Institute of Tropical Medicine

Annual Report 2011

COLOPHON

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Layout & cover: Stefan De Pauw

Print: Vanden Broele Graphic Group, Brugge

Cover: ITM contrasts.
Top, large (~8 mm): Anopheles,
vector of human malaria in the tropics.
Bottom, small (~1 mm): Culicoides,
vector of cattle bluetongue in Europe.

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Foreword

2011 will be remembered in Belgian history as "the year without government". It took our politicians a record-setting 541 days to form a coalition after the elections of 13th June 2010. Apart from musings about the complexity of our country, the episode also pays homage to the strength of our institutions. Regional and local governments, administrations and agencies, schools and universities continued to do their job, with an unbeatable sense of duty - and humour. We actually survived the concurrent financial crisis better than most European countries. Nevertheless, the announcement of a new federal government on December 6th incited a widespread sigh of relief. We are proud and happy that one of our board members, Monica de Coninck, was asked to become the federal Minister of Labour. As deputy mayor for social affairs of Antwerp, and city representative on our board, she was highly valued for her commitment, common sense and straightforwardness. We will miss her very much but cannot think of any better person to fill her new position.

The underlying determinants of this odd interregnum are significant to the ITM in many other ways too, and this at the national as well as the international level. Since the constitutional revision of 1993, Belgium is comprised of a federal state, three language communities (living in four "linguistic areas") and three regions. Each entity has its own governance structure and competences, none having precedence over another. The ITM has a truly unique position in this landscape, which seems impenetrable for outsiders but does insure peaceful sustainability. As an autonomous foundation, the ITM draws its legal charters, official mandates and public funding from a variety of federal and regional ministries. Its basic academic mandate and funding comes from the Flemish Ministry of Education. For scientific research, it has an additional covenant with the Flemish Ministry of Economy, Sciences and Innovation but receives also substantial support from the Federal Ministry of Scientific Policy through fiscal measures and interuniversity programmes. Curative medicine is a federal competence whereas health promotion and prevention is a regional one. Our medical services in Antwerp are thus regulated and subsidized through various charters and agreements with the Federal Ministry of Social Affairs and Public Health, whereas our preventive programmes in Flanders take place under a covenant with the Flemish Ministry of Health. Development cooperation is mainly a federal matter but in principle the regions are, or should become, responsible for international aid within the realm of their competences - including health promotion. Besides the main Framework Programme for capacity strengthening for the Belgian Ministry of Development Cooperation, the ITM also runs international health projects for the Flemish Ministry of International Cooperation. Our campaigns for integrated primary health care are thus not inspired by national practice.

Balancing a delicate, but transparent and robust equilibrium in the Belgian labyrinth is one of the major achievements and strengths of the ITM. It also requires considerable diplomatic and managerial skills, and takes a heavy toll in terms of planning, reporting and accounting. The ITM's administrative and financial services deserve a lot of respect in this regard, what with the dozens of other national and local rules they have to abide with. State reform being a main stake in past, present and future politics of Belgium, the latest government formation once more tested our equipoise. The robustness of the state system avoided acute disturbances with transitional measures and interim funding. Unavoidably, however, the ensuing reflections fed existentially into the ITM2020+ reform process (see annual report 2010 and below). While the government programme does not imply a direct political impact on the ITM, not all practical consequences of principle decisions on state reform and fiscal austerity can as yet be predicted.

The financial and economic crisis formed the second pillar of the recent political insecurity, and has perhaps even more fundamental implications for ITM's future. The ITM2020+ reforms are based on the supposition, and hope, that developing countries will further strengthen their own capacities and take full ownership of their national health research. The eventual finiteness of development aid (not necessarily of international solidarity) as a main task and resource for the ITM is a moral and political imperative, and must be prepared now. "Switching the Poles" motto is not gratuitously the motto of the ITM's capacity strengthening programme. In essence, the protracted financial crisis that hits Europe and the United States so hard has the same roots, i.e. a world-wide redistribution of wealth and knowledge that must be applauded rather than deplored.

This (r)evolution to global equity comes with its own inequities, shocks and pains. It cannot be achieved in a fair and peaceful manner, however, without profound technological and societal innovation that is crucially dependent on new scientific insights and progress. The ITM2020+ process started with a simple but obvious question of the Minister of Education for a long-term vision on the ITM's future. The year 2011 has precipitated the relevance of that request, but also of the only possible answer: academic excellence and scientific innovation in, and for, a globalised society. These values are ingrained in the heart and soul of the ITM, and its scientists deserve great credit for not shying away from the challenges of the 21st century.

The Board discussed, reviewed and approved also the concrete foundations of ITM2020+ during its four formal meetings in 2011. As planned, the ITM was fundamentally restructured in three disciplinary departments with greater autonomy and responsibility. The new matrix is superposed by Interdepartmental Research Centres, which will tackle "grand challenges" with interdisciplinary research. Key positions in the revised organogram were filled, including departmental heads, managers and educational coordinators. Together with the director and the general manager, the department heads form an authoritative Direction Committee, but also assure participatory policy-making and management in and from the departments. A new scientific career concept was approved, distinguishing "vertical" academic pathways besides "horizontal" expert positions. We also established a system of "tenure-track" professorships which allow young, promising postdoctoral researchers to prove their academic potential over an initial period of five years. A new resource allocation model was designed, that will enable a maximal delegation to the departments of responsibilities and management, but also of accountability. Meanwhile, additional investments are being made in the soft- and hardware necessary to run this complex and advanced organisation. In 2011 they resulted in new reference laboratories for HIV and infectious diseases, the opening of the first ITM-owned residence hall and of two new wharfs, an up-to-date electronic patient management system for the medical services, and the start-up of an over-arching Management Information System.

