



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)



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 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 laboratories at Swiss TPH.







Introducing Swiss TPH



1943: Swiss Tropical Institute (STI) founded at Socinstrasse 57 in Basel by Prof. Rudolf Geigy

2009: STI integrated the Institute of Social and Preventive Medicine (ISPM; University of Basel) to become the Swiss Tropical and Public Health Institute (Swiss TPH)











- 1943: Swiss Tropical Institute (STI) founded at Socinstrasse 57 in Basel by Prof. Rudolf Geigy
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- 2022: Swiss TPH moved to the brand-new building "Belo Horizonte" in Allschwil









MSc Infection Biology









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





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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









Introducing the Department of Medical Parasitology and Infection Biology (MPI)

- ten research groups
- basic research and drug/vaccine R&D on poverty-related infectious diseases
- home of the MSc Infection Biology Programme



Sébastien Gagneux Department Head



Malaria Host

Interactions





Pascal Mäser Parasite



Damien Portevin Gagneux Tuberculosis Tuberculosis Chemotherapy Ecology and Evolution Immunoloav



Jennifer Keiser Helminth Drug Development

Tiffany Bouchery Hookworm Immunobioloav











Claudia Daubenberger Clinical Immunology





Katharina Röltgen Viral Immunology

Emma Hodcroft Epidemiology and Viral Evolution

11





- ten research groups
- basic research and drug/vaccine R&D on poverty-related infectious diseases
- home of the MSc Infection Biology Programme
- malaria, tuberculosis, sleeping sickness, Chagas disease, Leishmaniases, parasitic worm infections, SARS-CoV2 and other respiratory viruses





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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













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

















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**.

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:	
	1 st semester: lectures and course work	
	2 nd /3 rd 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/. 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
		NKIZ	



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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:

Project announcements: Project selection by students:

Project start:

Project duration:

Place of project realisation:

Project supervision:

Individual research project, embedded within ongoing research activities

1st semester (AS1; October/November) 1st semester (AS1; December)

2nd semester (~February) (note that ≥12 ECTS out of the "Foundations in Infection Biology" Module are required to begin with a MSc research project) 12 months (including write-up and final exam)

One of the MPI research groups (additional internal/external options possible)

Prof/head of research team (main supervisor) Additional Prof/PD/lecturer (second supervisor) PhD students/postdocs/scientists/technicians

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Some examples of previous MSc Infection Biology projects



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University 23

Some examples of previous MSc Infection Biology projects

	Swiss TPH S	
University	Manter Theain Master of Science in Information Nachogy Characteristication of Mycobacterium Indexeculosis drug resistance variants in TB patients from Georgia	University Swiss TPH
Characterization of Leishmania donovani and Leishmania infantum strains for drug discovery using mouse- and iPS cell-derived macrophages	Tojan Mya	Evaluation of emodepside in laboratory models of human intestinal nematode and schistosome infections Tanja Karpsten February, 2019
Siro Robin Ellenberger Master of Science in Infection Biology University of Basel	Sopervision For Dr. Salwarden Gregoren, skolanden genanskonskopk ak Odel Leisen, Salwarden Kalensensko	Master Thesis in Infection Biology Swiss Tropical and Public Health Institute Helminth Drug Development Unit
Supervision: Prof. Dr. Pascal Maser Dr. Marcel Kaiser	Swint Texploid and Poble Invent	Supervision: Prof. Dr. Jennifer Keiser and Valérian Pasche
Basel, February 2021		
Swiss TPH >	MSc Infection Biology	University 24

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 e-mail or Zoom with the programme coordinators

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

Contact the administrative programme coordinator: Pascal Gschwind (<u>pascal.gschwind@swisstph.ch;</u> 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

working in a drugs and Infectious laboratory vaceines diseases tean work Life genes, proteins, pathogens Sciences genomes, cells interdisciplinary biginformatics scientific research İmmunity discoveries multinational and multicultural molecular aspects creepy creatures environment 🔆 University Swiss TPH 27 **MSc Infection Biology**



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