University of Basel

Swiss TPH
Swiss Tropical and Public Health Institute
Schweizerisches Tropen- und Public Health-Institut
Institut Tropical et de Santé Publique Suisse

Associated Institute of the University of Basel

MSc Infection Biology

Specialized Master's degree programme at the
Swiss Tropical and Public Health Institute (Swiss TPH)

Swiss TPH

In Brief:
MSc Infection Biology Programme

The MSc Infection Biology programme in a nutshell

Infection biology focuses on **host-pathogen interactions** and aims to understand **molecular, cellular, immunological** or **evolutionary mechanisms** through which **pathogens colonize and transmit between their hosts, cause disease** or **develop drug resistance.**

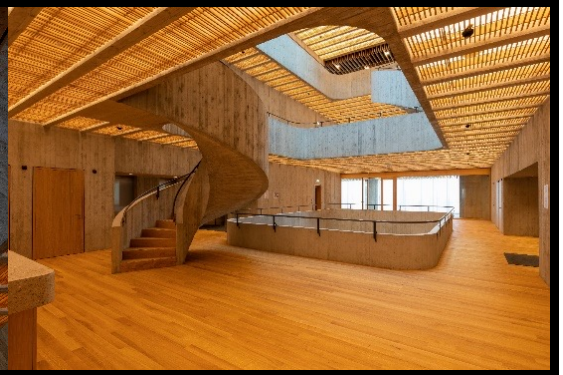
Thematic focus:
Poverty-related infectious diseases such as malaria, tuberculosis, Chagas disease or schistosomiasis.

Research focus:
MSc students perform an individual research project (12-month) in one of the Research Groups at Swiss TPH.

Swiss TPH

Introducing Swiss TPH









Swiss TPH – a holistic approach to improving global health

Our Vision:
To make the world a healthier place

Our Mission:
Improving the health and well-being of people – locally, nationally and internationally – through ***excellence in research, services and education***

Our People:
~950 staff and students from 95 nations

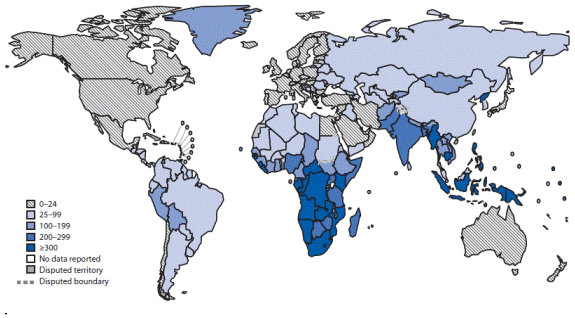
Swiss TPH – A focus on poverty-related infectious diseases

People living in low-income populations are most heavily affected by infectious diseases:

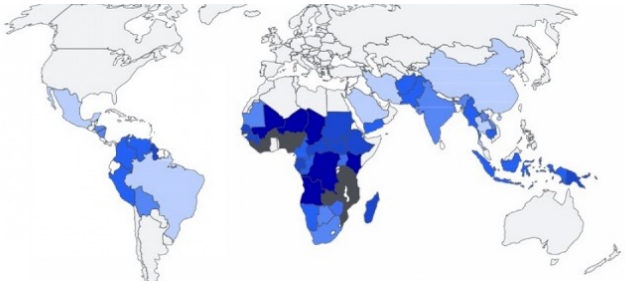
- Tuberculosis
- Malaria
- HIV/AIDS
- Neglected Tropical Diseases:
  - parasitic worm infections (Helminthiases)
  - Leishmaniases
  - Chagas disease
  - ...

→ over half of the world's population affected
→ hundreds of millions of cases each year
→ millions of deaths each year

Tuberculosis in 2017



Malaria in 2017



Swiss TPH

Infection Biology Research at Swiss TPH

Infection Biology Research

- thirteen Research Groups
- experimental laboratory research and bioinformatics/computational science
- basic research and drug/vaccine R&D on poverty-related infectious diseases