Much work in progress thus at the ITM - "work" for sure, but definitely also "progress". The tedious micromanagement of change links up with momentous (r)evolutions at the national and global level. With this somehow comforting thought, We congratulate all staff of the ITM for the pivotal achievements of 2011 and wish that the Force may be with them in 2012.

Cathy Berx
Governor of the
Province of Antwerp
Chair of the
Board of ITM

Bruno Gryseels
Director

The new ITM

On July 1st 2011, the organogram, management and structure of the ITM have been profoundly reshaped. The five current scientific departments have been reformed into three larger departments whereby the loose thematic coherence has been replaced by a 'disciplinary' logic. The old departments of Parasitology, Microbiology, Animal Health, Clinical Sciences and Public Health were defragmented and remerged into three new departments dealing respectively with "pathogens, patients and populations" (3P): Biomedical Sciences, Clinical Sciences and Public Health.

These bring together disciplinary groups and technological platforms, creating a critical mass for methodological quality assurance and peer review. Interdisciplinary work on broad thematic subjects and diseases should be organised in structured Interdepartmental Research Centres. Within this matrix, priorities will be defined based on available expertise and resources, and on an own research agenda rather than, or at least besides on societal demands and funding opportunities.

These changes resulted from a long and intense internal reflection on the raison d'être, objectives and strategies of the ITM in the 21st century, initiated by the management on request of the Ministry of Education. In addition, the reforms follow the findings and recommendations of the last audit of the over-all management of the ITM (2009). The auditors praised the achievements of the ITM (including the "remarkable" level and impact of its research) and stressed the need for stronger government funding, interuniversity recognition and clearer post-doctoral career paths. The main internal recommendations included the decentralisation of strategic and managerial responsibilities to the departments; the replacement of the collegial management of departments by appointed heads with line responsibilities; a clearer career perspective for long-term postdoctoral scientists with "up or out" tracks on one hand but socially more stable ones on the other; a stronger and explicit external communication strategy; and quickening and broadening the implementation of the formal, ISO-compliant quality system throughout the organisation.

A basic presumption of ITM 2020+ is that we believe that scientific institutions in the developing countries will and must take over their national and regional duties in full autonomy and ownership within the next decade. While international collaboration will remain an intrinsic need for tropical institutes, it will be driven by mutual scientific benefit rather than by development cooperation. The ITM will therefore only remain justifiable and viable if it stands out among global students, scholars and partners for its academic and scientific excellence. Its societal value will derive from scientific innovation with indirect rather than direct social impact. National and international evolutions indicate that this challenge is approaching faster than many anticipate, and the ITM must gear up now to realise this strategic aim.

On the other hand, international academic and scientific competition becomes more intense by the year. "Excellence" is pursued by all academia, and modern bibliometrics make benchmarking increasingly easy and transparent. The ITM must keep and speed up pace up in this "Red Queen race", while maintaining its values, qualities and partnerships as intrinsic driving force as well as part of its competitive edge. Therefore, a strong, efficient and purpose-driven organisation is needed that decisively translates the strategic aims in scientific priorities and strategies. In addition to the strategic agility, the steady growth of size, diversity and complexity of the institute requires on its own an upgrade of its managerial and administrative capacities.

The new departments are therefore managed by a collegial board of professors anymore, but led by a departmental head who carries academic and administrative line responsibility towards the ITM's management and Board. The new departmental heads have been selected among internal candidates, appraised and ranked by an external jury and finally appointed by the Board of Governors. In addition, a professional manager has been appointed in each department, who assists the department heads with the administrative, financial and human resource management of the department and assures a close collaboration the central support services. Most of the strategic and administrative responsibilities should be decentralised to the departments by the end of 2012.

In a first phase of the reforms, the existing but reshuffled units remain the basic elements of the new departments. They are led by a tenured professor or "ZAP" ("Zelfstandig Academisch Personeel", according to Flemish University denominations), who will take up the responsibility for the academic duties assigned to the Unit and be the hierarchical superior of its technical and scientific staff. The heads of unit report to the head of department. All administrative staff reports to the departmental manager, who manages their tasks as much a possible as a joint "pool" so that every unit and professor is



The three new department heads: Jean-Claude Dujardin (Biomedical Sciences); Lut Lynen (Clinical Sciences); Marleen Boelaert (Public Health).

assured of sufficient and equitable administrative support. Every three or four related units are combined in a "group", which seeks active academic collaboration in a related domain, without a hierarchic organisation.

The organogram below shows the new departmental structure as well as a list of the new services, the corresponding former units and heads of department.

