Research Groups of the Department of Infectious Diseases

Infectious Diseases - A Brief Description

Although infectious diseases have been known for thousands of years, the understanding of their source emerged only in the past century. Thus, the study of infectious diseases at the molecular and cellular level is a rather new research area, whose origin as an independent scientific discipline can be traced back to the discovery of pathogenic microorganisms in the 19th century.

Today it is common knowledge that infectious diseases are caused by bacteria, viruses, fungi and parasites. Although a lot has been learned about human pathogens in the past decades, infectious diseases continue to be a major threat for human health. Not only well known diseases like malaria, AIDS or chronic hepatitis, but also gastrointestinal or respiratory infections result in millions of deaths each year. Rapid evolution of pathogens and a changing environment result in rising threats from multiresistant bacteria or the emergence and spread of pathogens including novel strains of influenza virus, MERS or Dengue virus. Furthermore, advances in medicine have led to an increased number of immunocompromised people who are particularly susceptible to infectious diseases.

Apart from their enormous medical importance, microbes are also important model systems for molecular and cell biology. For example, RNA splicing was discovered in adenoviruses, oncogenes were found for the first time in retroviruses and the structure of nucleosomes was described initially for DNA viruses.

Current infectious disease research is a highly interdisciplinary topic at the interface between medicine and molecular, cell and structural biology. The Major "Infectious Diseases" within the MSc "Molecular Biosciences" offers the opportunity to study this topic in considerable depth, both in theory and in practice.

Research at the Department of Infectious Diseases

Main research topics of the Department include HIV/AIDS, malaria, viral hepatitis and the interaction between pathogens and their host (immunology of infection, pathogen spread (https://www.klinikum.uni-heidelberg.de/UEberblick.1208.0.html)). Researchers from all units are integrated within the new Center for Integrative Infectious Disease Research, where replication and spread of pathogens is studied in systems of increasing complexity, from molecular detail to interaction with the host immune response in 3D culture systems or animal models. Interactions are further strengthened by the new CIID building (INF 364) opened in November 2017, which houses many groups from the Department of Infectious Diseases and offers state of the art equipment, in particular an Infectious Disease Imaging Platform (https://www.idip-heidelberg.org) for imaging of pathogens by a broad spectrum of advanced methods.

Beyond that, all research groups of the department are connected within local and international research consortia and networks, some of which are coordinated by members of the department. This comprises the Cluster of Excellence "CellNetworks" (http://www.cellenet.unihd.de/), the German Center for Infection Research “DZIF” (http://www.dzif.de) as well as DFG collaborative research centers SFB1129 (http://www.sfb1129.de), SFB-TR179 (web tba) and SFB-TR83 (http://www.tr83.de/) and the DFG priority program 1923 (web tba).

We cooperate with numerous institutions from Heidelberg University, the European Laboratory for Molecular Biology (EMBL), the German Cancer Research Center (DKFZ) and the Max-Planck-Institute for Medical Research, as well as with international partners. Our research activities are strengthened in particular by close interdisciplinary collaboration with scientists from the fields of physics, chemical biology, proteome and transcriptome analysis, cryo-electron microscopy, image analysis and scientific modelling.

More information on the research activities of the members of the Department of Infectious Diseases, the ZMBH-group and the associated research groups participating in this Major can be found in the profiles provided in the appendix and on the corresponding websites.
Content and Structure of the Major Infectious Diseases

The Major "Infectious Diseases" is intended for students with a good basic knowledge of molecular and cell biology who wish to put their main focus on infectious disease pathogens. In the context of the Major they will deepen their knowledge of the basics of molecular and cell biology and get to know specific aspects of the replication of infectious pathogens and their interactions with their hosts. The participating departments and research groups offer internationally renowned research programs as well as an excellent infrastructure and they are very well connected with other research institutions inside and outside the university. Therefore, they offer ideal conditions for the Major "Infectious Diseases".

Criteria for admission

We welcome appropriately qualified students from all over the world to this course. Since modern infectious disease research focuses on molecular mechanisms of pathogenesis, a good basic knowledge of molecular and cell biology is a prerequisite for admission. Some prior knowledge of infectious disease biology and immunology is also helpful, but not mandatory. Students in the Heidelberg Bachelor courses “Biology” and “Molecular and Cellular Biology” who are interested in this Major are advised to attend the lectures and courses on microbiology, infectious disease immunology, parasitology and virology in Semesters 4 and 5.

Acquired Degree

With the successful completion of the course the student acquires the MSc in Biology with the specialization (Major) "Infectious Diseases". This Master’s degree qualifies students to enter PhD programs in Europe or could be a starting point for a career in the pharmaceutical industry or a biotech company.

Various doctoral study programs are offered by the institutes involved in the "Infectious Diseases" Major. Further information is to be found on the websites of the participating departments. Students who are particularly keen to pursue a doctoral degree, and who have sufficiently high grades, may transfer to a doctoral program already after three semesters of Masters studies.

Education at the Department of Infectious Diseases

The Department of Infectious Diseases at the Medical Faculty of Heidelberg represents the subject of Infectious Diseases in research, education and diagnostics, in the fields of bacteriology, virology, parasitology and tropical medicine. There are five units with a large number of research groups, most of which are involved in the educational activities of this Major. These units are:

- Medical Microbiology and Hygiene
- Molecular Virology
- Virology
- Integrative Virology
- Parasitology
Medical Microbiology

Fields of Interest

Teams in the Medical Microbiology and Hygiene unit work in the field of Infection & Immunity. Specifically, we are interested in understanding how host immunity reacts towards the contact with invading pathogens. A focus over the last years has been innate immunity which comprises the first line of defense against pathogenic microorganisms. Groups within the research unit study the biology of macrophages and dendritic cells which first encounter microbes. Moreover, frontline immunity at mucosal surfaces is analyzed. As the immune system is organized as a cellular network, communication between cells is of crucial importance. Therefore the research unit has a deep interest in signal transduction.