Sébastien Gagneux
Tuberculosis Ecology and Evolution

Damien Portevin
Tuberculosis Immunology

Jennifer Keiser
Helminth Drug Development

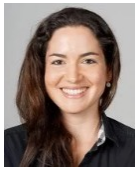
Tiffany Bouchery
Hookworm Immunobiology

Till Voss
Malaria Gene Regulation

Nicolas Brancucci
Malaria Host Interactions

Christian Nsanzabana
Genotyping

Pascal Mäser
Parasite Chemotherapy



Katharina Röltgen
Viral Immunology

Emma Hodcroft
Epidemiology and Viral Evolution

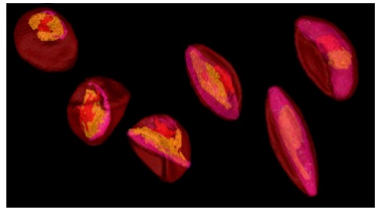
Claudia Daubenberger
Clinical Immunology

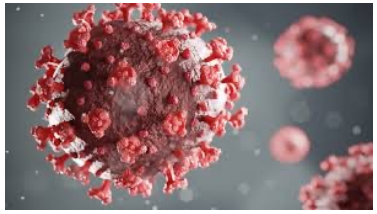
Daniel Paris
Diagnostics Development

Pie Müller
Vector Biology

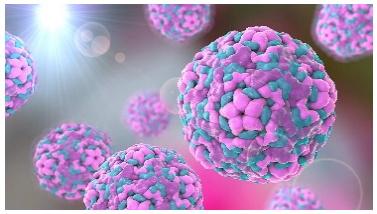
Infection Biology Research

- thirteen Research Groups
- experimental laboratory research and bioinformatics/computational science
- basic research and drug/vaccine R&D on poverty-related infectious diseases
- malaria, tuberculosis, sleeping sickness, Chagas disease, Leishmaniases, parasitic worm infections, SARS-CoV2 and other respiratory viruses



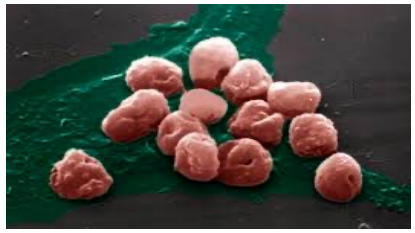


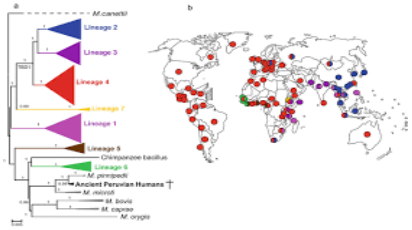


Infection Biology Research

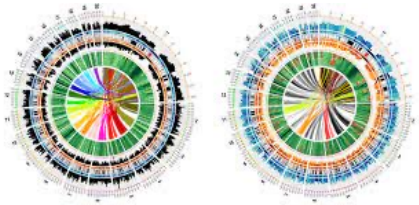
Our research interests:

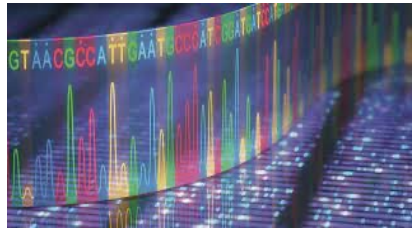
- pathogen biology
- host-pathogen interactions
- mechanisms of drug resistance and drug mode-of-action
- mechanisms of native, adaptive and vaccine-induced immunity
- molecular/genomic epidemiology
- discovery and development of drugs, vaccines and diagnostics





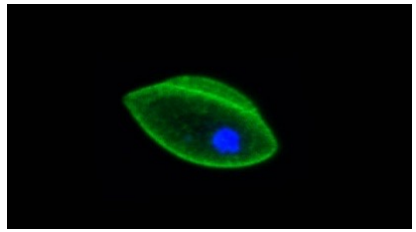
Infection Biology Research

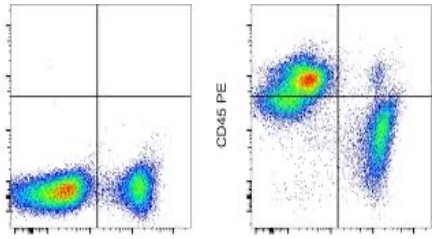


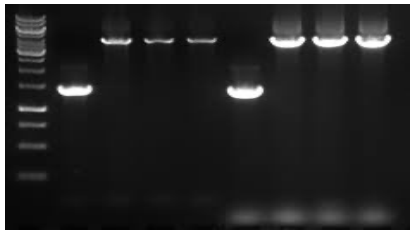


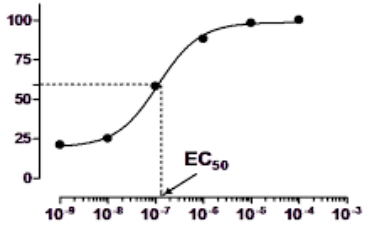
Our methodologies:

- *in vitro* pathogen culture systems
- genetic manipulation/genome engineering
- molecular and cell biology
- biochemistry
- whole genome sequencing and other –omics approaches
- immunology
- microbiology
- microscopy
- cellular assays
- drug assays
- bioinformatics
- biostatistics
- computational science
- …









Swiss TPH

In Detail:
MSc Infection Biology Programme

Main goals of the MSc Infection Biology Programme

To understand **the phenomenon of infection and host-pathogen interaction** from a molecular, immunological, cell biological and evolutionary viewpoint.

To understand different concepts and approaches in **drug and vaccine discovery and development**.

To understand basic concepts in **bioinformatics** and acquire skills for **computational data analyses**.

Main goals of the MSc Infection Biology Programme

To understand **the phenomenon of infection and host-pathogen interaction** from a molecular, immunological, cell biological and evolutionary viewpoint.

To understand different concepts and approaches in **drug and vaccine discovery and development**.

To understand basic concepts in **bioinformatics** and acquire skills for **computational data analyses**.

To have a good understanding of **molecular, cellular, immunological, bioinformatic and epidemiological methods** for the analysis of host-pathogen interactions.

To be able **to plan and carry out laboratory experiments** in order to address a scientific hypothesis, to **analyze the results** achieved and to **report them orally and in writing.**

To obtain an overview on the **current research literature in the field of infectious disease research**.

Admission criteria

The following degrees of a Swiss University allow for direct admission:

Bachelor of Science (BSc) in **Biology, Biochemistry, Medicine, Veterinary Medicine or Pharmaceutical Sciences**

Students with a BSc degree obtained from other Universities and/or in a related discipline will be assessed individually.

Further admission criteria:

A **minimum average mark of 5.0** (unrounded) for all eligible BSc degrees (Swiss grading system 1 to 6, where 6=max/4=pass)

OR

proof of study achievements of **≥15 ECTS in infection biology/microbiology**.

Study structure

Duration:	**3 semesters in total:** 1st semester: lectures and course work 2nd/3rd semester: individual research project, some lectures/course work, MSc thesis write-up, MSc final exam
Credits:	90 CPs (**30 CPs** for in-depth professional studies, **50 CPs** for MSc thesis, **10 CPs** for MSc examination)
Language:	English
Start of program:	Autumn semester (September)
Application deadline:	30 April
Number of students in the course:	10-20

Study structure – Module 1 “Foundations in Infection Biology”

Mandatory course work (19 ECTS)	Course number	Semester	CPs	Main responsibility
Concepts in Molecular Epidemiology	28872-01	AS1	2	S. Gagneux
Drug Discovery and Development for Parasitic Diseases	11652-01	AS1	2	J. Keiser
Evolution of Host-Pathogen Interactions	28394-01	AS1	2	D. Ebert
Immunology of Infection	11650-01	AS1	2	C. Daubenberger
Introduction to Bioinformatics	28880-01	AS1	2	P. Mäser/D. Brites
Molecular Infection Biology	12384-01	AS1	2	T. Voss/P. Mäser/…
Transferable Skills	51775-01	AS1	1	T. Voss/P. Mäser
Biostatistics (lecture with exercises)	28893-01	AS1	3	D. Keidel
Interdisciplinary Research in Epidemiology and Infection Biology	11647-01	AS2	1	J. Utzinger/J. Keiser
Topics in Host-Pathogen Interactions	67320-01	SS	2	T. Voss/C. Nsanzabana
TOTAL			**19**	

Study structure – Module 2 “Electives in Infection Biology”

