



Swiss Tropical Institute  
Institut Tropical Suisse  
Schweizerisches Tropeninstitut

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Swiss Tropical Institute, Socinstrasse 57  
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## Editorial Focus on Neglected Tropical Diseases

Dear Reader

The topic of our second newsletter – following a first issue on malaria – focuses on the whole spectrum of the so-called neglected tropical diseases. These diseases justifiably gained substantial interest over the past decade. They are also an area of great interest and effort of the Swiss Tropical Institute (STI) for a long time.

While we all know very well about the “classical” neglected tropical diseases and diseases of poverty such as malaria, tuberculosis and HIV/AIDS that primarily affect people in resource-constraint countries, we too often tend to forget the “most neglected diseases” that include human African trypanosomiasis (HAT, also known as sleeping sickness), South American trypanosomiasis (also known as Chagas disease), Buruli ulcer, leishmaniasis, leprosy, lymphatic filariasis, schistosomiasis, soil-transmitted helminthiasis and food-borne trematodiasis. The burden of these diseases – as expressed disability-adjusted live years (DALYs) – rank number two behind HIV/AIDS as presented in the figure (image bottom of text, click to enlarge), which is based on a careful analysis by Peter Hotez and colleagues [1].

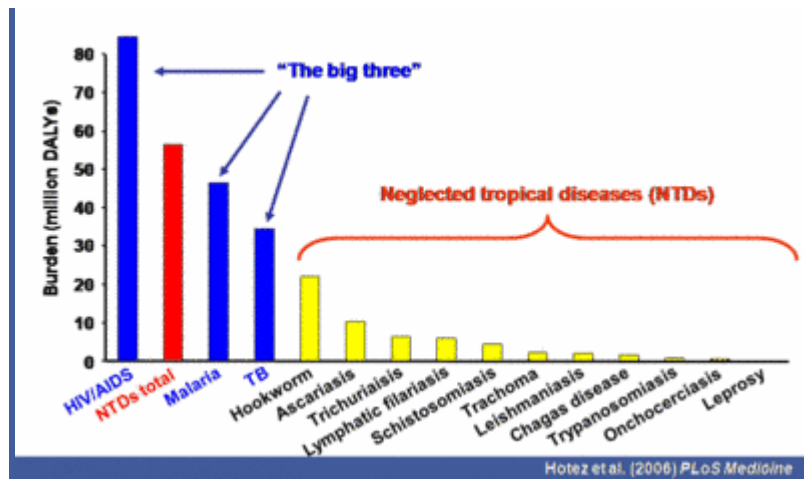
These diseases are prevailing in resource-constraint settings, where people are too poor to pay for any kind of treatment and do not represent a viable market. Therefore, these diseases fell outside the scope of the drug industry’s R&D efforts for a long time. Consequently, they also did not attract sufficient attention from the public research sector. Thanks to a new global understanding and funding possibilities (public, private and charities), as well as new models of searching for innovative tools (e.g. diagnostics, drugs and vaccines) through public-private partnerships (PPPs), awareness has grown and there is renewed stimulus for substantial research efforts and disease control priorities.

It is along these lines that STI wishes to provide with this newsletter insight into its own efforts in innovation, validation and application of new approaches and strategies to contribute to the control of neglected tropical diseases. While we recognize that there is a high priority for new diagnostics, drug and vaccines to combat neglected tropical diseases, we also wish to stress that already many tools for control are available but need to be made available and accessible to those in need through integrated and sustainable control strategies that are well tailored to the respective endemic and health and social system setting. Finally and more importantly, when talking about reducing disease burden and contributing to health and well-being, we should not only think of neglected tropical diseases and how to overcome them, but also include in these consideration for practical research or public health actions systemic thoughts about neglected people and neglected health systems.

I wish you an enjoyable reading and look forward to your feedback.