While classical bacteriology focuses on virulence factors and pathogenicity principles it is nowadays obvious that altered immune responses are equally important for infection susceptibility. The research unit analyzes the complex interplay of bacteria and immune cells thereby paving new roads for understanding current problems in infection defense, including sepsis, opportunistic infections in immunocompromised hosts and multi-resistant bacteria.

In order to address these topics we are using a multitude of methods and experimental approaches covering the fields of immunology, microbiology, molecular and cell biology as well as biochemistry.

The following teams belong to Medical Microbiology:
- Prof. Dr. Klaus Heeg (Head of the Medical Microbiology)
- apl. Prof. Dr. Katharina Hieke-Kubatzky
- PD Dr. Tatjana Eigenbrod

apl. Prof. Dr. Katharina Hieke-Kubatzky

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Scientific Vita

2018: Professorship (apl.) at Heidelberg University

2012: Habilitation in "Molecular Medicine" at the University of Heidelberg

2008: Max Kade Grant for a research year at the University of Michigan, Ann Arbor, USA

2007-present: Group Leader at the Department of Infectious Diseases, University of Heidelberg

2005-2006: Junior Group Leader at the University of Freiburg, Institute of Experimental and Clinical Pharmacology and Toxicology

2002-2004: Postdoctoral Fellow at the Ludwig Institute for Cancer Research, Brussels, Belgium

2001-2002: Researcher at Alantos Pharmaceuticals, Heidelberg

1997-2000: PhD Thesis at the Max Planck Institute for Immunobiology, Freiburg

1992-1997: Studies in Chemistry at the University of Freiburg

Selected Publications


Specific Research Interests

- Signal Transduction
- Bacterial Protein Toxins
- Cytokine receptor signaling, JAK-STAT pathway
- Mechanisms of immune evasion used by Pasteurella multocida Toxin
- Osteoclastogenesis: Crosstalk between the skeletal and the immune system
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**Scientific Vita**

2014-present: Post-doctoral Fellowship at the Department of Infectious Diseases, University Hospital Heidelberg

2013-2014: Post-doctoral Fellowship at the Université Laval, Canada

2009-2013: PhD student at the Université Laval, Canada

2008-2009: Master degree (second year) at Rennes university, France

2007-2008: Master degree (first year) at Poitiers university, France

2004-2007: Licence degree in Biology: speciality in ecology and evolution. Poitiers university, France

**Specific Research Interests**

- Human microbiome
- Airways infection
- Host-microbes interactions
- Microbial ecology and evolution
- Next-generation sequencing

**Selected Publications**


Boutin S, Graeber SY, Stahl M, Dittrich AS, Mall MA, Dalpahe AH: Chronic but not intermittent infection with Pseudomonas aeruginosa is associated with global changes of the lung microbiome in cystic fibrosis. *Eur Respir J* 2017; 50(4)


1997-2004: Medical student, Johannes Gutenberg University Mainz; license to practice medicine

**Specific Research Interests**

- Infection & Immunity
- Innate immunity, Toll-like receptors
- Immunostimulation through bacterial nucleic acids
- RNA modifications
- Physiological implications of RNA-mediated immune activation during bacterial infections

**Selected Publications**


Eigenbrod T, Bode KA, Dalpke AH: Early inhibition of IL-1beta expression by IFN-gamma is mediated by impaired binding of NF-kB to the IL-1beta promoter but is independent of nitric oxide. *J Immunol 2013;* 190(2):6533-41


Molecular Virology

Fields of Interest

Teams in the department Molecular Virology work on several highly important human pathogens, namely hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV) and several flaviviruses, most notably Dengue virus (DENV) and Zika virus (ZIKV). These viruses are leading causes for death worldwide with about 400 million people suffering from a chronic infection with HBV or HCV and about 400 million new DENV infections occurring each year, especially in tropical countries. Moreover, the recent pandemic spread of ZIKV underscores the medical relevance of this virus family.

As a department that focuses on the molecular and cell biology of these infections, the following topics are studied: virus-host cell interactions, mechanism of host cell infection, morphology, biogenesis and dynamics of viral replication factories, virus assembly and involved host cell factors, viral and cellular factors and their suitability for (broad-spectrum) antiviral therapy, RNA structures and their role for viral replication, mathematical modeling and simulation of virus replication and interaction with innate immune responses, virus-induced host cell alterations, host cell stress response to virus infection, innate immune response and viral counter measures, antiviral therapy and therapy resistance. In order to cover these topics, we are using a broad and diverse array of methods and experimental approaches covering the fields of molecular biology, cell biology, biochemistry and immunology. In addition to state-of-the-art methods in these fields we use live cell imaging, cutting edge light and electron microscopy as well as 3D reconstructions.

The following teams belong to Molecular Virology:

- Prof. Dr. Ralf Bartenschlager (Head of the Molecular Virology)
- Prof. Dr. Stephan Urban
- apl. Prof. Dr. Volker Lohmann
- Dr. Alessia Ruggieri

Prof. Dr. Ralf Bartenschlager

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Scientific Vita

2002-present: Full Professor and head of Department of Infectious Diseases, Molecular Virology, Heidelberg University, Germany; CHS Stiftungsprofessur “Molekulare Virologie”

2001: Full Professor for Molecular Biology, University of Mainz

1999: Habilitation, University of Mainz

1994-1998: Assistant, University of Mainz

1992-1993: PostDoc, Central Research Unit, Hoffmann-La Roche AG, Basel, Switzerland

1990: PhD in Molecular Biology, Heidelberg University


Specific Research Interests

- Virus - host cell interaction (HBV, HCV, DENV and ZIKV)
- Structural and functional aspects of viral RNA replication and assembly
- Viral and host targets for antiviral therapy
- Mathematical modeling of virus replication and spread as well as innate immune responses and viral countermeasures
- Strategies of viral persistence
Selected Publications