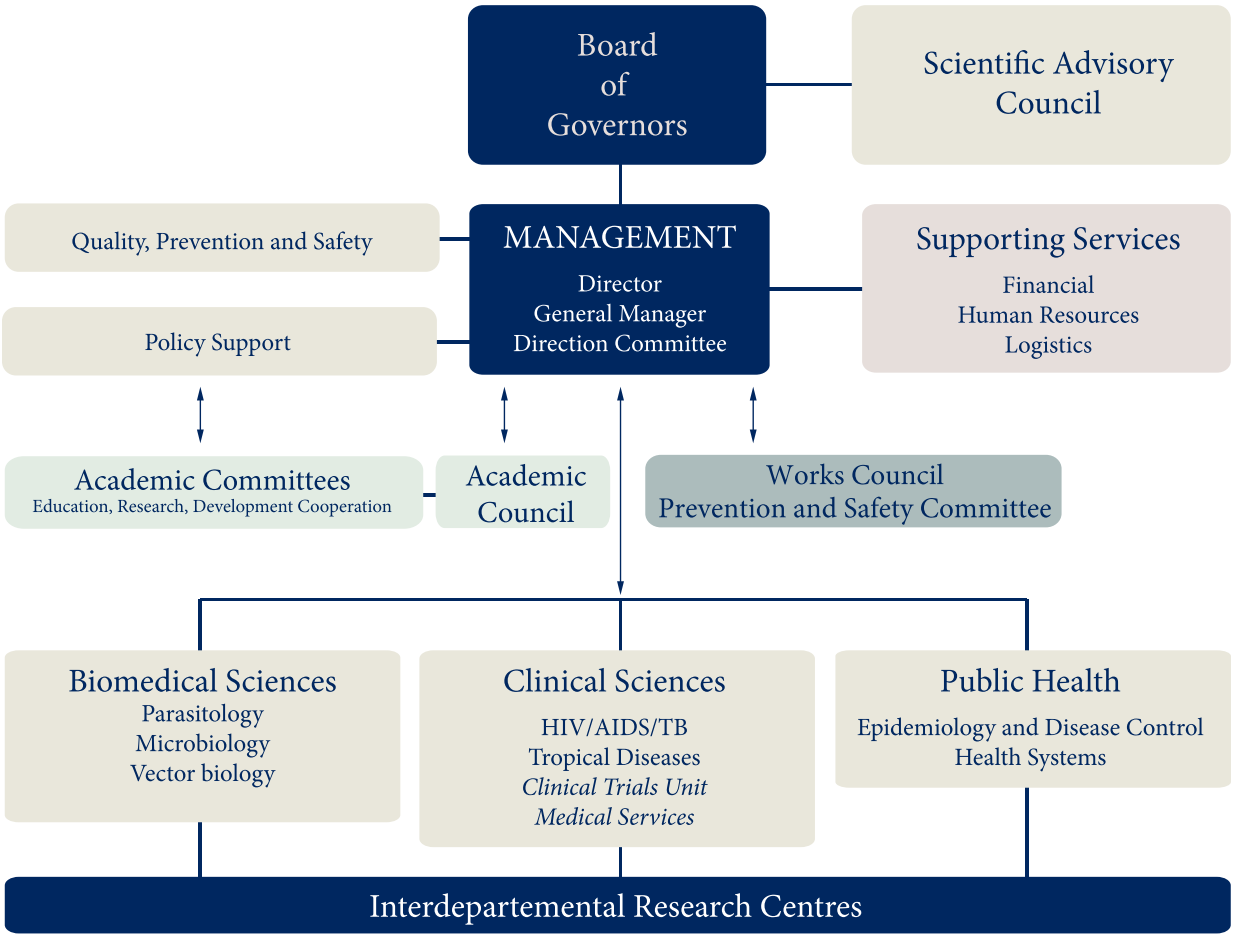
The **Department of Biomedical Sciences** regroups the units from the former Departments of Parasitology, Microbiology and Animal Health that deal at least partly with laboratory lab research, even if they are also active in the field. Conceptually they focus on the **pathogen**, including vectors and animal reservoirs. Their main expertise lies in the biology, immunology and ecological epidemiology of tropical and global diseases caused by viruses, bacteria and parasites. Their fields of action thus include basic, applied and translational research. The focus is on the understanding of biological, ecological and pathological processes and their translation in new biomedical applications. Thematically, the current focus is on HIV and HTLV-1 in virology; tuberculosis and Buruli ulcer in mycobacteriology; malaria, trypanosomiasis, leishmaniasis and schistosomiasis in parasitology. Veterinary and zoonotic subjects include furthermore taeniasis, brucellosis and theileriosis. Recently, the department also develops research lines on emerging veterinary and zoonotic diseases in Europe, such as Bluetongue and Schmallenberg virus. The integration of human and veterinary expertise is of great value for zoonotic diseases and emerging pandemics but still need to be properly structured. The question if the veterinary sciences will retain also an exclusive animal health objective, or be sequestered in a zoonotic or ecological "one health" concept should be answered in the next few years.