Freely selectable course work (0-11 ECTS)	Course number	Semester	CPs
Techniques in Molecular Parasitology	18420-01	AS (January)	4
Advances in Infection Biology, Epidemiology and Global Public Health	69293-01	AS/SS	1
Medical Entomology	48620-01	SS	2
Advanced Immunology of Infection	67319-01	SS	2
Essentials in Drug Development and Clinical Trials	20458-01	SS	2
Exercise: Immunology of Infection	11651-01	AS	2
Epidemiological Concepts	11655-01	AS	3
Medical Parasitology and Neglected Tropical Diseases	34889-01	AS	3
Malaria Epidemiology and Control	28874-01	SS	2
Recent Progress in Infection Biology	39402-01	SS	1
Infection and Cell Biology I	22826-01	AS	2
Infection and Cell Biology II	21506-01	SS	2
Molecular Virology	12412-01	AS	2
Infection Biology - From in vitro models to human patients	30638-01	AS	1
New approaches to tackle antibiotic resistance	14466-01	AS	1
TOTAL			**0-11**

Study structure – Module 3 “General Electives”

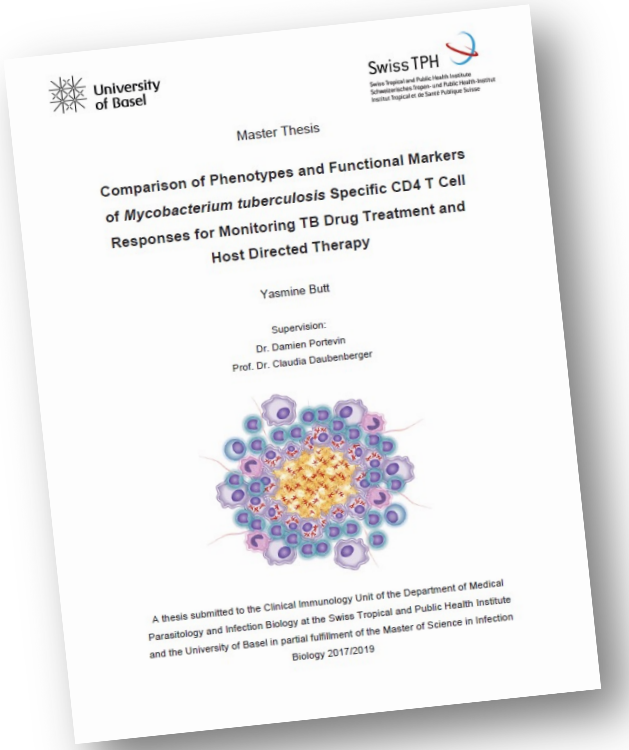
Freely selectable course work (0-11 ECTS)	Semester	CPs	Main responsibility
Lectures and other courses outside the MSc Infection Biology study programme*			
…			
…			
…			
…			
TOTAL		**0-11**	

*Lectures/courses outside the University of Basel: only upon application to the Teaching Commission and ≥3 ECTS/lecture

Study structure – Individual research project/thesis work

Project topics:	Individual research project, embedded within ongoing research activities
Project announcements:	1st semester (AS1; October/November)
Project selection by students:	1st semester (AS1; December)
Project start:	2nd semester (~February) *(note that ≥12 ECTS out of the "Foundations in Infection Biology" Module are required to begin with a MSc research project)*
Project duration:	12 months (including write-up and final exam)
Place of project realisation:	One of the MPI research groups (additional internal/external options possible)
Project supervision:	Prof/head of research team (main supervisor) Additional Prof/PD/lecturer (second supervisor) PhD students/postdocs/scientists/technicians