Prof. Dr. Stephan Urban

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Scientific Vita

Since 2014: Full professor (W3) “Translational Virology” at the Medical Faculty of the University of Heidelberg 2008-2014: Professorship (apl.) at the Faculty for Biosciences at the University of Heidelberg 2001-present: Research group leader at the Department of Infectious Diseases, Molecular Virology of the University Hospital Heidelberg 2000-2001: Stipendium at the ZMBH, Heidelberg University 2000: Habilitation at the faculty of Biosciences, Heidelberg University 1995-2000: PostDoc Center for Molecular Biology (ZMBH), Heidelberg University (Prof. Dr. H. Schaller) 1991-1995: PhD, Dept. of Virology (Prof. Dr. P. H. Hofschneider), Max-Planck-Institut for Biochemie, Martinsried 1991: Diploma in Biochemistry, University of Tübingen

Specific Research Interests

- Molecular mechanisms of Hepatitis B- and Hepatitis D Virus/host interactions with a focus on the early events of infection
- Identification of hepadnaviral receptors and structural analyses of virus receptor interactions
- Development of novel cell culture systems and animal models for HBV/HDV
- Clinical development of entry inhibitors (Mycludex B) for HBV/HDV infection
- Development of hepatotropic drugs for the therapy of liver diseases

Selected Publications


apl. Prof. Dr. Volker Lohmann

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Scientific Vita

2012: Habilitation, Heidelberg University
2002-present: Group Leader, Heidelberg University
1998-2002: PostDoc, Institute for Virology, University of Mainz
1993-1997: PhD, University of Mainz
1987-1992: Biology School, University of Mainz

Specific Research Interests

- Replication of hepatitis C virus and hepatitis A virus
- Host cell factors of viral replication
- Lipid kinases and phosphatidylinositols
- Antiviral therapy and mode of action of inhibitors
- Role of the innate immune system in virus control
- Function of norovirus nonstructural proteins

Selected Publications


Dr. Alessia Ruggieri

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Scientific Vita

2014-present: Independent group leader at the Department of Infectious Diseases, Heidelberg University
2008–2013: Postdoc at the Department of Infectious Diseases, Heidelberg University (Prof. R. Bartenschlager)
2004–2008: PostDoc at the Institute of Human Genetics, University of Saarland (Dr. J. Mayer)
1999–2003: PhD in Virology, École Normale Supérieure de Lyon, France
1998–1999: Diploma thesis, University of Lyon, France

Specific Research Interests

- Dynamics of the host stress response to RNA virus infection
- Identification of regulators of hepatitis C virus-induced stress granule oscillation
- Mathematical modeling of oscillating host stress response to hepatitis C virus infection
- Interplay of Flaviviruses with the host cell translation machinery
- Innate immune sensing of human endogenous retroviruses

Selected Publications

translation suppression from cellular stress responses. _mBio_ 2017; 8:e02150-16.


Virology

Fields of Interest

Groups in Virology are interested in the molecular mechanisms leading to viral infection. The broad expertise of the various groups within the department allows us to dissect various steps in the viral life cycle, ranging from receptor binding to assembly and release, and to investigate pathogen-host interactions for a number of medically relevant viruses.

A major focus of our research is human immunodeficiency virus (HIV), the causative agent of AIDS (Kräusslich, Müller). In spite of several decades of intense research, many questions concerning the biology of the virus remain unanswered; among these are surprisingly basic questions as ‘Where does the virus enter the host cell?’ or ‘When and how is virus maturation initiated?’ Our projects address the molecular and structural biology of the virus and its interaction with the host cell, including the evaluation of novel targets for antiviral therapy. We mainly focus on detailed analyses of virus morphogenesis and structure, as well as on the cell biology and dynamics of HIV entry, assembly and release and the induction of the innate immune response. To address these topics, we combine traditional biochemical and virological approaches with advanced imaging techniques (live-cell imaging, novel fluorescent labeling strategies, various super-resolution fluorescence microscopy, (cryo)electron microscopy and -tomography, correlative microscopy, click chemistry) that we employ alone or together with strong collaborators. By this we aim at a quantitative and time resolved description of HIV-1 entry and morphogenesis, delineating the mechanistic role of viral and cellular factors (proteins and lipids) in these processes.

Other viral systems studied include parvoviruses, the enteropathogens norovirus and reovirus, bunyaviruses, influenza virus and hepatitis E virus. We develop and use vectors based on adeno-associated virus for basic research and gene therapy approaches (Grimm) and exploit the CRISPR/Cas system for gene therapeutic and antiviral strategies (Grimm, Kräusslich). The Hansman group investigates the structural biology of the interaction of noroviruses, a major cause of infectious diarrhea, with cellular binding molecules. A further focus of interest is virus entry: the Lozach group is interested in entry pathways of bunyaviruses in the mammalian host and arthropod vector cells, whereas the Boulant group addresses the induction of innate immune response upon reovirus entry in human polarized intestinal epithelial cells and organoid systems, and the group of Dao Thi studies interactions between Hepatitis E virus and host cells in stem-cell derived culture systems. Finally, we are interested in influenza virus structure, particle formation and entry, and in the role of host proteins and lipids in these processes (Kräusslich, Chlanda). Combination of conventional virological approaches with a wide variety of specialized techniques (e.g. cryo-electron tomography, high throughput approaches, advanced fluorescence microscopy techniques, x-ray crystallography and more) is employed to address our virological questions.

The following teams belong to the Virology:

- Prof. Dr. Hans-Georg Kräusslich (Head of the Virology)
- Prof. Dr. Dirk Grimm
- apl. Prof. Dr. Barbara Müller
- Dr. Steeve Boulant
- Dr. Petr Chlanda
- Dr. Viet Loan Dao Thi
- Dr. Grant Hansman
- Dr. Pierre-Yves Lozach

Prof. Dr. Hans-Georg Kräusslich

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Scientific Vita

2014–present: Vice-dean for research Medical Faculty, Heidelberg University
2004–present: Director Department of Infectious Diseases, Heidelberg University
2000–present: Full professor and head of virology, Heidelberg University
1995–1999: Full professor and head of department, Heinrich-Pette-Institute, Hamburg
1996–1999: Director, Heinrich-Pette-Institute, Hamburg
1993–1995: Head of junior department, German Cancer Research Centre, Heidelberg
1990: Habilitation, University of Heidelberg
1989–1993: Group leader, German Cancer Research Centre, Heidelberg
1985: MD in experimental virology (LMU Munich)
1977–1984: Medical School (LMU Munich)

