

# Drug Resistance: From Mechanisms to Management

December 10-11, 2015, Parterre Rialto, Basel Switzerland

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

Swiss TPH Winter Symposium 2015

## Thursday, December 10

### Welcome and Registration

**08.15** Registration

**08.45** Welcome and Introduction: *Sébastien Gagneux and Pascal Mäser, Swiss TPH*

### Session 1 – Mechanisms

Moderator: *Tanja Stadler, D-BSSE ETH Zürich*

09:00 **Overview of drug resistance mechanisms in parasites**, *Pascal Mäser, Swiss TPH, Basel, Switzerland*

09:30 **Emerging antibiotic resistance; what really matters in 2015**, *Patrice Nordmann, University of Fribourg, Switzerland*

10:00 **Drug Resistance in helminths**, *Roger Prichard, McGill University, Montreal, Canada*

**10:30** *Coffee Break*

11:00 **Mechanisms of malaria drug resistance**, *Selina Bopp, Harvard University, USA*

11:30 **Drug resistance in HIV**, *Thomas Klimkait, University of Basel, Switzerland*

12:00 **The role of biofilms in antibiotic resistance**, *Urs Jenal, University of Basel, Switzerland*

**12:30** *Lunch*

### Session 2 - Evolution and Modelling

Moderator: *Urs Jenal, University of Basel*

14:00 **Within-host evolution of drug resistance**, *Rasmus Marvig, University Hospital Copenhagen, Denmark*

14:30 **Evolution of plasmid-mediated antibiotic resistance**, *Alvaro San Millan, Oxford University, UK*

15:00 **Evolutionary implications of phage therapy**, *Alex Hall, ETH Zürich, Switzerland*

**15:30** *Coffee Break*

16:00 **Evolution and epidemiology of multidrug-resistant TB**, *Sébastien Gagneux, Swiss TPH, Basel, Switzerland*

16:30 **Population genetics of malaria drug resistance**, *Roberto Amato, Wellcome Trust Sanger Institute, Cambridge, UK*

17:00 **Modelling the transmission of drug-resistant pathogens**, *Tanja Stadler, D-BSSE ETH Zürich, Basel, Switzerland*

**17:30** *Close of Day 1*

## Friday, December 11

### Session 3 – Populations and the Environment

Moderator: *Joanna Coast, University of Bristol*

09:00 **Common themes in the evolution of drug resistance across pathogens and cancer**, *Sebastian Bonhoeffer, ETH Zürich, Switzerland*

09:30 **Insights from the Swiss HIV Cohort**, *Roger Kouyos, University of Zurich, Switzerland*

**10:00** *Coffee Break*

10:30 **Drug resistance in the context of ONE Health**, *Jakob Zinsstag, Swiss TPH, Basel, Switzerland*

11:00 **Resistance to insecticides**, *Pie Müller, Swiss TPH, Basel, Switzerland*

11:30 **Resistance development in crop protection and lessons learned for resistance management**, *Matthias Witschel, BASF*

**12:00** *Lunch*

### Session 4 - Management and Control

Moderator: *Esther Schelling, Swiss TPH*

13:30 **Circumventing antibiotic resistance**, *Marc Gitzinger, BioVersys, Basel, Switzerland*

14:00 **Challenges and incentives in infectious disease R&D: an industry perspective**, *Georg Ruedi, Actelion, Allschwil, Switzerland*

14:30 **Economics of drug resistance**, *Joanna Coast, University of Bristol, UK*

**15:00** *Coffee Break*

15:30 **Managing antibiotic resistance in Switzerland**, *Sarah Tschudin, University of Basel, Switzerland*

16:00 **Overview of StAR**, *Karin Waefler, Federal Office of Public Health, Bern, Switzerland*

16:30 **Drug resistance in the era of malaria elimination**, *Marcel Tanner, Swiss TPH, Basel, Switzerland*

17:00 **A global (WHO) view on drug resistance**, *Marc Sprenger, World Health Organization, Geneva, Switzerland*

**17:30** **Outlook and Closing Remarks**, *Jürg Utzinger, Swiss TPH, Basel, Switzerland*

**17:45** *Close of Symposium*

## Speaker Profiles

### Welcome and Introduction

**Moderator, Sébastien Gagneux**, Swiss TPH

Sébastien Gagneux heads the Tuberculosis Research Unit at the Swiss TPH. After receiving his PhD from the University of Basel in 2001, he worked as a postdoctoral fellow at Stanford University and at the Institute for Systems Biology in Seattle. He then spent three years as a Program Leader at the MRC National Institute for Medical Research in London, UK before returning to Swiss TPH in 2010. His research focuses on the evolution and ecology of *Mycobacterium tuberculosis*, and combines population genomics, molecular epidemiology and experimental approaches to determine the effect of bacterial variation on the host-pathogen interaction and the spread of drug resistance in TB.