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[1] Hotez PJ, Molyneux DH, Fenwick A, Ottesen E, Ehrlich Sachs S, Sachs JD (2006). Incorporating a rapid-impact package for neglected tropical diseases with programs for HIV/AIDS, tuberculosis, and malaria. *PLoS Medicine* 3, e102.





## Buruli Ulcer

**Buruli ulcer (BU) caused by *Mycobacterium ulcerans* is considered to be the third most common mycobacterial infection after tuberculosis and leprosy. Since it is one of the most devastating neglected infectious diseases, the World Health Assembly adopted in May 2004 a resolution on BU calling for increased surveillance and control and for intensified research to develop tools for diagnosis, treatment and prevention of BU.**

### Distribution

The disease has been reported in more than 30 countries worldwide, but children living in rural communities in sub-Saharan Africa are affected the worst. BU is a chronic necrotizing skin disease mainly affecting subcutaneous and adipose tissue. The unique pathology of BU is primarily attributed to a plasmid-encoded macrolide toxin, mycolactone, which has cytopathic and apoptotic activity. A histopathological hallmark of progressing BU is poor inflammatory response despite the presence of clusters of extracellular acid-fast bacilli surrounded by areas of necrosis.

### Clinical Findings and Treatment

Clinical lesions usually start as painless subcutaneous nodules that may develop into plaques or oedema. If left untreated, extensive ulcerations with typical undermined edges of the dermis develop. Until recently, surgery has been the only WHO recommended treatment for BU. Wide excision margins reaching into the healthy tissue are necessary to prevent recurrences and often subsequent skin grafting is required. In most endemic areas access to surgery is very limited for the majority of BU patients. Moreover, the costs for treatment and prolonged hospital stays are often prohibitive. Recently, WHO published provisional guidelines recommending treatment with a combination of rifampicin and streptomycin for eight weeks. More than 50% of BU cases are children under the age of 15 years. Potential long-term side effects of streptomycin in this population limit the duration of the antibiotic treatment. While no antibiotic therapy has been formally proven effective in BU, there is evidence that the treatment with rifampicin and streptomycin reduces recurrence rates and helps to avoid surgery or at least limits its extent. Since both rifampicin and streptomycin are front line drugs for tuberculosis treatment, potential development of antibiotic resistance in both *M. ulcerans* and *M. tuberculosis* due to the short course treatment is a concern.

### Research on BU at STI

Driven by demands of colleagues from BU endemic regions of Africa, the Molecular Immunology unit started to work on BU in 2000. In accordance with the priorities identified by the WHO Technical Advisory Group for BU the goals of our research are to (i) improve understanding of the transmission of *M. ulcerans*; (ii) develop methods for early diagnosis; and (iii) investigate prospects for improvement of therapy and vaccine development. We have established strong research partnerships on BU with colleagues from Ghana and from Cameroon, that allows us to carry newly developed treatment options and laboratory research tools that we are developing into the field.

### Genetic Diversity

BU often occurs in focalised areas close to stagnant or slow-moving waters. The mode of transmission is not fully understood, partly because no molecular typing method has sufficiently high resolution for micro-epidemiological analyses. Standard molecular typing methods have revealed an apparent lack of genetic diversity in *M. ulcerans* within individual geographical regions, indicating a clonal population structure. We are developing

molecular-biological tools which should allow us to differentiate between closely related *M. ulcerans* isolates coming from the same area and to map the spread of genetic variants in time and space. Our comparative genomic analysis of 30 *M. ulcerans* clinical isolates of diverse geographic origin with a novel plasmid-based microarray technology revealed extensive large sequence polymorphisms. The identified transposable element-associated insertional/deletional (InDel) recombination events are indicative for progressing genome shrinking in *M. ulcerans*, which has emerged from the environmental mycobacterium *M. marinum* by acquisition of a large virulence plasmid. Categorization of the deleted genes according to their biological functions indicates that *M. ulcerans* is adapting to a more stable environment. Analysis of the large InDel polymorphism allowed us to distinguish between two distinct lineages: (i) the "classical" lineage representing the most pathogenic genotypes – those that come from Africa, Australia and South East Asia; and (ii) an "ancestral" lineage comprising strains from China/Japan, South America and Mexico. Results indicate that *M. ulcerans* has passed through at least two major evolutionary bottlenecks since divergence from *M. marinum*. The classical lineage shows more pronounced reductive evolution than the ancestral lineage, suggesting that there may be differences in the ecology between the two lineages. In a different genetic fingerprinting approach, variable number of tandem repeats typing based on newly identified polymorphic loci has enabled us to differentiate for the first time between genotypes in an African country. These results suggest the emergence and spreading of new genetic variants of *M. ulcerans* within Ghana.