Specific Research Interests

- Molecular virology
- Cell biology of virus infection
- Assembly, release and molecular architecture of HIV and influenza virus particles
- HIV Protease and antiviral resistance
apl. Prof. Dr. Barbara Müller

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Selected Publications


Specific Research Interests

- Biology of human immunodeficiency virus
- Fluorescently labeled HIV-1 derivatives
- Dynamics of HIV cell entry and HIV particle formation
- HIV assembly and maturation
- Quantitative analysis of HIV replication steps

Movie:
Dr. Steeve Boulant

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Email: s.boulant@dkfz-heidelberg.de

Scientific Vita
2012-present: Junior Group Leader CHS Foundation, University Hospital Heidelberg
2008-2012: Postdoctoral associate, Harvard Medical School Boston MA, USA
2006-2008: Marie curie Postdoctoral fellow, MRC Virology Unit Glasgow, UK
2005-2006: Postdoctoral associate, MRC Virology Unit Glasgow, UK
2004-2005: Bridging grant fellow, IBCP-CNRS Lyon, France
2001-2004: PhD in Molecular Biology and Biochemistry, IBCP-CNRS, France
2000-2001: DEA in Molecular Biology and Biochemistry (Master), Lyon, France
1998-2000: Bachelor degree in Molecular Biology and Biochemistry, Lyon, France

Specific Research Interests
• Characterization of the dynamic uptake, intracellular trafficking and endosomal rupture of non-enveloped viruses using live-cell confocal microscopy
• Evaluation of the forces exerted during viral entry
• Characterization of the kinetics and mechanism of clathrin structures
• Determining the anti-viral innate immune response in intestinal polarized epithelium cells
• Evaluation of the intracellular location and functional aspects of innate immunity sensor proteins (TLR and RLR) in polarized cells

Selected Publications


Dr. Grant Hansman

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Scientific Vita
2012-present: Group Leader, Heidelberg University and DKFZ, Germany
2005-2012: Senior Scientist, National Institute of Infectious Diseases, Japan
2001-2005: PhD, The University of Tokyo, Japan
1998-1999: Honors Degree, University of New South Wales, Australia
1993-1996: BSc, Macquarie University, Australia

Specific Research Interests
• Norovirus and other caliciviruses
• Structural biology of viral proteins (X-ray crystallography and cryo-EM)
• Drug discovery using X-ray crystallography
• Antigenicity using virus-like particles
• Molecular epidemiology of noroviruses
• Zoonosis among caliciviruses
• Human norovirus reverse genetics

Selected Publications


Prof. Dr. Dirk Grimm

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Scientific Vita

2007-present: Group leader “Virus-Host Interactions”, Heidelberg University Hospital
2006-2007: Research Associate, Stanford University, School of Medicine, CA, USA
2001-2006: Postdoctoral Fellow, Stanford University, School of Medicine, CA, USA
1999-2001: Postdoctoral Fellow, German Cancer Research Center, Heidelberg
1998: PhD (Biology) with Summa cum laude, University of Heidelberg
1994: Diploma (Biology), University of Kaiserslautern
1988-1994: Study of Biology (Universities of Kaiserslautern and Heidelberg)

Specific Research Interests

- Human gene therapy
- Viral and parasitical infections (HIV, hepatitis viruses, Plasmodium)
- Adeno-associated viral (AAV) and bocaviral (BoV) vectors
- Gene/genome engineering (CRISPR, TALENs)
- RNA interference (RNAi)

- Induced pluripotent stem cells (iPSC)
- Synthetic biology

Selected Publications


Dr. Pierre-Yves Lozach

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Phone: +49-(0)6221-56 1328 Fax: +49-(0)6221-56 5003 Email: pierre-yves.lozach@med.uni-heidelberg.de Web: http://www.bunyavirus.org

Scientific Vita

Since 2013: CellNetworks Group Leader, University Hospital Heidelberg
2012-2013: Assistant Professor, Pasteur Institute International Network, Laval, Canada
2010-2012: Senior Research Associate, ETH Zurich, Switzerland
2008-2010: Marie curie Post-doctoral fellow, ETH Zurich, Switzerland
2007-2008: Postdoctoral associate, ETH Zurich, Switzerland
2005-2007: Pediatric Dengue Vaccine Initiative postdoctoral fellow, Pasteur Institute, Paris, France
2001-2004: PhD in Fundamental Virology, Pasteur Institute, Paris, France
2000-2003: MSc in Fundamental Virology, Pasteur Institute, Paris, France

Specific Research Interests

- Arthropod-borne viruses (arboviruses) such as Rift Valley fever virus, Uukuniemi virus, and West Nile virus
- Cell biology of tick vector
- Transmission of arboviruses to humans
- Early virus-host cell interactions
- Dynamics of virus-receptor interactions
- Virus intracellular trafficking and entry
- Mechanisms of virus fusion
- Molecular determinants of arbovirus virulence and diseases
Selected Publications

Lozach PY: Early virus-host cell interactions. J Mol Biol 2018; 430(7):2555-6

Hoffmann A, Mazelier M, Léger P, Lozach PY: Deciphering virus entry with fluorescently labeled viral particles. Methods Mol Biol 2018; 1826:159-83


Albornoz A, Hoffmann AB, Lozach PY and Tischler ND: Early bunyavirus-host cell interactions. Viruses 2016; 8:143


Léger P and Lozach PY: Bunyaviruses: from transmission by arthropods to entry into mammalian-host first-target cells. Future Virology 2015; 10(7):859-881


Scientific Vita

2018-present: Chica and Heinz Schaller Junior Group Leader, University Hospital Heidelberg

2015-2017: Postdoctoral fellow, The Rockefeller University, USA

2012-2014: Postdoctoral associate, Institute of Microbiology of the University Hospital Centre Vaudois and of the University of Lausanne, Switzerland

