,						
(Reading lists	Recommons	led Reading: 1	Molecula	r Biology of the	Cell from	Alberts	Bruce:			
information links atc.)	Iohnson Ale	ieu neauiiig. 1. I wander: Lowic	Iulian: 20		cen, nom	Aibeits,	Diuce,			
mormation miks etc.)	2 Drinciples	of Neural Science	co Etho	d Eric D Vanda	ᆡᆝᆸᇆᇊᆈ	wartz T	M. lossall at			
	2. FILLUPIES	or meural sciell	ce, stille	u., LIIC N. NAHUE	., j. n. sun	waitz, i.	ואו. זבסטבוו פנ			
		Immunohiolog	w from "	onnoth Murah	2011					
L	D. Janeway S	gororonania	у, пошк	enneur wurphy	, zull.					

Module Title:									
Grundzüge der Ana	itomie für	Pharmazeut	en						
					UNIVE	RSIT	ÄΤ	BONN	
Module ID/Code: MeIm	mun-14				ONIVE		/ \ 1	Bonn	
1. Content and intended	d learning ou	itcomes							
Content	Nussbauprin	izip							
	Metamerie								
	Extremitäter	า							
	Bewegungsa	pparat							
	Rumpfwand	· · · ·							
Learning outcomes	Students hav	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	g methods			1		1			
	Type of			Language of	Group	Week	dy	Workload	
	instruction	Topic		instruction	size	conta	ct	[h]	
						time	3		
	Lecture	and topology) German 180 2 SWS		90					
3. Prerequisites for the module									
compulsory	None								
recommended	None								
4. Degree program alloc	ation								
		Study prog	ram		compulse	ory/		Semester	
					elective				
	Medical Imn	nunosciences and	Infectior	n (M. Sc.)	electi	ve		1; 2	
	Pharmazie (S	Staatsexamen)			compulse	ory		1-5	
5. Requirements for the	award of cr	edits (ECTS)					e	5. Credits	
Required achievements	Written exa	mination (graded)						3 ECTS	
Assessment (incl.	Written Exa	mination (100%)							
weighting) and	Duration: 12	0 min;							
examination language	Examination	language: Germa	n						
7. Frequency			8. \	Workload		9. Du	ratio	on	
Winter semester	Winter and s	summer		90		1 te	erm		
Summer semester 🛛 🗌	semester								
Module coordination									
Module coordinator	Prof. Dr. Ruj	in Huang							
Institute/Department	Anatomische	es Institut, Medica	al Faculty	,					
Further information									
(Reading lists,	Regular part	icipation in the le	ctures is	highly recomme	nded				
information links etc.)	Recommend	led Reading: Curre	ent litera	ture, Der Mensc	h - Anator	nie und	l Phy	vsiologie J.S.	
	Schwegler, F	Runhild Lucius, Thi	ieme Auf	lage 7, 2022					

#### Module Title: Immunometabolism



1. Content and intended learning outcomes								
Content	Content Introduction in the emerging field of cellular metabolism and immune function.							
	Detailed inst	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 mo	dels						
2. Teaching and learning	g methods							
	Type of			Language of	Group	Week	ly	Workload
	instruction	Topic		instruction	size	conta	ct	[h]
						time	;	
	Seminar Immunometa		bolism	English	20 2 SW		S	90
3. Prerequisites for the	module							
compulsory	none							
recommended	none							
4. Degree program allocation								
	Study program compulsory/						Semester	
					elective			
	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.	Attendance in seminars and participation in scientific discussions.							
weighting) and	Oral presentation: 40 min. as part of seminar(100%)							
examination language Language of presentation : English								
7. Frequency			8. \	Norkload	9. Dur		atio	on
Winter semester	Winter and summer			90 h 1		1 te	1 term	
Summer semester	semester							
Module coordination								
Module coordinator	Prof. Dr. Christoph Wilhelm							
Institute/Department	Institute of Clinical Chemistry and Clinical Pharmacology, Medical Faculty							
Further information								
(Reading lists,	Reading lists, Recommended Reading:							
information links etc.)	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