### Perspectives

More research is needed to develop evidence-based differentiated recommendations how to combine antibiotic and surgical therapy. Our pilot studies of lesions from antibiotic-treated BU patients provide evidence for initiation of vigorous immune responses. Results indicate that the relatively short antibiotic treatment reverses local immunosuppression and that the curative effect may be sustained by immune defence mechanisms. Three different general types of infiltration, diffuse mixed infiltrates, granulomas and dense lymphocyte aggregation in the vicinity of vessels were observed. Mycobacterial material was primarily located inside phagocytes. Some patients appear to show no adequate clinical response to the antibiotic treatment. This has raised the question, whether lack of response is due to antibiotic resistance of certain strains of *M. ulcerans*, inherited or acquired host factors or merely to lack of compliance to the treatment. On the other hand we have also growing evidence, that some patients develop signs of immunopathology after antibiotic treatment. In close collaboration with the WHO and treatment centers in West-Africa this is currently investigated further.

As an alternative to chemotherapy, we have started to explore in collaboration with Dr. Junghanss (University of Heidelberg, Germany) and Dr. UmBoock (Aide aux Lépreux Emmaüs-Suisse, Cameroon), whether thermotherapy is an alternative. An ongoing first pilot trial in Cameroon with an innovative heat application device is showing very promising results, encouraging us to pursue optimisation of this treatment option.

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photo left: surgical treatment of a BU lesion

photo in the middle: Nyong basin in Cameroon, a BU endemic region

photo right: Sand digging and collection of drinking water from the river Nyong





## Food-borne trematodiasis

**Current global estimates are that at least 750 million people are at risk of food-borne trematodiasis (>10% of the world's population) with more than 40 million people infected. Over 100 species of food-borne trematodes are known to parasitize humans, many of which also infect domestic animals. However, food-borne trematodiasis is a truly neglected tropical disease.**

Humans become infected when eating raw or undercooked aquatic products (e.g. fish, crustacean and water plants) that contain metacercariae. Half a dozen of food-borne trematodes pose a significant public-health and economic problem. These include the liver flukes (*Clonorchis sinensis*, *Fasciola hepatica*, *F. gigantica*, *Opisthorchis felineus* and *O. viverrini*) and the lung flukes (*Paragonimus* spp.). Whilst the majority of infections are asymptomatic and usually characterized by a small parasite load, patients with high infection intensities are at risk of morbidity. The public-health impact of food-borne trematodiasis is considerable and is primarily driven by morbid sequelae due to inflammatory lesions and damage of tissues and target organs. The most serious complication in clonorchiasis and opisthorchiasis patients is cholangiocarcinoma. The annual mortality rate due to food-borne trematodiasis is difficult to quantify, but has been estimated at 10,000. New research is needed to estimate the global burden of food-borne trematodiasis, and this should embrace a societal perspective (e.g. burden in livestock to be included).