2007-2011: PhD, Ecole Normale Superieur de Lyon, France

2003-2006: MSc, Dongseo University, South Korea

Specific Research Interests

- Molecular virology, virus-host interaction, virus life cycle
- Hepatotropic viruses with a special focus on hepatitis C virus (HEV)
- Stem cell technology for improved cell culture models
- Personalized models of virus infection, precision medicine
- Antiviral therapy and therapy resistance

Selected Publications


Dr. Petr Chlanda

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Scientific Vita

2017-present: Schaller research group leader at the Department for Infectious Diseases-Virology, University of Heidelberg Medical School

2011-2017: Postdoc at the National Institutes of Health, Bethesda, USA

2010-2011: Postdoc at the European Molecular Biology Laboratory, Heidelberg, Germany

2006-2010: Ph.D. at Heidelberg University, Heidelberg, Germany

2000-2006: M.S. at Charles University, Prague, Czech Republic

Specific Research Interests

- virology
- cryo-electron microscopy
- membranes and lipids
- cell biology
- membrane fusion

Selected Publications

Chlanda P: Influenza Hemagglutinin and M2 ion channel priming by trypsin: Killing two birds with one stone. *Virology* 2017; 509-131-132.


Chlanda P.
Integrative Virology

Fields of Interest

The central theme of our laboratories’ research is to integrate aspects of virology, host cell biology and immunology to understand basic principles of HIV-1 pathogenesis.

Part Fackler laboratory:

The studies of the Fackler laboratory focus currently on three specific aspects. First, we study the molecular mechanisms of action of the HIV-1 pathogenicity factor Nef. This involves assessing how Nef manipulates central host cell processes such as vesicular transport, signal transduction and cell motility. Second, we investigate how HIV-1 is recognized by the innate immune system of the host and the virus evades this response. These studies focus on intrinsic immunity factors such as CD317/BST-2/thetherin and SAMHD1 as well as the virally encoded antagonists Vpu and Vpx. Finally, we study the underlying mechanisms that confer HIV-1 target cells resistance to infection. These analyses focus on resting CD4+ T lymphocytes that are refractory to productive infection with HIV-1 with the aim to define the barriers to infection but also the potential immunological consequences productive infection of these abundant target cells would have.

Methodology most commonly used in the lab includes flow cytometry, live cell and confocal microscopy, as well as approaches to study protein-protein interactions and virus replication/pathogenesis. These analyses are preferentially conducted in primary HIV-1 target cells.

Part Lusic laboratory:

The studies of the Lusic laboratory focus on deciphering the cellular mechanisms used by the virus to either promote or repress viral gene expression. We investigate which parameters control integration of the viral genome and subsequent gene expression, with a strong focus on reactivation of viral gene expression after a silent phase of latency.

While an overall goal of our laboratory is to explore the specific contributions of nuclear topology and chromatin factors to HIV integration site selection and establishment of latency, we are specifically interested in determining the role of nuclear pore complex proteins in integration site selection. Moreover, we would like to focus on the interactions between nucleoporins with proteins that we previously found to contribute to proviral latency such as TRIM proteins.

Our methodology comprises the visualization of integrated HIV DNA in host cells by using a combination of 3D Immuno DNA FISH and Chromatin Immunoprecipitation technology.

The following teams belong to the Integrative Virology:

-Prof. Dr. Oliver T. Fackler (Head of the Integrative Virology)
-Dr. Marina Lusic

Scientific Vita

2013-present: Head of section Integrative Virology, Department of Infectious Diseases, Virology, Heidelberg University

2007-present: W3 professor at the Department of Infectious Diseases, Virology, Heidelberg University

2003: Habilitation in experimental virology, Heidelberg University

2000-2007: Group leader, Department of Virology, Heidelberg University

1997-2000: Postdoctoral fellow, University of California at San Francisco

1994-1997: PhD in molecular virology (Homburg/Saar)


1989-1993: Studies in biology (Saarbrücken)

Specific Research Interests

- Immuno- and cell biology of HIV infection
- Innate and intrinsic immunity against HIV-1 and viral evasion thereof
- HIV accessory genes

Prof. Dr. Oliver T. Fackler

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Integrative Virology
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**Selected Publications**


**Dr. Marina Lusic**

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**Scientific Vita**

2014-present: Group leader, Department of Infectious Diseases, Heidelberg

2009-2014: Extended faculty member/project leader at San Raffaele Scientific Institute, Milan and ICGEB, Trieste, Italy

2004-2009: PostDoc, ICGEB, Trieste, Italy

2003: PhD degree in Molecular Biology and Biochemistry, Faculty of Biological Sciences, University of Belgrade

1999-2004: Long term ICGEB Fellowship, Molecular Medicine Laboratory, International Centre for Genetic Engineering and Biotechnology (ICGEB), Trieste, Italy

1998: Magister of Science, Biochemistry and Molecular Biology, University of Belgrade

**Specific Research Interests**

- Nuclear organization and chromatin changes upon viral infection
- Control of HIV-1 integration and cellular fate
- HIV-1 transcription and latency; role of oxidative stress

**Selected Publications**


Parasitology

Fields of Interest

Malaria has remained one of the most important infectious diseases worldwide, causing an estimated 214 million clinical cases and killing approximately 438,000 people every year (WHO, 2015). Hopes of malaria control have been thwarted by widespread drug resistances. Malaria is caused by protozoan parasites of the genus Plasmodium, of which Plasmodium falciparum is the most virulent form. Infection starts with the bite of an infected Anopheles mosquito that transmits infective stages termed sporozoites into the human body. Sporozoites are carried with the blood flow to the liver where they invade hepatocytes. After completing their development within the liver, the parasite is released and now invades erythrocytes. Intra-erythrocytic development of the parasite is responsible for the clinical manifestation of the disease, including intermittent fever, shaking chills, organ dysfunction and the syndromes associated with cerebral and maternal malaria. Severe complications result from the ability of infected erythrocytes to adhere to the endothelial lining of venular capillaries and to sequester in the deep vascular bed.