**Moderator, Pascal Mäser**, Swiss TPH

Pascal Mäser graduated from the University of Basel in 1998 with a PhD thesis on the molecular mechanisms of drug resistance in African trypanosomes. His postdoctoral studies at the University of California, San Diego, concentrated on the mechanisms of salt toxicity in plants. In 2002 he returned to Switzerland as an Assistant Professor at the Institute of Cell Biology of the University of Bern, where he resumed the work on drug resistance and parasite genomics. Pascal Mäser returned to the Swiss TPH in 2009 and since 2012, heads the Parasite Chemotherapy Unit. His research focuses on drug discovery for protozoan parasites.



### Session 1: Mechanisms

**Patrice Nordman**, University of Fribourg, Switzerland

Patrice Nordmann is Professor in Microbiology at the University of Fribourg (CH). His research focuses on emerging antibiotic resistance in gram negative bacteria in human medicine. It gathers mostly two complementary approaches: genetic and biochemical analysis of antibiotic resistance traits which are emerging worldwide, and development of diagnostic techniques for rapid identification of emerging antibiotic resistance traits. He is co-author of more than 600 peer-reviewed articles and the recipients of several awards, the latest being the 2015 ICAAC (International Congress for Antimicrobial Agents and Chemotherapy) antimicrobial research award from the American Society for Microbiology.



**Roger Prichard**, McGill University, Canada

Roger Prichard is a James McGill Professor and Chair of the Institute of Parasitology at McGill University, Montreal. He earned his PhD in Biochemistry at the University of New South Wales, Sydney, Australia; PhD (UNSW) and did his Postdoc at the University College of Wales, Aberystwyth, UK. He received the Wardle Medal of the Canadian Society of Zoologists; Docteur honoris cause, Université Paul Sabatier, Toulouse, France; Distinguished Veterinary Parasitologist, American Assoc. Vet. Parasitologists; WAAVP/Pfizer Award for Research and WAAVP/Bayer Award for Teaching, World Assoc. Veterinary Parasitology; and Hon. Dip. Europ. Veterinary Parasitology College and Fellow, Australian Soc. Parasitology. He was an adviser to WHO, Gates Foundation, US FDA, World Bank, Onchocerciasis Control Programme. Prof. Prichard works on parasitic disease control in humans and animals, antiparasitic drug pharmacology, and the basis of drug resistance in parasitic nematodes. He has published over 300 papers, and has supervised 43 PhD and MSc students and 19 postdoc fellows in the field of human and veterinary parasitology.



**Selina Bopp**, Harvard University, USA

Selina Bopp is a research scientist in the group of Prof. Dyann Wirth at the Harvard T.H. Chan School of Public Health (Boston, USA). She received her PhD from the Swiss TPH in 2007 and completed her postdoc in the lab of Elizabeth Winzeler at The Scripps Research Institute and the University of California, San Diego (La Jolla, USA). Selina Bopp's primary research interest centers on understanding the biological impact of genetic variation in the lethal malaria parasite *Plasmodium falciparum*. She is particularly interested in genes that are under recent positive selection (such as drug pressure) and her current research focuses on translating this genetic variability into parasite biology.



**Thomas Klimkait**, University of Basel, Switzerland

Thomas Klimkait received his scientific education in Cologne, Germany and Maryland, USA. After 8 years in drug discovery programs in the Pharma industry (HIV protease inhibitor) he returned to academia to continue research on viral mechanisms for the emergence from drug therapy and cell tropism of viruses. He developed various molecular tools for diagnostics and is involved in the development of diagnostics for/in rural African settings.