There are only two drugs currently recommended for the treatment and control of food-borne trematodiasis, praziquantel and triclabendazole. Discovery and development research on novel trematocidal drugs has been neglected over the past decades. There is one notable exception, namely the recent advances made at STI with peroxidic compounds, (i) artemisinin and its semi-synthetic derivatives (e.g. artemether and artesunate); (ii) a synthetic peroxide, the 1,2,4-trioxolane OZ78; and (iii) the Chinese anthelmintic tribendimidine. We found that the artemisinins, OZ78 and tribendimidine have a broad spectrum of trematocidal activity in rodent models. These promising findings prompted us to launch studies in a larger animal model, hence studies testing the efficacy of artemether and OZ78 in *F. hepatica*-infected sheep are ongoing with our partners at the University of Naples in Italy and from Novartis Animal Health here in Basel. It is also important to note that, since artemether is a highly efficacious and safe antimalarial drug that has been administered to millions of patients the world over, phase II clinical testing on fascioliasis has been initiated with Prof. Sanaa Botros from the Theodor Bilharz Institute in Cairo, Egypt. Finally, two PhD students will embark on this project shortly with an emphasis on mechanism of action and preclinical studies.

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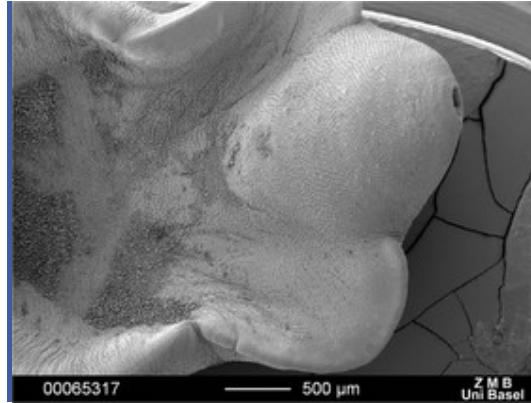
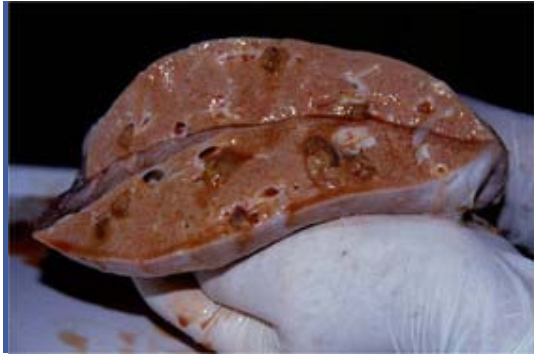
### Further reading

Keiser & Utzinger (2007). Advances in the discovery and development of trematocidal drugs. Expert Opinion in Drug Discovery 2 (suppl. 1), S9-23.

Keiser & Utzinger (2007). Food-borne trematodiasis: current chemotherapy and advances with artemisinins and synthetic trioxolanes. Trends in Parasitology 23 (in press)

photo left: Sheep liver containing *F. hepatica*

photo right: Scanning electron microscopy of a *F. hepatica* trematode treated with OZ78. Blebbing and roughening visible on the dorsal anterior part of the tegument.





## Clinical Research in Neglected Tropical Diseases

**After decades with almost no research and development for neglected tropical diseases, this field has gained significant momentum in the past few years. Today, a fair part of the neglected tropical diseases drug development projects are conducted under the umbrella of Public-Private Partnerships (PPP), embracing a public body, one or several private companies and/or academic institutions in a long-term joint venture.**

At the STI various units and individuals contribute to R&D for new medicines and vaccines against so-called neglected tropical diseases. The activities embrace a large scientific area from drug discovery to large scale implementation programmes. Various groups of STI are active in drug screening and evaluation, pre-clinical testing and give scientific & medical advice to trial design. In the Medical Department, the outpatient clinic has proven the capacity to recruit patients to clinical trials for different sponsors and the physicians are active in giving medical advice to clinical trials. The conduct of clinical trials in developing countries requires a specialized expertise beyond the in-depth knowledge of the current regulations and guidelines. Ways have to be sought in each individual project to best reconcile the legal requirements with the local needs and capacities. Within the Swiss Centre for International Health, the Pharmaceutical Medicine Unit (STI-PMU) is specialized in the conduct of regulatory clinical trials on neglected tropical diseases.