The **Department of Clinical Sciences** includes the units of the former department with the same name, as well as the Clinical Trials Unit (formerly an interdepartmental unit under the administrative responsibility of the Department of Public Health). Scientifically, they mainly focus on research and education, taking the **patient** as a starting point. Their expertise mainly covers the diagnostics, treatment and clinical epidemiology of tropical infectious diseases at large but also including HIV/AIDS and tuberculosis. Their research leads to "evidence-based medicine", phenotyping in fundamental research and clinical trials of new medicines and technologies. Diagnostics, clinical decision making, patient-centred care and emerging drug resistance are important cross-cutting issues.

Also the **Medical Services** now belong directly to the Department of Clinical Sciences instead of being a separate unit reporting directly to the director. Their main task remains patient care in Belgium as well as related research, education and scientific services. The HIV/SOA reference laboratory, which includes the official AIDS reference laboratory (ARL), formerly part of the Department of Microbiology, have been integrated in de Medical Services as well. The Medical Services consist of outpatient clinics for HIV/AIDS, STD, Imported diseases and for travel health, as well as a general diagnostic laboratory and the ARL. Each is led by a Head of Service, coordinated and supervised by a Chief Physician. All Heads of Service, the Chief Physician and the Laboratory Directors report directly to the Department Head.

The **Department of Public Health** includes all units of the former department, except for the Clinical Trials Unit, and now also integrates the units for "Epidemiology and Control" of the former departments of Parasitology (Malaria and parasitic diseases) and Microbiology (HIV/AIDS and STD). The scientific task of the new Department of Public Health is situated at

The new organogram of the ITM, as of 1 July 2011.



the **population** level. Their expertise mainly consists of the epidemiology of tropical infectious diseases, the techniques, strategies and evaluation of specific control interventions, socio-economical and organizational aspects of health care and the general and international health care policy. Their research aims at a reduction of disease in the population and an optimal organization of the health care.

Units of different departments working on the same disease or related thematic subjects can establish **Interdepartmental Research Centres**. For the time being, such centres are being prepared for HIV/AIDS, tuberculosis, malaria, neglected tropical diseases (NTD), international health policies and maternal and child health.

In addition to these organisational restructuring and the introduction of line management, a third major reform aims at the quantitative and qualitative strengthening of the scientific staff and enhanced scientific career opportunities. Concrete new regulations are being implemented at this very moment, including new staff policies blending university-like, "vertical" academic tracks and purpose-oriented, "horizontal" expert tracks. Individual profiles and objectives, career-long training and coaching and periodic staff performance assessments become essential elements of the career structure. A "tenure track" junior professorship system is introduced to promote the career development of young, promising postdoctoral scientists as well as innovation in the ITM's portfolio.

The Academic Board will review its mandate and internal regulations, and establish permanent commissions for Education, Research and Development Cooperation. Under the final responsibility of the Academic Board, these commissions will advise on the academic strategies and quality assurance in their domain.

By the end of 2012, all reforms should be consolidated, and new strategic plans should be in place at all levels.

Table. The new structure and focus of the scientific units and departments (heads in brackets)

DEPARTMENT OF PUBLIC HEALTH (Boelaert)	**Main scientific focus**
Group Health Systems	
Unit of Health Services Organisation (Kegels)	Human Resources, quality, management
Unit of Public Sector Health Care (Unger)	Public sector management and policy
Unit of Health Policy (Van Damme)	International policies and global health
Unit of Health Financing (Criel)	Community-based health financing
Unit of Maternal and Reproductive Health (De Brouwere)	Maternal health interventions
Unit of Nutrition and Child Health (Kolsteren)	Nutritional status and interventions
Group Epidemiology and Disease Control	
Unit of General Epidemiology and Disease Control (Van der Stuyft)	Dengue, TB, health interventions
Unit of Epidemiology and Control of Tropical Diseases (Boelaert)	Neglected diseases interventions
Unit of Epidemiology and Control of Malaria (D'Alessandro)	Malaria interventions
Unit of Epidemiology and Control of HIV/ STD (Buvé)	HIV / STD interventions
Unit of HIV/AIDS Policy (Laga)	HIV interventions and policies
DEPARTMENT OF CLINICAL SCIENCES (Lynen)	
Clinical Trials Unit (Ravinetto)	
Group Tropical Medicine	
Unit of Tropical Diseases (Van den Ende)	Clinical decision making
Unit of Tropical Laboratory Medicine (Jacobs)	Quality, diagnostics, antibiotic resistance
Unit of Travel Medicine (Van Gompel)	Imported diseases
Group HIV/STD & co-infections	
Unit of HIV/STD (Colebunders)	HIV/AIDS care, TB (IRIS)
Unit of HIV/AIDS & Infectious Diseases (Lynen)	HIV/AIDS care, TB, opportunistic infections
Medical Services	
Travel Clinic (Van Gompel)	Imported diseases (fever, diarrhoea)
HIV/STD Clinic (Florence)	HIV, concomitant infections in Belgium and EU
Central Laboratory for Clinical Biology (Van Esbroeck)	Diagnostics for imported diseases
HIV/STD Reference Laboratory (Fransen)	HIV and STD diagnostics
Hospitalisation Service UZA (Van den Ende)	HIV care, management tropical diseases
DEPARTMENT OF BIOMEDICAL SCIENCES	
Group Microbiology	
Unit of Mycobacteriology (De Jong)	TB, drug resistance, diagnostics, Buruli
Unit of Virology (Vanham)	HIV/AIDS, vaccine, microbicides
Unit of Immunology (Kestens)	Cellular immunology HIV and TB
Group Parasitology	
Unit of Molecular Parasitology (JCD)	Molecular genetics Leishmaniasis
Unit of Parasite Diagnostics (PB)	Diagnostics Trypanosomiasis and Leishmaniasis
Unit of Malariology (NN)	Eco-epidemiology, molecular biology, P. vivax
Unit of Medical Helminthology (Polman)	Eco-epidemiology and control helminth diseases
Unit of Veterinary Protozoology (Van den Abbeele)	Molecular biology Trypanosomes and Glossina
Unit of Veterinary Helminthology (Dorny)	Epidemiology and control of zoonotic helminths
Group Vector Biology	
Unit of Medical Entomology (Coosemans)	Anopheles biology and control
Unit of Veterinary Entomology, Biostatistics and Epidemiology (Berkvens)	Theileriosis, Blue Tongue, Brucellosis