**Urs Jenal**, University of Basel, Switzerland

Urs Jenal studied Experimental Biology at the Swiss Federal Institute of Technology (ETH) Zurich and received his PhD from there in 1991. Subsequently, he completed postdoctoral research at the ETH Zurich and at Stanford University, USA. Since 1996, Jenal has taught and conducted research at the Biozentrum University of Basel; since 2002 he is a full Professor of Molecular Microbiology. Urs Jenal explores the molecular basis of signal transduction controlling the growth, development and behavior of bacteria. One of his main focus points is the cyclic di-nucleotide (c-di-GMP) pathway, which coordinates the formation of microbial biofilms and contributes to the development of chronic bacterial infections.



## Session 2: Evolution and Modelling

**Rasmus Lykke Marvig**, Copenhagen University Hospital, Denmark

Rasmus Marvig, PhD, is a Bioinformatics Research Scientist at the Center for Genomic Medicine, Rigshospitalet (Copenhagen, Denmark), where he is a leading researcher in microbial pathogen genomics. Rasmus Marvig did his doctoral research in bacterial genomics at the Technical University of Denmark from which he also holds an M.Sc.Eng. (Honours Programme) in Biotechnology. Rasmus Marvig has acquired skills in clinical microbiology and genome sequencing from several international partners, and he has been admitted as a Visiting Researcher to Stanford University, Harvard Medical School, Massachusetts Institute of Technology, and École Polytechnique Fédérale de Lausanne. In his research, Rasmus Marvig studies the evolution of microbial populations during infection in order to understand the capacity of bacterial pathogens to adapt to different anatomical niches, evade the host immune system, and overcome therapeutic challenges.



**Alvaro San Millan**, Oxford University, UK

Alvaro San Millan is a research assistant in the Department of Zoology of the University of Oxford. He received his PhD in veterinary medicine from the Universidad Complutense of Madrid in 2010, where he characterized the spread of plasmid-mediated antibiotic resistance in Pasteurellaceae species. During this period he also worked in the Pasteur Institute in Paris studying vancomycin resistance and dependence in *Enterococcus faecium*. In 2012 he obtained a Marie Curie Fellowship to study the evolution of plasmid-mediated antibiotic resistance with Craig MacLean in Oxford. Alvaro is interested in the study of the evolutionary pressures that drive the evolution of plasmid-mediated antibiotic resistance, combining experimental evolution, molecular biology and mathematical approaches and using *Pseudomonas aeruginosa* as a model system. As a result of his work he has been awarded The Brian Wilkins Memorial Fund Prize from the International Society for Plasmid Biology in 2014



**Alex Hall**, ETH Zürich, Switzerland

Alex Hall is assistant professor of pathogen ecology at the Institute of Integrative Biology, ETH Zürich. He obtained his PhD from the University of Edinburgh in 2009. After a postdoc at the University of Oxford and a postdoc and fellowships (Marie Curie IEF; SNSF Ambizione) at Eawag and ETH Zürich, he started his new group in August 2015. His group studies the ecology and evolution of microorganisms in the context of infectious disease. Current topics include the evolution of bacterial



resistance to antibiotics and bacteria-virus interactions.

**Roberto Amato**, Wellcome Trust Sanger Institute, Cambridge, UK

Roberto Amato is a Staff Scientist based at the Wellcome Trust Sanger Institute since 2015 and co-chair of the Pf3k population genetics group. Between 2012 and 2015 he was a research associate in statistical genomics at the University of Oxford. He received a PhD in Computational Biology and Bioinformatics from the University of Naples "Federico II" in 2012. During his doctoral studies he was a visiting student at the Department of Human Genetics, University of Chicago. He also holds a BSc and an MSc in Computer Science. His current interests are centred on the population genetics of malaria, and in particular on the analysis of *Plasmodium* genomic diversity in natural settings. The primary focus is on the combination of theoretical and empirical methods to characterize and understand the evolution of the malaria parasite and its clinical consequences such as the emergence of drug resistance. The ultimate goal is to create a framework where genomic data can be used to identify in near real-time relevant changes in the parasite populations and to guide public health interventions.