In the field of human African trypanosomiasis (HAT) the following projects are currently carried out:

Development of a new, oral drug (DB289, pafuramidine maleate) against first stage human HAT within the UNC - Chapel Hill led consortium for parasitic drug development (CPDD): Three Phase II trials, one Phase III trial were designed, organized and carried out in Angola, the Democratic Republic of Congo and South Sudan.

The combination of the two drugs nifurtimox – eflornithine for treatment of second stage HAT was assessed in a Phase II/III trial by the Drugs for Neglected Diseases initiative (DNDi). The STI-PMU contributed to the site assessment, implemented the trial in two sites in the Democratic Republic of Congo and was responsible for the monitoring.

In partnership with DNDi the STI-PMU contributed to the HAT clinical trials capacity building and strengthening platform (HATCap) in sub-Saharan Africa

In addition, the following clinical trials on malaria are carried out or supported by the STI-PMU:

A Phase II dose range finding trial was conducted in the frame of the development of a new drug against malaria (RBx11160) on behalf of Medicines for Malaria Venture (MMV) in India, Tanzania, Thailand and Zanzibar.

Clinical monitoring and site management for a Phase II trial (iv Artesunate) on children with severe malaria in Gabon and Malawi as well as Phase III trials (Pyramax® program) in Gabon and Tanzania on a combination of pyronaridine / artesunate for the treatment of uncomplicated malaria (all for MMV).

A Phase Ia trial on two virosome formulated anti-malaria vaccine components (PEV 301 and PEV 302) for Pevion Biotech was conducted in Switzerland and a Phase Ib

trial to be conducted in Tanzania is currently in planning.

The field of activities was recently expanded into the auditing of clinical trials. A first work order was received from MMV, and two centers contributing to a Phase III malaria trial were audited in the Democratic Republic of Congo and Kenya.

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photo left: Group picture of the Investigators meeting for the DB289 Phase IIIb study held in Kinshasa, Democratic Republic of Congo in April 2007

photo right: Source data verification during a monitoring visit carried out in the frame of the DB289 Phase III study at Kikongo, Democratic Republic of Congo. Didier Kalemwa, Representative of the STI in Kinshasa, Natalie Nkoy, laboratory technician at the Programme Nationale de Lutte contre la Trypanosomiase Humaine Africaine (PNLTHA) and member of the local supervision team to the study.





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## Drug discovery at the Swiss Tropical Institute

**Based on a profound expertise in the in vitro cultivation of protozoan parasites, the group under the leadership of Prof. Reto Brun started to establish a Screening Centre for protozoan parasites at the beginning of the 1990s in collaboration with the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR).**

The backbone of the STI Screening Centre was an integrated in vitro screening which tested compounds against African and South American trypanosomes, leishmanias and malaria as well as for cytotoxicity in parallel. Less than one milligram of a compound is needed to get information on the 4 parasites. The principle is a serial drug dilution in 96-well plates with an automatic readout. In vitro active compounds will be forwarded to mouse models of infection, which were established for African trypanosomes and for malaria. An array of different models is available with standard operating procedures (SOPs) and a database with data for all the standard drugs. Regarding the mouse models we can distinguish between acute and chronic models, a single or a multiple application of the compounds, different routes of administration, different parasite strains with different characteristics, etc.

Today the STI Screening Centre employs over 15 people, including a new subunit which is working with helminth diseases (schistosomiasis and food-borne trematodiasis). The group has very tight links to the TDR program 'Genomics and Discovery Research', to the Medicins for Malaria Venture (MMV) Foundation and the Drugs for Neglected Diseases initiative (DNDi). Further collaborations exist with several international consortia consisting of partners from universities and from private industry (small and big pharma). The Consortium for Parasitic Drug Development (CPDD) under the leadership of the University of North Carolina and supported by the Bill and Melinda Gates Foundation is exploiting diamidines as new drugs against sleeping sickness. One new product is already in phase III clinical trials for the early stage of this disease and so the effort of the discovery work is now focusing on the second stage of the disease with infection of the brain. Three diamidines could already be identified which cure brain infections in mice. Preclinical work done by our partners in the consortium is dealing with toxicology, pharmacokinetics, metabolism and efficacy in a monkey model. The Bill and Melinda Gates Foundation just awarded another 5 years of funding for the development of a clinical candidate for advanced sleeping sickness.