Performance Indicators 2011

EDUCATION

International Master Courses (2010-2011)	
Applicants	339
Admitted students	65 (19%)
International students	61 (94%)
Graduated students	62 (95%)
Post Graduate Certificate and Short Courses	
Enrolled students	133
Graduated students	129 (92%)
Short Course participants	231
Doctoral training	
Doctoral trainees on 31.12.11	111
of which international	82 (74%)
Doctoral trainees started in 2011	15
Doctoral graduates in 2011	22

RESEARCH

Total number of scientists on 31.12.11 (PhD fellows included)	274
Postdoctoral scientists	93
Number of scientific articles in 2011	363
In ISI journals	264
with JIF >=2 and <5	187
with JIF >=5 and <10	23
with JIF >=10	14
Number of books and chapters in 2011	20
Number of PhD dissertations in 2011	22
Average PhD duration	4,7 years
Number of externally funded research projects	320
Amount of external research funding (without transfers for partners & overhead)	8,6 million euro
Number of new collaborative projects	36
International meetings organised	10

MEDICAL SERVICES

Patient contacts total	34 384
Outpatients tropical and travel-related diseases	24 444
Outpatients HIV/STD	9 940
Hospitalised patients (UZA)	170
Laboratory patients	33 812

INTERNATIONAL HEALTH DEVELOPMENT

Master students from developing countries	60
Doctoral trainees from developing countries	75
Doctoral graduates from developing countries in 2011	12
Institutional partnerships	17
Africa	7
Asia	4
Latin America	6
Expenses for capacity strengthening in the South	12,8 million euro
National and International Reference Laboratories	8
Diagnostic kits for neglected diseases shipped	2,1 million

FINANCES (million euro)

Total income	52,3
Government subsidies	26,3
Academic core funding	10,2
Research programme funding	1,8
Medical programme funding (excluding patient fees)	3,5
International development programme funding	12,8
Investment funds	0,6
Own income	26
External project funding	8,6
Tuition fees, overhead, fiscal rebates, other	12,4
Medical fees	5
Expenditure	47,8
Institutional education & departmental research	11
Externally funded research and services	10,4
Development cooperation (DGD Programme)	11,3
Medical Services	6,7
Management	8,4

HUMAN RESOURCES (in Full Time Equivalents)

Total Staff on 31.12.11	405,0
University and college graduates	343,2
Male : Female ratio	42:58
Total staff on institutional budget	210,9
Senior (tenure) academic staff	33,8
Academic assistants	35,9
Support staff	141,2
Staff medical services	54,9
Scientific staff on external funding	96,3
Support staff on external funding	42,8

QUALITY AND SAFETY MANAGEMENT

Accreditation Master Courses	Achieved in 2009
Laboratories under accreditation/certification	7
Number of ISO certificates	4
ISO certificates granted in 2011	ISO17043, ISO9001
Staff working under formal quality assurance system	>150
Numbers of accredited tests	>100
Number of external quality audits	2 (BELAC; J&J)
Number of internal audits	16
Wellbeing, safety and prevention at work	
Sick leave (% of work days)	2,9
Sick leave due to work-related accidents (% of work days)	0,1
Energy Performance Certificate	102%

Education

The ITM2020+ vision includes also innovation in education, requiring strategic planning, coordination and decision-making. One of the first effective reforms was the appointment of departmental education coordinators and the establishment of an Education Committee within the Academic Council. The programme and management structure of the Master in Public Health (MPH) were reorganised, in order to advance the integration of the two majors (disease control and health systems) and to allow further modularization and flexibility in the MPH learning paths. We launched new projects on quality assurance and e-learning within the Linqed educational network, and prepared the establishment of joint programmes with national and international partners.

Evolutions and achievements in 2011

The ITM2020+ vision for education was translated in specific key concepts, including specificity of contents and niche, global relevance, research focus, student-centered curricula and blended learning methods.

The ITM organizes two distinct master programmes. The Master in Public Health (MPH) offers majors in Health Systems and Disease Control. The Master of Science in Tropical Animal Health (MSTAH) divides into majors in Epidemiologic Surveys and Control of Animal Diseases. Each master course is limited to 25 participants.