**Tanja Stadler**, Swiss Federal Institute of Technology (ETH Zurich)

Tanja Stadler is an Assistant Professor at the Department of Biosystems Science and Engineering of the Swiss Federal Institute of Technology (ETH Zürich) in Basel since 2014. Tanja studied Applied Mathematics at the Technical University of Munich (Germany), the University of Cardiff (UK), and the University of Canterbury (New Zealand). She obtained a Master degree in 2006 and a PhD in 2008 from the Technical University of Munich (with Prof. Anusch Taraz and Prof. Mike Steel). Tanja then joined ETH Zürich as a postdoctoral researcher with Prof. Sebastian Bonhoeffer in the Department of Environmental Systems Sciences, and was promoted to Group Leader in 2011. Her work is at the interface of mathematics, computer science, evolution, ecology and infectious diseases. In particular, she develops phylogenetic tools to address epidemiological and medical questions, as well as questions in the fields of ecology, species evolution, cell differentiation and language evolution. Her honors include the TUM PhD award 2008, the John Maynard Smith prize 2012, the ETH Latsis prize 2013, and the Zonta prize 2013. In 2013, Tanja received an ERC starting grant.



## Session 3: Populations and the Environment

**Sebastian Bonhoeffer**, ETH Zurich, Switzerland

Sebastian Bonhoeffer is professor of theoretical biology at the Institute of Integrative Biology, ETH Zurich. His work focuses mostly on the evolutionary dynamics of infectious pathogens. He has a long standing interest in the evolution of drug resistance in bacteria and viruses, and more recently has extended this work to cancer, malaria, and fungal plant pathogens.



**Roger Kouyos**, University of Zurich, Switzerland

Roger Kouyos is Professor at the University Hospital Zurich. He and his group study infectious diseases by combining approaches from epidemiology, bioinformatics, and evolution. One current focus of their work is the molecular epidemiology of HIV, i.e., the use of sequence data to characterize the transmission of the virus. Prof. Kouyos also has a strong interest in mathematical modelling in infectious diseases ("infectious disease dynamics"), again, with a focus on the interaction between epidemiological and evolutionary processes.





#### **Jakob Zinsstag**, Swiss TPH

Jakob Zinsstag received his PhD in veterinary medicine (Dr. Med. Vet.) from the Veterinary Faculty of the University of Berne in 1986. From 1994 to 1998 he directed the Centre Suisse de Recherches Scientifiques in Abidjan, Côte d'Ivoire. Since 1998 he leads a research group at the Swiss TPH on the interface of human and animal health with a focus on health of nomadic people and control of Zoonoses in developing countries under the paradigm of "one health". He holds a PhD in Tropical Animal Production from the Prince Leopold Institute of Tropical Medicine of Antwerp, Belgium. Since 2010 he is Professor of Epidemiology at the University of Basel and since 2011 deputy head of department of Epidemiology and Public Health at the Swiss TPH. He is a diplomat of the European College of Veterinary Public Health (ECVPH). He is a member of the trans-disciplinary board of the Swiss Academies of Sciences ([www.transdisciplinarity.ch](http://www.transdisciplinarity.ch)) and president of the International Association of Ecology and Health ([www.ecohealth.net](http://www.ecohealth.net)). The group's projects are located in Chad, Mali, Mauritania, Côte d'Ivoire, Ethiopia, Tanzania, Viet Nam, Kyrgyzstan and Mongolia.



#### **Pie Müller**, Swiss TPH

Pie Müller is a medical entomologist with an interest in the biology of disease vectors, insecticide resistance, entomological surveillance and the development of vector control products. He obtained a Diploma in Physical Anthropology (1997) and a PhD in Sensory Ecology (2002) from the University of Zürich. After having worked for a private consultancy company he joined the Liverpool School of Tropical Medicine, UK, as a postdoctoral researcher in 2004. There he became introduced to the fascinating field of medical entomology and studied the molecular mechanisms of insecticide resistance in malaria vectors. After five years in Liverpool he moved back to Switzerland where he has been Head of the Vector Control Group and the pesticide testing facility at the Swiss Tropical and Public Health Institute since 2009.



#### **Matthias Witschel**, BASF, Germany

Matthias Witschel obtained his PhD in 1994 with Prof. H.-J. Bestmann, University of Erlangen-Nürnberg, working on the total synthesis of ant pheromones and isoprenoids, as a fellow of the Studienstiftung des Deutschen Volkes. During his education he also worked as a visiting researcher in the groups of Prof. L. E. Overman, UC Irvine, and Prof. J.-M. Lehn, College de France. After his Postdoc as a Feodor-Lynen-fellow in the group of Prof. B. M. Trost, Stanford University, he started in 1996 at BASF, where he had different positions in chemistry and screening, currently as Principal Scientist in herbicide research. In 2009 he initiated during a sabbatical with Prof. F. Diederich, ETH Zürich, a program for the design of drugs against malaria using agrochemical knowhow, resulting in several promising projects still pursued with external partners. In 2013 he received the BASF AgroScience Award. He is editor of "Modern Crop Protection Compounds" and "Modern Methods in Crop Protection Research" and author or co-author of over 220 patents and publications.