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left: Preparation of an assay in a 96-well microtiter plate with parasites in a serial drug dilution.

middle: Incubation of the assay plate at 37°C for 72 hours.

right: Reading of the plate in a fluorescence scanner with data transfer to our intranet.





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## Neglected tropical diseases in the open-access literature

The growing awareness of the so-called neglected tropical diseases is witnessed by increased political and financial means to control these diseases, recent publications in the top biomedical literature (e.g. *New England Journal of Medicine* and *PLoS Medicine*) and the launch of two new open-access journals that are devoted to the neglected tropical diseases, namely *PLoS Neglected Tropical Diseases* and *Geospatial Health*. Members of STI serve on the editorial and advisory boards of both journals and a number of papers authored/co-authored by STI staff have already been published or are currently in press in these journals.

### PLoS Neglected Tropical Diseases

*PLoS Neglected Tropical Diseases* (<http://www.plosntds.org>) is the first open-access journal devoted to the world's most neglected tropical diseases. It is the latest addition to the Public Library of Science (PLoS) family, a non-profit organization based in San Francisco. The journal is published online, featuring high-quality, peer-reviewed research on all scientific, medical, and public-health aspects of these forgotten diseases affecting the world's forgotten people. *PLoS Neglected Tropical Diseases* is particularly keen to publish research from authors in countries where the neglected tropical diseases are endemic. It aims to (i) provide a forum for the neglected tropical diseases community of scientific investigators, health practitioners, control experts, and advocates to publish their findings in an open-access format; (ii) promote and profile the efforts of scientists, health practitioners, and public-health experts from endemic countries, and build science and health capacity in those countries; and (iii) highlight the global public-health importance of the neglected tropical diseases and advocate for the plight of the poor who suffer disproportionately from these diseases in endemic countries. Prof. Peter Hotez from the George Washington University in the US acts as the editor-in-chief. The journal's start-up phase is supported by a grant from the Bill and Melinda Gates Foundation.

### Geospatial Health

*Geospatial Health* is the official journal of the Global Network of Geospatial Health ([www.GnosisGIS.org](http://www.GnosisGIS.org)) which was founded as the result of a Team Residency at the Rockefeller Foundation's Study and Conference Center in Bellagio, Italy in April 2000. The focus of the journal is on all aspects of the application of geographical information systems (GIS), remote sensing (RS) and other spatial analysis tools in human and veterinary health. The first two issues published clearly show that the neglected tropical diseases play a prominent role in *Geospatial Health*. Dr. Robert Bergquist, formerly with the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Developing Countries (TDR) acts as the editor-in-chief and the journal is published at the University of Naples, Italy.

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www.plosntds.org

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"It is expected that the journal will be both catalytic and transformative in promoting science, policy, and advocacy for these diseases of the poor."  
*—Peter Hotez, Editor-in-Chief*

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## Strongyloides stercoralis: a neglected soil-transmitted helminth

The most common and widely researched soil-transmitted helminths are *Ascaris lumbricoides*, *Trichuris trichiura* and the hookworms (*Ancylostoma duodenale* and *Necator americanus*). An estimated 1-2 billion people around the world are infected with one or several of these intestinal nematodes, causing a global burden that might be as high as 39 million disability-adjusted life years (DALYs), similar to that owing to malaria or tuberculosis. Yet, soil-transmitted helminthiases are so-called neglected tropical diseases. Perhaps the most neglected among them is *Strongyloides stercoralis*, though an estimated 30-100 million people are infected in tropical and temperate regions of the world.