Some examples of previous MSc Infection Biology projects


University of Basel

Swiss TPH

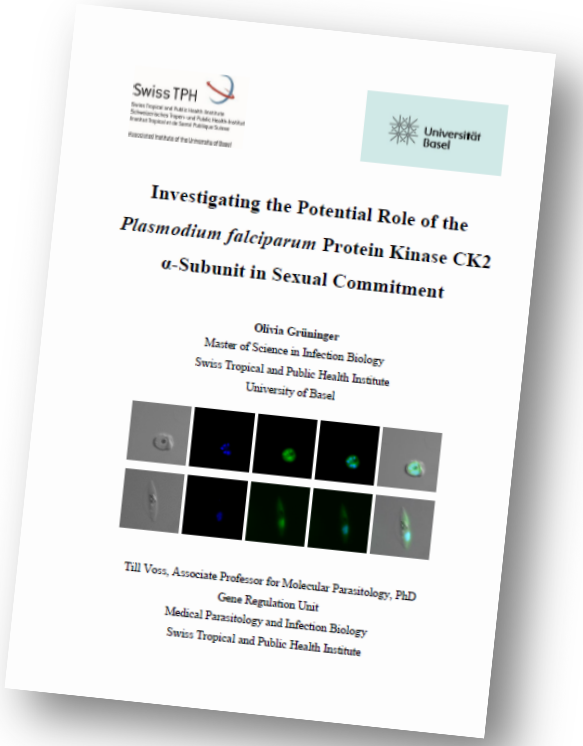
Master Thesis

Comparison of Phenotypes and Functional Markers of *Mycobacterium tuberculosis* Specific CD4 T Cell Responses for Monitoring TB Drug Treatment and Host Directed Therapy

Yasmine Butt

Supervision:
Dr. Damien Portevin
Prof. Dr. Claudia Daubenberger

A thesis submitted to the Clinical Immunology Unit of the Department of Medical Parasitology and Infection Biology at the Swiss Tropical and Public Health Institute and the University of Basel in partial fulfilment of the Master of Science in Infection Biology 2017/2019


Swiss TPH

Universität Basel

Investigating the Potential Role of the *Plasmodium falciparum* Protein Kinase CK2 α-Subunit in Sexual Commitment

Olivia Grüninger
Master of Science in Infection Biology
Swiss Tropical and Public Health Institute
University of Basel

Till Voss, Associate Professor for Molecular Parasitology, PhD
Gene Regulation Unit
Medical Parasitology and Infection Biology
Swiss Tropical and Public Health Institute


Molecular characterization of *Plasmodium spp.* prevalence and investigation of *k13* mutants and *hrp2/hrp3* gene deletion carrying *P. falciparum* on Bioko Island

Salome Hosch

University of Basel
Swiss Tropical and Public Health Institute
Department of Medical Parasitology and Infection Biology
Clinical Immunology Unit

Evaluated by Prof. Dr. Claudia Daubenberger and Prof. Dr. Till Voss

Supervised by Prof. Dr. Claudia Daubenberger and Dr. Tobias Schindler

Master in Infection Biology

Basel, January 2020

Universität Basel

Swiss TPH

Some examples of previous MSc Infection Biology projects


University of Basel

Swiss TPH

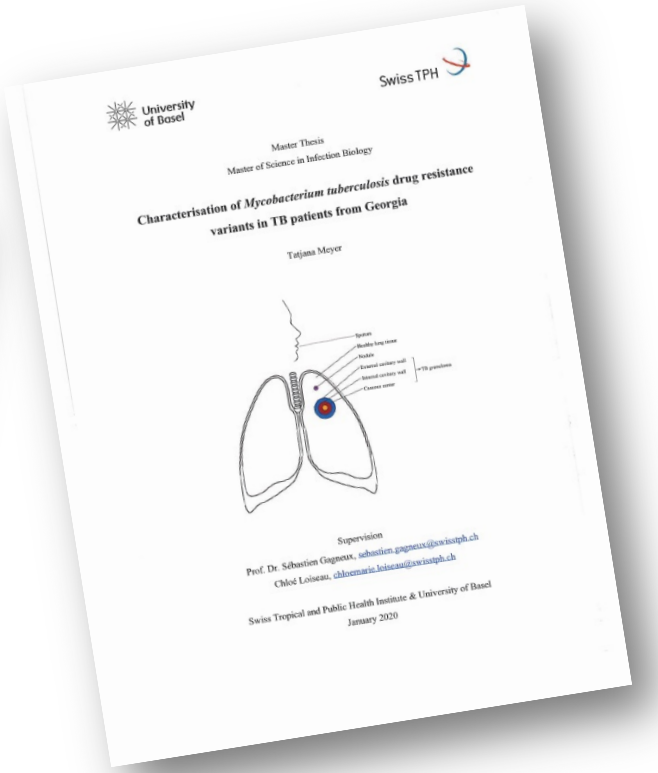
Swiss Tropical and Public Health Institute