## Session 4: Epidemiology, Management and Control

#### **Moderator, Esther Schelling**, Swiss TPH

Esther Schelling, PhD, is project leader at the Swiss TPH. Her areas of expertise are: Simultaneous assessment of zoonoses (brucellosis, Q-fever, anthrax, human and bovine tuberculosis, Rift Valley Fever) and health status in human and livestock populations using qualitative and quantitative methodologies to identify cost-effective and appropriate control measures; Evaluation of performance of joint public health and veterinary interventions; Inter- and transdisciplinary approaches to assess good practices on delivery of primary social services to remote and mobile communities; Milk hygiene and nutrition patterns in pastoral and peri-urban production and marketing systems of sub-Saharan Africa. She is President of Livestocknet in Switzerland.



#### **Marc Gitzinger**, BioVersys, Switzerland

Marc Gitzinger completed his studies in Biology at the University of Freiburg (Germany) and the University of Queensland (Australia). He holds a PhD in Biotechnology from the ETH Zurich. Besides his excellent skills in molecular biology, he gained business experience as Associate Intern at McKinsey & Co and insights to intellectual property rights at the patent offices, Ernest T. Freylinger SA (Luxemburg) and Joachim Stuercken GmbH (Germany). Marc is winner of the Venture Leaders 2008 award and is CEO and Co-founder of BioVersys AG here in Basel.



#### **Georg Rueedi**, Actelion Pharmaceuticals Ltd., Switzerland

Georg Rueedi received his PhD in Organic Chemistry at the University of Zurich. Following a post-doctoral fellowship at Stanford University he joined Actelion Pharmaceuticals in 2005 where he was involved in small molecule antibacterial drug research. Since 2013 has been head of the Anti-Infectives Medicinal Chemistry group at Actelion Pharmaceuticals, focusing on the discovery of new antibiotics effective against multidrug resistant organisms.



#### **Joanna Coast**, University of Bristol, UK

Joanna Coast has been Professor of Health Economics, School of Health and Population Sciences, University of Birmingham since 2005. As of November 2015 she will move to the University of Bristol as Professor in the Economics of Health and Care group; she previously worked at the University of Bristol from 1990 to 2005. She has a BA (Econ) in Economics, an MSc in Health Economics (University of York) and a PhD in Social Medicine (University of Bristol). She has published widely in health economics on topics including capability and well-being, the economics of antimicrobial resistance, health care rationing, end of life care and use of qualitative methods in health economics. Her work on antimicrobial resistance has focused on applying environmental economic theory to resistance issues and exploring how health economics might incorporate resistance costs in analytical work. She has been a member of funding bodies for a number of organisations including NIHR, Netherlands Organisation for Scientific Research, and Marie Curie. She is Senior Editor for Health Economics for Social Science and Medicine.



**Sarah Tschudin-Sutter**, University of Basel, Switzerland

Sarah Tschudin-Sutter (MD, MSc) is board-certified in internal medicine and infectious diseases and has a main research interest in the transmission of hospital acquired infections. She conducted her training in in the Division of Infectious Diseases and Hospital Epidemiology of the University Hospital of Basel, Switzerland and completed her research fellowship at the Johns Hopkins University School of Medicine in Baltimore, Maryland, where she also obtained her Masters of Science degree in Infectious Diseases Epidemiology as well as a certificate in Healthcare Epidemiology at the Johns Hopkins Bloomberg School of Public Health. She was appointed assistant professor at the University of Basel in 2014.