We restructured the MPH programme in a common core module and a specific methodological part for each major, followed by a selection of thematic modules. One single MPH steering committee, one (rotating) course director and harmonized admission criteria completed the integration. Our offer of other postgraduate and expert courses was further adapted to the changing international context, and modeled to meet also the needs of PhD students. A new expert course on Qualitative and Mixed Methods (QMM) in International Health Research combines social theory, methodological skills and hands-on field work in the city of Antwerp. Highly positive evaluations by students and lecturers encouraged us to consolidate the course as part of our annual programme. The e-learning Short Course on Anti-Retroviral Therapy (e-SCART), an introductory course to ART, further capitalized on its alumni through the creation of a virtual 'community of practice' and the continued training of e-facilitators. The Quantitative Risk Assessment (QRA) course was continued on demand of the Belgian Technical Cooperation (BTC) agency. Based on feed-back of students, alumni and lecturers, the postgraduate course in tropical medicine for nurses and midwives was conceptually and organizationally revised. We initiated the development of joint Master programmes in Tropical Biomedical Sciences with the Faculty of Pharmaceutical, Biomedical and Veterinary Sciences of the University of Antwerp, and for an online Master of Science in Animal/Human/Ecosystem Health with the Faculty of Veterinary Science of the University of Pretoria. We supported, financially as well as educationally, a Good Clinical Practice training module at the Clinical Research Unit of Nanoro (CRUN) in Burkina Faso which combines theoretical training with practical trial fieldwork.

The annual workshop of the Linqed educational network was hosted by the University of Gadjah Mada in Yogyakarta, Indonesia. The network initiated projects on the development of quality assurance in student assessment methods, on online courses for e-learning, and international exchanges on student assessment practices. As part of the ITM2020+ reforms, the Academic Council created an Education Committee and the board approved the appointment of departmental education coordinators.

Educational innovations

Innovation and e-learning are easier to implement in flexible short courses than in long-established programmes. The reorganisation of the MPH opens the way, however, for second-term inflow of postgraduate alumni, integrating short courses in the individual curriculum and other flexible pathways. A new course on Qualitative and Mixed Methods in international health research brought along new concepts as well, including practical field training in medical and social projects in Antwerp. An innovative electronic platform for epidemiology and statistics exercises (e-EPISTAT) was initiated with four self-study chapters, respectively on epidemiological measures; validity of measurements and tests; types of epidemiological studies; and inferential statistics. The annual training of tutors for the e-SCART was integrated with alumni gatherings at the ICASA conference in Addis Ababa and an online training on e-tutoring. Interested institutional partners were supported to join the annual Telemedicine workshop, where they discussed common challenges: the development of an EC FP7 "Africa Build" project, and a proposal for an international 'Clearing house' for sustaining telemedicine networks in resource-limited settings. The latter would especially aim at the exchange of clinical case studies and other information, the identification of consultants and reducing response times. In 2011, our Telemedicine website scored 5990 visits from 33 different countries. It counted over 90 active members and dealt with 77 new case discussions. Eight new Continuous Medical Education modules were developed, and Google analytics were introduced to follow-up their utilization. The learning management system Moodle was used to set up virtual 'communities of practice' for the e-SCART course, the Linqed network and the ITM HIV/AIDS Centre (IHAC). We explored virtual classroom tools, and tested electronic voting systems to enhance in-class participation and real-time feedback.

Quality assurance and student participation

The relatively short stay and the unfamiliarity with Dutch does not allow the same participation of our students in the institutional government as in universities. The alternative, regular "Student Participation Meetings" between student representatives and the management are perceived by both sides as a valid alternative, allowing direct exchanges and feedback and leading to concrete improvements of the academic and social environment of the students. The "Introduction to International Health" module of the postgraduate course in Tropical Medicine and International Health was successfully re-accredited as core course for the tropEd Master in International Health. Our collaboration with the Universidad Mayor de San Simon from Cochabamba, Bolivia, led to its membership of the international tropEd network (www.troped.org).

Students meet the ITM direction.

As a general reform, we introduced new registration and management procedures including "study contracts" for hundreds of students following individual training or internships.

Costs of studying

Our tuition fees policy aims at covering 25 % (postgraduate certificate level) to 50% (international master and expert level) of the full course costs. The other part is covered by ITM's own budget, half of which is core funding from the Flemish Ministry of Education.

The tuition fees were adjusted to the cost of living, and now amount to 15 800 euro for an 11-months, 25-students master course (60 ECTS credits). The fee for the postgraduate certificate course (5 months, 30 ECTS credits), taught in groups of 40-50 students, is 1 300 euro for EU students and 2 600 euro for non-EU students. For shorter expert courses with similar numbers, the pro rata fee is approximately 300 euro per credit.

The ITM-DGD Framework Agreement Programme provided 48 master and 8 postgraduate students with a full scholarship in 2011. The Joint Japan/World Bank Graduate Scholarship Programme funded 3 MPH students, and the Belgian Technical Cooperation (BTC) agency another six. Scholarships for ITM's short courses were awarded by the DGD, BTC, Debucquoy fund, WHO, MSF and private organizations. We provided eight partial scholarships to European students from own funding and private sponsors, especially the Ackermans-Van Haaren Fund.