Characterization of *Leishmania donovani* and *Leishmania infantum* strains for drug discovery using mouse- and iPS cell-derived macrophages as an infection model

Siro Robin Ellenberger
Master of Science in Infection Biology
University of Basel

Supervision:
Prof. Dr. Pascal Mäser
Dr. Marcel Kaiser

Basel, February 2021


University of Basel

Swiss TPH

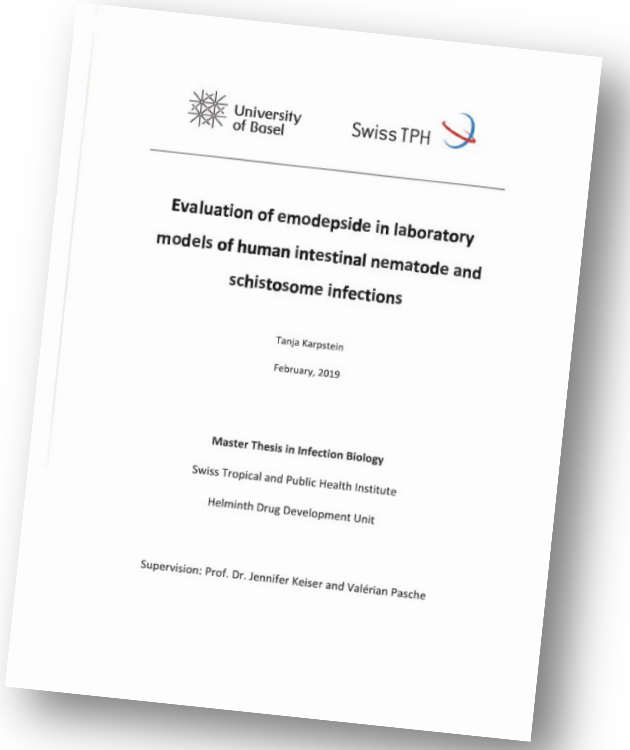
Master Thesis
Master of Science in Infection Biology

Characterisation of *Mycobacterium tuberculosis* drug resistance variants in TB patients from Georgia

Tatjana Meyer

Supervision
Prof. Dr. Sébastien Gagneux, sebastien.gagneux@swisstph.ch
Chloé Loiseau, chloemarie.loiseau@swisstph.ch

Swiss Tropical and Public Health Institute & University of Basel
January 2020


University of Basel

Swiss TPH

Evaluation of emodepside in laboratory models of human intestinal nematode and schistosome infections

Tanja Karpstein

February, 2019

Master Thesis in Infection Biology

Swiss Tropical and Public Health Institute

Helminth Drug Development Unit

Supervision: Prof. Dr. Jennifer Keiser and Valérian Pasche

Career opportunities

Holders of a Master of Science in Infection Biology usually work in **academia or industry in laboratory-oriented basic or applied research** in the fields of **Infection Biology and further disciplines of the Life Sciences and the Medical and Pharmaceutical Sciences.**

Further career opportunities are in the fields of **education, science communication** as well as in **governmental and non-governmental organisations or foundations.**

Further studies/degrees:

- PhD/doctorate
- teaching diploma for secondary schools

Further information

https://bio.unibas.ch/de/studium/msc-infection-biology

https://www.swisstph.ch/en/study-with-us/bachelor-and-master/msc-in-infection-biology

Degree profile: link to pdf

Consultation hours: any time by appointment

Contact the programme coordinators: Prof. Till Voss (till.voss@swisstph.ch) or Prof. Pascal Mäser (pascal.maeser@swisstph.ch)

Contact the administrative programme coordinator: Pascal Gschwind (pascal.gschwind@swisstph.ch; or phone +41 61 284 83 60)

The MSc Infection Biology Programme is the right choice for you if you are interested and passionate about

infectious diseases

working in a laboratory

drugs and vaccines

team work

Life Sciences

genes, proteins, genomes, cells

pathogens

bioinformatics

interdisciplinary research

scientific discoveries

immunity

multinational and multicultural environment

molecular aspects of life

creepy creatures

Swiss TPH

Thank you very much for your interest in the MSc Infection Biology Programme - we hope to welcome you soon as one of our students.