**Karin Waefler**, Federal Office of Public Health, Switzerland

Karin Waefler, MSc, is Project Leader of the Swiss National Strategy against Antibiotic Resistance (StAR) at the Swiss Federal Office of Public Health (FOPH). The focus of the project is to address the health priorities of the Swiss Federal Council to protect the health of people and animals through the control and combat of antibiotic resistance. Karin has been with the FOPH since 2005 and also served as Project Leader of Public Information on Transplantation and Organ Donation. Prior to working at the FOPH, she was Programme Leader of the Nature and Environment course at Sanu Future Learning AG SA, Managing Director of the Competence Center for New Media in Education - net4net at eduswiss/Bern University of Applied Sciences, and Secondary School Biology Teacher at Gymnasium Neufeld Bern.



**Marcel Tanner**, Former Director, Swiss TPH

Marcel Tanner obtained a PhD in medical biology from the University of Basel and a MPH from the University of London. He was Director of the Swiss Tropical and Public Health Institute from 1997 to July 2015, and is Professor of Epidemiology and Medical Parasitology at the University of Basel and at the Federal Institute of Technology. Since 1977, his research ranges from basic research on the cell biology and immunology on malaria, schistosomiasis, trypanosomiasis and filariasis to epidemiological and public health research on risk assessment, vulnerability, health impact and district health planning. He gathered his research, teaching and health planning expertise from working in rural and urban areas in Africa (mainly Tanzania, Chad, Burkina Faso and Côte d'Ivoire) and Asia (China, Thailand, Laos). He was co-investigator and coordinator of the first African malaria vaccine trial in 1992 and participated as co-principal investigator in several major intervention trials on malaria and schistosomiasis. He has published extensively in the many fields of global health with more than 500 original papers. He also acted and acts as advisor on communicable diseases research and control, health systems strengthening and capacity building in various national and international agencies/bodies and in boards/committees such as, e.g., WHO/TDR, Wellcome Trust, DNDi, NITD, INCLEN-Trust and INDEPTH.



**Marc Sprenger**, World Health Organization, Switzerland

Marc Sprenger, MD, is an infectious disease, epidemiology and global health expert. He is Director of the antimicrobial resistance secretariat at the WHO in Geneva since September 2015. Dr Sprenger and the secretariat focus on coordination of an Organization-wide approach to antimicrobial resistance, working with WHO programmes carrying out technical activities required for the implementation of the global action plan on antimicrobial resistance. In May 2010 Dr Sprenger was elected for five years as Director of the European Centre for Disease Prevention and Control (ECDC). As Director General (2003-2010) of the Dutch National Institute for Public Health and the Environment (RIVM) he initiated the organisation's transformation from a research-dominated to a results-based agency, with solid governmental commissioning relationships. As Director of Health (1999-2003) of the Dutch National Healthcare Insurance Board, he advised on health care system and insurance issues, including reimbursement and health-planning details and assessment of new pharmaceuticals. As head of the Centre for Infectious Disease Epidemiology, RIVM (1993-1999) he was responsible for setting up a new centre of national coordination of infectious diseases epidemiology. In this capacity he initiated the European Antimicrobial Resistance Surveillance System (EARSS). Dr Sprenger studied General Medicine at Maastricht University, specialized as medical microbiologist at Erasmus Medical Center (Rotterdam) and obtained a PhD in Epidemiology at Erasmus University.



**Closing Words: Jürg Utzinger**, Director, Swiss TPH

Jürg Utzinger is trained in environmental sciences (MSc) and epidemiology (PhD) with several years of postdoctoral research in demography and epidemiology at Princeton University. Until his appointment as Director of the Swiss TPH in July 2015, Jürg headed the Ecosystem Health Sciences unit at the Department of Epidemiology and Public Health, Swiss TPH. He is also Professor of Epidemiology at the University of Basel. Jürg's research, teaching and training interests pertain to the epidemiology, diagnosis and integrated control of neglected tropical diseases and malaria. He has ongoing collaborative projects in Côte d'Ivoire, China and elsewhere in Africa and Asia. Jürg's group pursues a wide variety of epidemiological research, including health impact assessment of large foot-print development projects in the tropics and risk profiling of parasitic diseases. Together with colleagues in Côte d'Ivoire, Jürg has established the first health and demographic surveillance system in the Taabo area, which serves as a platform for monitoring and surveillance of health and wellbeing of 40,000 mainly rural dwellers. Jürg has extensively published in the peer-reviewed literature, edited several special thematic journal issues and wrote numerous book chapters. He is founding deputy editor of PLoS Neglected Tropical Diseases and acts on the editorial boards of Acta Tropica, Geospatial Health and Parasites & Vectors.