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.						
	<ul> <li>Detailed instructions on how to present and discuss primary research articles.</li> </ul>						
	<ul> <li>Overview about new scientific development in the field, by analyzing latest</li> </ul>						
	literature.						
	• Discussion of novel therapeutic concepts, immune monitoring/-scoring and						
	experimental methodologies in immune-oncology.						
	<ul> <li>Introduction in state of the art techniques that are used in the analysis of immunological processes will be presented and the advantages and disadvantages</li> </ul>						
	will be discussed.						
Learning outcomes	The goal of this course is that students understand the various determinants of anti-						
U	tumor immu	ine responses ai	nd how t	his knowledge c	ould be us	ed to im	prove cancer
	immunother	ару.					
	Key compete	ences: Gaining p	profound	knowledge on t	he role of	the Imm	nunsystem in
	oncology an	d possible interv	vention a	nd activation in	treatment	. Preser	ntation skills,
	evaluation a	nd critical discu	ssion of p	primary literatu	e, intercul	tural sci	entific
	discussion on basis of examples from literature, integrating new scientific findings						
into scientific models							
2. Teaching and learning	g methods			E	[	14/	h
	Type of	Topic		Language of	Group	week	V Workload
	instruction	Topic		instruction	size	time	۲ [h]
	Lecture/	Immuno-ond	cology	English	20	2 SW3	5 90
	Seminar		07	0	-		
3. Prerequisites for the module							
compulsory	none						
recommended	none						
4. Degree program allocation							
	Study program compulsory/ S				Semester		
					elective		
	Medical In	Medical Immunosciences and Infection (M. Sc.)			elective		1
5. Requirements for the	e award of credits (ECTS) 6. Credits						
Required achievements	Ural presentation (graded)						
Assessment (Incl.	Attendance in seminars and participation in scientific discussions. 3 ECIS						
examination language	Language of presentation : English						
	8. Workload 9 Duration						
Winter semester $\nabla$	Winter and summer		90 h		1 torm		rm
Summer semester	semester			50 11	I (CIIII		
			L				
Module coordinator Prof. Dr. Michael Hölzel							
Institute/Department	Medical Faculty, Institute of Experimental Opcology (IEO)						
Further information							
(Reading lists	(Reading lists Recommended Reading:						
information links etc.)	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
Madula ID/Cada, Madimmun 19



[h]

90

1

Module ID/Code: Medimmun-18 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 selftolerance 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 Weekly Type of Workload Language of Group Topic contact instruction instruction size time Lecture/ Nucleic acid English 20 2 SWS Seminar recognition in antiviral Innate Immunity and autoinflammation 3. Prerequisites for the module compulsory none recommended none 4. Degree program allocation Study program compulsory/ Semester elective Medical Immunosciences and Infection (M. Sc.) elective 5. Requirements for the award of credits (ECTS) 6. Credits **Required achievements** Oral presentation (graded) 3 ECTS Assessment (incl. Attendance in seminars and participation in scientific discussions. weighting) and Oral presentation: 40 min. as part of seminar in English (100%) examination language 7. Frequency 8. Workload 9. Duration Winter semester  $\mathbf{N}$ Winter and summer 90 h 1 term Summer semester semester Module coordination Prof. Dr. Martin Schlee Module coordinator

Institut für Klinische Chemie und Klinische Pharmakologie, Medical Faculty

Institute/Department

Further information	
(Reading lists,	Recommended Reading:
information links etc.)	- 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



1. Content and intended learning outcomes								
Content	Introduction	to the complex	field of	r cell biology.				
	Detailed instructions on how to present and discuss primary research articles.							
	Overview ab	Overview about new scientific developments in the field, by analyzing hallmark						
	research pap	pers as well as th	ne currer	it literature.				
	Novel conce	Novel concepts of T cell differentiation and function will be described and discussed.						
	State of the	art techniques t	nat are u	ised in the analy	SIS OF I CE	IS WIII D	e presented	
Loarning outcomes	The sim of t	his course is the	t student	es will be discus	o difforon	tiation a	nd function of	
Learning outcomes	I ne 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 baset immune.							
	various i cell populations and now this knowledge could be used to boost immune responses to infections and during vaccination or to inhibit them in diseases such as							
	autoimmunity							
	Key Compet	ences: Gaining p	profound	knowledge in T	cell differe	entiatior	n and function.	
	Presentation	n skills, evaluatio	on and cr	itical discussion	of primary	/literatu	ire,	
	intercultural	scientific discus	ssion, crit	ical thinking, in	tegrating n	ew scie	ntific findings	
	into current	scientific model	s.					
2. Teaching and learning	g methods							
	Type of				Group	Weekl	y Workload	
	instruction	Topic		instruction	size	contac		
	instruction			motraction	5120	time	[]	
	Lecture/	T-Cell func	tion	English	20	2 SWS	5 90	
	Seminar	nar						
3. Prerequisites for the	module							
compulsory	none							
recommended	none							
4. Degree program allo	ation					· 1		
	Study program				compulsory/ elective		Semester	
	Medical Immunosciences and Infection (M. Sc.) ele					ve	1	
5. Requirements for the	e award of credits (ECTS) 6. Credits							
Required achievements	Oral presentation (graded)							
Assessment (incl.	Attendance in seminars and participation in scientific discussions. 3 ECTS							
weighting) and	Oral presentation: 40 min. as part of seminar (100%)							
examination language	Language of presentation: English							
7. Frequency			8. \	Vorkload	9. Duration		ation	
Winter semester□Summer semester□	Winter and s semester	Winter and summer 90 h semester 90 h		90 h	1 term			
Module coordination								
Module coordinator	Prof. Dr. Dirk Baumiohann							
Institute/Department	Medical Clinic III – Professorship for Autoimmunity. Medical Faculty							
Further information								
(Reading lists Recommended Reading)								
information links etc.)	- 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	•		U				
	- 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							