Our master students must have an initial university master degree, language proficiency (English or French) and relevant professional experience of 2 to 5 years, according to the course. Competitive selection criteria include academic record, relevance of professional experience, future plans and peer review. In case of equality, we take gender and geographical balance into account. For the academic year 2010-2011, 24 students out of 144 eligible applicants (17%) were selected for the MPH-DC, 20 out of 128 (16%) for the MPH-HSMP, and 21 out of 67 (31%) for the MSTAH.

In 2011 our Student Service assisted over 930 students, trainees and guests with travel, visa, housing, social support, cultural activities and practical advice. Making students feel at home and offering administrative support remains its prime objective, enabling them to concentrate fully on a fruitful and pleasant academic stay. As student numbers continue to increase, and decent housing ever more difficult to afford, the ITM has set out last year to build its own student houses. We were happy and proud to welcome the first 24 tenants in the new Napay building just across the street of ITM's main building (Napay means greetings in Quechua, a South-American language). By the end of 2013 we should be able to house some 130 students in our own premises.

Alumni network

The ITM's alumni network aims at supporting our graduates throughout their career as well as receiving continuous feedback and input for our courses. Apart from the MPH and MSTAH networks, a new community of practice was created for (e-)SCART alumni. One of the new activities in 2011 included calls for abstracts and presentations at international conferences, of which a number were selected and supported to attend the conference and satellite alumni meetings.

The International Health and Health Systems Research networks shared regular newsletters and more than 1000 scientific papers with well over 1500 alumni.

(Post-)doctoral fellowships and grants

Doctoral and postdoctoral training makes up an ever greater part of ITM's educational mission. At the end of 2011, 111 PhD students were registered at ITM and 22 had successfully defended their thesis, 12 of which from developing countries.

The PhD students doing research at the ITM include academic and research assistants employed by ITM, Belgian and European scientists with a fellowship from research funding agencies, and PhD bursaries from developing countries supported by the DGD or other (development) agencies. The latter category usually follows a "sandwich" track with alternating stays at ITM and in the home country. From 2011 onwards all DGD funded grants are nationally harmonized and include a subsistence allowance for living expenses, a 'bench fee' for research costs and supervision costs. The ITM awards such fellowships on a selective or competitive basis as part of an institutional collaboration programme, or to graduates from its Master and expert courses. In 2011 three such 'individual' PhD scholarships were awarded. As the number of PhDs graduates increases, postdoctoral positions remain scarce and haphazard, especially in developing countries. This situation restricts the perspectives of young, talented scientists, resulting all too often in brain drain to industrialized countries. The ITM therefore awards 'postdoctoral re-entry grants' to selected PhD graduates, allowing them to initiate and build up a scientific career in their country. The grant is channeled through the home institution, which commits itself to a career development plan and the gradual take-over of the funding.

International collaboration

In South America, ITM provided institutional and academic support to master and postgraduate courses in public health, disease control and tropical medicine at the Institute of Public Health at the Pontificia Universidad Católica (IPH-PUCE) in Quito, Ecuador, the Post Graduate Unit for Tropical Medicine of the Universidad Mayor San Simon in Cochabamba, Bolivia and the Instituto de Medicina Tropical Cayetano Heredia in Lima, Peru. In Africa, ITM supported veterinary training programmes at the Centre for Ticks and Tick-Borne Diseases in Lilongwe, Malawi and to the web-based Veterinary Master of Science programme at the University of Pretoria. At the Institut National d'Administration Sanitaire in Rabat, Morocco, we supported curriculum development, e-learning capacity and PhD training. At the Makerere University School of Public Health, Uganda, ITM contributed to the development of a fellowship programme for district medical officers. Also in Uganda, at the Uganda Martyrs University we supported the development of an advanced diploma in Health Insurance Management. In Maputo, Mozambique, we repeated for the third time a two-week course on sexual and reproductive health within a Master of Public Health at the Eduardo Mondlane University.

In Asia, ITM contributed to training programmes in clinical tropical medicine, internal medicine and HIV/AIDS at the Sihanouk Hospital Center of Hope in Phnom Penh, Cambodia; the tropical medicine diploma course at the B.P. Koirala Institute of Health Sciences in Dharan, Nepal; and public health training for health district teams and e-learning development at the Institute of Public Health in Bangalore, India.

Together with these and other institutional partners in the ITM-DGD framework programme, we constitute since 2008 the educational network Linqed, with a focus on educational quality management (www.linqed.org).

Mens sana in corpore sano.