Malaria research conducted by the Parasitology Unit includes the following aspects:

The Lanzer lab addresses key questions related to the molecular and biophysical mechanisms underpinning cytoadhesion of Plasmodium falciparum-infected erythrocytes. P. falciparum is the most virulent of the 5 Plasmodium species that can cause malaria in humans. The group is further interested in understanding how genetic polymorphisms in the human genome, such as those leading to sickle cell haemoglobin or haemoglobin C protect carriers from severe malaria-related disease and death. Another research focus concerns mechanisms of drug resistance and strategies to overcome established resistance mechanisms, including the development of novel antimalarial drugs.

The Frischknecht lab studies the formation and motility of the sporozoite and the intracellular development within the liver using a mix of reverse genetics, imaging and biophysical approaches. Studies are mainly performed using rodent malaria parasites, which can be easier manipulated than the human parasites. The group has many collaboration partners on the Heidelberg campus and around the world.

The Ganter lab investigates the unusual way in which the malaria parasite Plasmodium replicates. Cells usually divide themselves into two daughter cells; however, Plasmodium forms multinucleated cells, within which nuclei autonomously divide before daughter cells are formed. Using various techniques—including reverse genetics, advanced imaging, and proteomic approaches—the group uses human and rodent malaria parasites to gain insight into the molecular mechanisms that drive this non-canonical replication cycle.

The Guizetti lab studies the unusual cell division mechanisms of the malaria parasite Plasmodium falciparum. Rapid mitotic divisions enable proliferation of the parasite in the human blood cells and contribute to disease severity. Even though mitosis in this parasite shows significant differences to what has been described in classical model organisms, it is poorly studied so far. We use super-resolution, electron, and live cell microscopy technologies combined with CRISPR/Cas9 genome editing to describe the dynamics and regulation of chromosomes, centromeres, and the nuclear envelope during division. Thereby we hope to uncover new targets within this essential pathway and contribute to the fight against malaria.

The Osier lab works to identify the antibody targets of naturally acquired immunity against Plasmodium falciparum malaria and the antibody-dependent mechanisms that underlie protective immunity. The group also seeks to understand how parasite diversity is overcome in immune persons facing natural challenge, and to test the efficacy of combination malaria vaccines. The group aims to contribute to the development of highly effective vaccines against malaria using the model of naturally acquired protective immunity.

The Portugal lab aims to explore the biology of asymptomatic P. falciparum parasites and its interactions with the human host during the dry season that ensure that the parasite is not cleared and can be transmitted in the next transmission season. The main interests are: 1) Compare the properties and function of P. falciparum parasites from asymptomatic individuals during the dry season versus symptomatic individuals during the malaria season; 2) Determine the kinetics of gametocyte carriage throughout the dry season; and 3) Scrutinize internal signals and/or environmental cues promoting proliferation and gametocytogenesis when the mosquito vector returns during the rainy season.

The Przyborski lab studies how the malaria parasite P. falciparum modifies its host cell, the mature human erythrocyte. In particular, the group is interested in the role of a large number of proteins that the parasite synthesizes and transports to the erythrocyte, and which themselves are involved in further modification of the infected cell. Of particular interest is an expanded family of DnaJ/Hsp40-like proteins that is likely to be important for the transport of virulence factors to the surface of the infected red-blood cell. Additional exported proteins, although important for parasite survival, have no counterparts in other biological systems, and may thus potentially be targeted by future generations of antimalarials. With the eventual goal of identifying potential future drug-targets, and in collaboration with other researchers in Heidelberg and around the world, the group combines a diverse array of cell biology, genetic and biochemical techniques.

The following teams belong to the Parasitology Unit:
- Prof. Dr. Michael Lanzer (Head of the Parasitology Unit)
- Prof. Dr. Friedrich Frischknecht
- Dr. Markus Ganter
- Dr. Julien Guizetti
- Dr. Faith Osier
- Dr. Silvia Portugal
- PD Dr. Jude Przyborski
Prof. Dr. Michael Lanzer

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Scientific Vita

2000: Chair of Parasitology offered by the Seattle Biomedical Institute, USA (declined)
1999: Full Professor & Department Chair of Parasitology, Heidelberg University
1996: Habilitation in Microbiology, University of Würzburg
1994-1998: Junior Group Leader, Research Center for Infectious Diseases, University of Würzburg
1982-1988: Graduate Student, Center for Molecular Biology, Heidelberg University
1984-1985: Undergraduate Student, Hoffman LaRoche AG, Basel

Specific Research Interests

- Molecular Parasitology
- Drug resistance mechanisms of the malarial parasite
- Antigenic variation, cytoadherence, protein trafficking in P. falciparum
- Membrane transport processes

Selected Publications


Prof. Dr. Friedrich Frischknecht

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Scientific Vita

2005-present: Group Leader, Center of Infectious Diseases, Parasitology, Heidelberg University Hospital
2001-2005: Postdoc, Institut Pasteur, Paris, France
2000: PhD, FU Berlin (summa cum laude)
1995-1996: Research student, Lab of Molecular Biology, Cambridge, UK
1990-1996: Studies of Biochemistry (FU Berlin)

Specific Research Interests

- Cell biology and biophysics of pathogen infection
- Malaria cell biology
- Live cell imaging
- Cell motility

Selected Publications


Klug D, Frischknecht F: Motility precedes egress of malaria parasites from oocytes. Elife 2017; 6, e19157

Dr. Markus Ganter

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Scientific Vita

2016-present: Junior Group Leader, Department of Infectious Diseases, Parasitology, Heidelberg University Hospital, Heidelberg

2010-2016: PostDoc, Harvard University, Cambridge, MA, USA

2009-2010: PostDoc, Max Planck Institute for Infection Biology, Berlin

2005-2009: PhD student, Department of Infectious Diseases, Parasitology, Heidelberg University Hospital, Heidelberg

2000-2005: Studies of Biology, Heidelberg University, Heidelberg

Selected Publications


Dr. Julien Guizetti

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Scientific Vita

2017-present: Young group leader at Heidelberg University Hospital investigating nuclear division mechanisms in human malaria parasites.

2011-2016: Postdoc as HFSP fellow Scherf lab, Institut Pasteur, Paris (France).