### Life Cycle and Morbidity

*S. stercoralis* live and reproduce in humid soil. Upon contact, infective larvae penetrate the human skin. Adult females reside in the intestinal tract where they parthenogenetically produce eggs. Larvae hatch before expulsion with the stool, leading to auto-infection and perpetuation of infestation. Clinical signs are rare among immunocompetent hosts, but hyperinfection involving the gastrointestinal and pulmonary system is possible. Disseminated infections are seen in immunocompromised individuals and are associated with high mortality if left untreated. The current drug of choice is ivermectin. Multiple doses of albendazole also show some efficacy.

### Diagnosis

There is a paucity of epidemiological investigations pertaining to *S. stercoralis*, which is partially explained by diagnostic challenges. The Kato-Katz method, the standard for community-based surveys on intestinal helminths, fails to detect *S. stercoralis* and the sensitivity of direct fecal smears is low. More appropriate diagnostic tools include the Koga agar plate method, the Baermann technique and the charcoal culture. However, examination of multiple stool samples is required to achieve high sensitivity. Serological tests are also available but are prone to cross-reactions. Efforts are underway to develop a PCR-based diagnostic approach.

### Current research at STI

The epidemiology of *S. stercoralis* has been studied in different parts of Southeast Asia, but detailed investigations in China are lacking. We therefore launched a study in Menghai county, Xishuangbanna prefecture in the southwestern part of the Yunnan province, China. To our knowledge, this investigation represents the first community-based epidemiological survey on *S. stercoralis* in China, with key findings presented in the peer-reviewed literature [1]. In brief, 180 participants aged 5 years and above from a single village submitted 2-3 stool samples which were examined by Koga agar plate and the Baermann techniques. We found a *S. stercoralis* prevalence of 11.7%. The prevalence was significantly higher in males than in females and no infections were found in study participants younger than 15 years. The collection and analysis of 3 stool samples rather than a single one resulted in 62-100% higher prevalences, depending on the diagnostic approach taken.

In a subsequent study we assessed – for the first time – the safety and efficacy of a single oral dose of tribendimidine against *S. stercoralis* and compared the results with the standard albendazole treatment. Tribendimidine is an anthelmintic from China with well-documented efficacy against *A. lumbricoides* and hookworms [2], different trematode species [3] and shows in vitro and in vivo activity against *S. ratti* in the rat model [4].

However, the effect of tribendimidine on *S. stercoralis* has not been investigated before. In a group of 57 individuals the prevalence of *S. stercoralis* was reduced from 19.3% to 8.8% after tribendimidine administration. The cure rate was 18.1% higher than in the albendazole-group but this difference showed no statistical significance. No adverse events occurred. In a next study, we plan to assess the safety and efficacy of tribendimidine at multiple doses.

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[1] Steinmann P, Zhou XN, Du ZW, Jiang JY, Wang LB, Wang XZ, Li LH, Marti H & Utzinger J (2007). Occurrence of *Strongyloides stercoralis* in Yunnan province, China, and comparison of diagnostic methods. PLoS Neglected Tropical Diseases 1: e75.

[2] Xiao SH, Wu HM, Tanner M, Utzinger J & Wang C (2005). Tribendimidine: a promising, safe and broad-spectrum anthelmintic agent from China. Acta Tropica 94: 1-14.

[3] Keiser J, Xiao SH, Chollet J, Tanner M & Utzinger J (2007). Evaluation of the in vivo activity of tribendimidine against *Schistosoma mansoni*, *Fasciola hepatica*, *Clonorchis sinensis* and *Opisthorchis viverrini*. Antimicrobial Agents and Chemotherapy 51: 1096-1098.

[4] Keiser J, Thiemann K, Endriss Y & Utzinger J (2007). *Strongyloides ratti*: in vitro and in vivo activity of tribendimidine. PLoS Neglected Tropical Diseases (submitted for publication).

photo left: Baermann test established in the Menghai county station, China for the control of parasitic diseases.

photo right: *S. stercoralis*-endemic Nan Weng village in Yunnan province, China