2011: One-month volunteering project, Sironko, (Uganda).

2007-2011: PhD project at Gerlich lab, ETH Zurich (Switzerland).

2006: Diploma thesis project at Vogel lab, McGill University, Montreal (Canada).


2001 – 2003: Studies in Biology, University Karlsruhe (Germany).

Specific Research Interests

- Molecular parasitology
- Cell division mechanisms of malaria parasite
- Cellular dynamics of mitotic factors
• Super-resolution and electron microscopy methods
• Genome editing of human blood stage malaria parasites
• Host-pathogen interactions and antigenic variation

Selected Publications

Mehnert AK, Guizetti J: Improved immunofluorescence staining protocol for STED nanoscopy of Plasmodium-infected red blood cells. BioRxiv 2018; doi: https://doi.org/10.1101/416767


Dr. Faith Osier

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Scientific Vita

2016-2021: Junior Group Leader, Department of Parasitology, University of Heidelberg

2013-present: Clinical Research Fellow and Group Leader, Biosciences Dept, KEMRI-Wellcome Trust Research Program (KWTRP), Kenya

2010-2012: Postdoc, Burnet Institute for Medical Research, Melbourne, Australia

2008-2010: Clinical Fellow in Immunology, Centre for Vaccinology and Tropical Medicine, Oxford, UK and KWTRP

2004-2008: Wellcome Trust Training Fellow (PhD), London School of Hygiene and Tropical Medicine and KWTRP

2003-2004: Masters in Human Immunity (with Distinction), University of Liverpool, UK

2001-2003: Member of the Royal College of Paediatrics and Child Health (MRCPCH), UK

1997-2003: Training in Paediatrics, KWTRP and National Health Service, UK

1990-1996: Bachelor of Medicine and Surgery, University of Nairobi, Kenya

Specific Research Interests

• Human immunity to Plasmodium falciparum malaria
• Parasite-host interactions
• Vaccine Development for malaria
• Epidemiology & Molecular biology of infectious diseases

Selected Publications


Dr. Silvia Portugal

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Scientific Vita

2016-present: Group leader Parasitology, Heidelberg University Hospital

2011-2016: Postdoc (NAID, NIH, USA)

2010: FAPESP Invited Visiting Researcher (Universidade de São Paulo, Brazil)

2005-2010: PhD thesis (Faculdade de Medicina da Universidade de Lisboa, Portugal)

1998-2003: Biology undergraduate (Faculdade de Ciência da Universidade do Porto, Portugal)

Specific Research Interests

- Plasmodium seasonal transmission
- Survival mechanisms of P. falciparum when no vectors are available
- Immune response to asymptomatic P. falciparum infections
- Plasmodium virulence and variant surface antigens
- Plasmodium gametocytogenesis dynamics throughout the dry season
- Transmission capacity of P. falciparum kept asymptomatically during the dry season

Selected Publications


Krishnamurty AT, Thouvenel T, Portugal S, Keitany G, Hondowicz BD, Kim K, Holder A, Crompton PD, Rawlings D, Pepper M: Somatically hypermutated Plasmodium-specific IgM+ memory B cells are rapid, plastic first responders to a secondary malaria infection. Immunity 2016; 45(2):140-14


PD Dr. Jure Przyborski

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Scientific Vita

2017: Heisenberg Fellow and Senior Group Leader, Centre for Infectious Disease, University Hospital Heidelberg, Germany.

2013: apl. Prof, University of Marburg, Germany

2010: Habilitation in Parasitology and Cell Biology, University of Marburg, Germany

2005: Group Leader, Department of Parasitology, University of Marburg, Germany

2004: PhD Molecular Parasitology, Liverpool School of Tropical Medicine, UK and University Hospital Heidelberg, Germany.

2000: BSc Human Science, University College London, UK

Specific Research Interests

- Malaria
- Chaperones
- Evolution
- Protein traffic
- Protein folding

Selected Publications


Prof. Dr. Christine Clayton

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Scientific Vita

1990-present: Professor for Microbiology, University of Heidelberg

1990-1990: Associate Professor, The Rockefeller University, New York USA

1983-1990: Assistant Professor, The Rockefeller University, New York USA

1981-1983: Postdoctoral Fellow, Stanford University Medical Center, California, USA

1978-1981: Postdoctoral Fellow, Imperial College, London, UK

1979: PhD (Zoology) University of London, UK

1975-1978: PhD student, National institute for Medical research, Mill Hill, London, UK

1972-1975: Bachelor of natural Sciences, major Biochemistry, University of Cambridge, UK

Specific Research Interests

• Regulation of mRNA decay and translation in trypanosomes

• Control of mRNA processing in trypanosomes

• Inhibition of mRNA processing by trypanocidal benzoxaboroles

Selected Publications


List of the Associated Research Groups Major Infectious Diseases

Dr. Marco Binder
Research Group “Dynamics of early viral infection and the innate antiviral response”
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Specific Research Interests
- Cell intrinsic immune defense and inflammatory signaling pathways
- Regulation and dynamics of signaling events
- Dynamics of RNA-virus replication
- Virus-host interactions in innate immunity
- Systems biology and mathematical modeling

apl. Prof. Dr. Martin Müller
Research Group “Tumorvirus-specific vaccination strategies”
F035, INF 280, 69120 Heidelberg
Phone: +49 6221 424628
Email: martin.mueller@dkfz.de
Web: http://www.dkfz.de/en/f035/

Specific Research Interests
- Prophylactic and therapeutic vaccination against human papillomaviruses (HPV)
- Scaffolds for vaccine antigens
- Natural and vaccine induced immunity against HPV
- Host cell restriction and dependency factors for adeno-associated viruses (AAV) and HP

Dr. Ellen Krautkrämer
Research Group “Hantavirus pathogenesis”
Nephrology, INF 162, 69120 Heidelberg, University of Heidelberg
Phone: +49 6221 9112 0
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Web: http://nierenzentrum-heidelberg.com

Specific Research Interests
- Replication cycle of hantaviruses in renal cells
- Clinical characteristics of hantavirus infection
- Mechanisms of hantavirus-induced cellular damage and renal failure
 Specific Research Interests

- Therapeutic cancer vaccines, especially against HPV-mediated malignancies
- Direct (MS-based) detection of CTL target epitopes on the surface of infected or transformed cells
- Therapeutic vaccine design and formulation
- Directing vaccination-induced T cells to certain body sites
- HPV-induced changes in antigen processing and presentation

Specific Research Interests

- Spuma Retroviruses (Foamy Viruses)
- Vaccine vector development
- Virus-host interaction in virus replication in vitro and in vivo
- Retrovirus assembly, morphogenesis and release
- APOBEC3 proteins: antiviral restriction factors and cancer genome mutators

Specific Research Interests

- Trypanothione metabolism of trypanosomes
- Antioxidant defense mechanisms
- Parasite specific enzymes as drug target molecules
Prof. Dr. Hedda Wardemann
Research Group "B Cell Immunology / B-Zell-Immunologie" (D130)
INF 280, 6. Stock, 69120 Heidelberg
Phone: +49 6221 42 1270
Email: h.wardemann@dkfz-heidelberg.de

Specific Research Interests
- Human immune responses against Plasmodium falciparum
- Malaria vaccine development
- Immunological memory to infection and vaccination
- Antigen-receptor diversity and quality of immune responses

Dr. Erec Stebbins
Research Group "Structural Biology of Infection and Immunity" (D160)
INF 280, H2.07.069, 69120 Heidelberg
Phone: +49 6221 421380
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Specific Research Interests
- Microbial pathogens as they relate to immunology and human carcinogenesis
- Structural biology/X-ray crystallography
- The African trypanosome (T. brucei), the causative agent of sleeping sickness
- Genotoxins or agents impacting oncogenic growth regulatory factors in the cell

Prof. Dr. F. Nina Papavasiliou
Research Group "Immune Diversity" (D150)
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Specific Research Interests
- Surface receptor diversification in the African trypanosome (T. brucei), the causative agent of sleeping sickness
- The interface between host immunity (antibodies) and the ever changing coat composition of T. brucei (also known as antigenic variation)
- Informational diversity through epitranscriptomic mechanisms in host immune cells
Prof. Dr. Yvonne Samstag

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Immunologie, INF 305, 69120 Heidelberg
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Web: http://www.klinikum.uni-heidelberg.de/Sektion-Molekulare-Immunologie.2831.0.html

Specific Research Interests
- Regulation of immune responses by the micromilieu (human and mouse models)
- Co-stimulatory signaling in T lymphocytes, cytoskeletal remodeling and redox regulation
- Regulation and function of granulocytes
- Allergy and chronic inflammatory diseases (SFB TRR 156)
- Tumor immunology and immune therapy (CAR T-cells, Checkpoint inhibitors)
- Tumor migration and metastasis
- Immunomodulation by plant-derived substances (www.azkim.de, www.cimresearch.org)
- High resolution imaging, InFlow microscopy

Dr. Frederik Graw

Research Group "Modelling Infection & Immunity"
BioQuant-Center for Quantitative Biology
INF 267, 69120 Heidelberg
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Email: frederik.graw@bioquant.uni-heidelberg.de
Web: http://www.bioquant.uni-heidelberg.de/research/groups/modelling-infection-immunity.html

Specific Research Interests
- Mathematical modeling of host-pathogen interactions
- Spatio-temporal dynamics of infection and immune processes
- Viral spread within tissues
- Immune cell differentiation and vaccine design

Prof. Dr. Frank Rösl

Division of Viral Transformation Mechanisms
DKFZ, INF 280, 69120 Heidelberg
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Specific Research Interests
- Interference of papillomaviruses in signal transduction pathways
- Relationship between "white" skin cancer and the infection with so-called cutaneous papilloma viruses
Dr. Antonio Marchini
The Laboratory of Oncolytic Virus Immuno-Therapeutics (LOVIT), DKFZ, INF 280, 69120 Heidelberg
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Specific Research Interests
- Oncolytic parvoviruses
- Oncolytic Virotherapy

Prof. Dr. Adelheid Cerwenka
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Specific Research Interests
- Molecular mechanism of NK/ILC activation
- Functional Diversification of NK cells
- Interaction of NK/ILCs with other Immune Cells, Endothelial Cells and virus-infected Liver Cells
- novel NK Cell-based Immunotherapies and Combination Therapies in preclinical Mouse Models

Prof. Dr. Felix Hoppe-Seyler
Research Group "Molecular Therapy of Virus-Associated Cancers"
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Web: https://www.dkfz.de/en/f065/

Specific Research Interests
- Human papillomavirus (HPV)-linked cancers: Transformation mechanisms and novel therapeutic strategies
- Crosstalk between HPVs and the host cell metabolism (hypoxia, iron and glucose metabolism)
- Cell biology of HPV-positive cancer cells: Regulation of senescence and apoptosis
- Signal transduction
Students of the Major ‘Infectious Diseases’ WS 2016-2017

From left to right, in the back: Yannik Voß, Léanne Strauß, Jasmin Dehnen, Tammy Lan, Christian Sommerauer, Moritz König. In the middle: Micha Rosenkranz, Thomas Kehrer, Emma Pietsch, Franziska Kraus, Benjamin Lang, Silke Schmidt, Anna Huhn. In the front: Sabina Ganskih, Julia Heinze.
Students of the Major ‘Infectious Diseases’ WS 2017-2018

From left to right, in the back: Martin Kampmann, Patrick Küber, Annika Binder, Ann-Kathrin Mehnert, Nora Heber, Philipp Ehmann, Simay Ayhan. In the front: Camila Metz, Katharina Morath, Michelle Yee, Hannah van Dijk
From left to right, in the back: Stefan Diehl, Nikolay Sergeev, Valerii Martynov, Noah Ruf, Jose Luis Guzman Martin, Felix Pahmeier. In the front: Chia Ching Wu, Hao-En Huang, Dorothee Reuß, Laura Emig, Lisa Augstein, Carmen Lahr, Marta Freixas Teres