International Masters

Master of Public Health - Health Systems Management and Policy (MPH-HSMP)

Objectives	Target group	Language	Credits
Focus: Management and policy of comprehensive and accessible quality health services at local, national and international level ***Components***: • Health systems management • Analysis, research, decision-making • Communication skills • Optional modules • Integration and synthesis (master thesis) ***Options***: • Health Policy • Strategic Management	Experienced health professionals (mainly medical doctors)	Yearly alternating English and French	60

Master of Public Health - Disease Control (MPH - DC)

Focus: Epidemiological, technical and organisational aspects of disease control with emphasis on sustainable integration in regular health services ***Components***: • Quantitative and qualitative methods • Public health • Research & tools • Master thesis ***Options***: • Reproductive Health Programmes • Tropical Diseases Control	Experienced health professionals (mainly medical doctors)	Yearly alternating English and French	60

Master of Science in Tropical Animal Health (MSTAH)

Focus: Epidemiological, technical and organisational aspects of animal disease control and surveillance ***Components***: • Research methodology • Project cycle management • Global livestock development • Epidemiological case studies • Master thesis ***Options***: • Animal disease control • Epidemiological data collection & processing	Experienced health professionals (mainly veterinary doctors)	Yearly alternating English and French	60

Objectives	Target group	Language	Credits

Postgraduate certificate courses

Tropical Medicine and International Health (TM&IH / MT&SI)

Focus: Clinical, biomedical and epidemological aspects of tropical and poverty related diseases and their control; health care organisation in low and middle income countries ***Components***: • Vector-borne diseases • Tuberculosis, HIV, malaria • Maternal and child health • Emergency medical care • Management of health care systems • Tropical and neglected diseases • Clinical decision-making • Tropical laboratory sciences • Clinical specialties in the tropics	Health professionals, mainly from the North, preparing to work in tropical and developing countries	Yearly, separately French and English	30

Tropical medicine for nurses and midwives (TG / MT)

Focus: Clinical, biomedical aspects of tropical diseases and their control; health care organisation in low and middle income countries ***Components***: • Vector-borne diseases • Tuberculosis, HIV, malaria • Maternal and child health • Emergency medical care • Management of health care systems • Tropical and neglected diseases • Tropical laboratory sciences • Nursing in developing countries	Paramedical health professionals, mainly from the North, preparing to work in tropical and developing countries	Yearly, separately French and Dutch	20

Specialised short courses

Introduction to International Health (TM&IH / MT&SI: Module 1)

Focus: Diseases and health care in low and middle income countries ***Components***: • Vector borne and tropical diseases • TB, HIV and malaria • Maternal and child health • Emergency medical care • Management of health care systems	Health professionals, mainly from the North, preparing to work in tropical and developing countries	Yearly, separately French and English	20

Clinical and Biomedical Sciences of Tropical Diseases (TM&IH / MT&SI: Module 2)

Focus: Clinical & biomedical aspects of tropical diseases ***Components***: • Descriptive tropical medicine • Clinical decision-making • Laboratory sciences • Clinical specialties in the tropics	Health professionals, mainly from the North, preparing to work in tropical and developing countries	Yearly, separately French and English	10

Objectives	Target group	Language	Credits
Short course on Clinical Research and Evidence-based Medicine (SCREM)			
Focus: Clinical research with focus on the design of guidelines and algorithms ***Components***: • Protocol / project development • Literature search and critical reading • Statistical data analysis and presentation • Algorithms and scoring systems • Research skills and communication	Experienced health professionals (mainly clinicians)	English	9
Planning and Management of Reproductive Health Programmes (MPH – DC: Module RH)			
***Focus*:** Management and integration of reproductive health programmes in general health services ***Components*:** • HIV/AIDS • Sexually transmitted infections • Family planning and maternal health • Project cycle management, logical framework	Experienced health professionals (mainly medical doctors)	Yearly alternating English and in French	15
Planning and Management of Tropical Diseases Programmes (MPH – DC: Module TD)			
***Focus*:** Management and integration of tropical diseases control programmes in general health services ***Components*:** • HIV/AIDS, tuberculosis, malaria • Neglected and tropical diseases • Project cycle management, logical framework	Experienced health professionals (mainly medical doctors)	Alternating English and in French	15
Health Policy (MPH-HSMP: Module HP)			
***Focus*:** Formulation, implementation and evaluation of public health policies in developing countries ***Components*:** • Framework for policy analysis • Actors and levers in policy making • Country case studies • Emerging challenges	Experienced health professionals	Alternating English and in French	9
Qualitative and Mixed Methods (QMM) in International Health Research			
Focus: Development of basic skills in qualitative research to understand human behavior and the social context as part of international health research ***Components***: • Qualitative research methods • Theory and models from social sciences • Mixed methods approaches	Health professionals and researchers	English	6

Objectives	Target group	Language	Credits

Specialised short courses (continued)

HIV & AIDS: the multidisciplinary approach ("HIV evening course")

Objectives	Target group	Language	Credits
***Focus*:** HIV/AIDS patient care in Belgium ***Components*:** • HIV: microbiology and epidemiology • Treatment of AIDS and opportunistic infections • HIV/AIDS in pregnancy and children • Multidisciplinary HIV/AIDS care	Medical and paramedical health professionals	Dutch (13 evening classes)	-

Electronic Short Course on Antiretroviral Therapy (e-SCART)

Objectives	Target group	Language	Credits
***Focus*:** Comprehensive HIV care and antiretroviral (ARV) treatment in resource-poor settings ***Components*:** • Virology, immunology and clinical aspects of HIV/AIDS/TB • ARVs and patient management • Prevention of mother to child transmission • HIV pediatrics • Post-exposure prophylaxis • ARV scaling-up	Health professionals (mainly medical doctors)	English	3

Quantitative Risk Assessment (QRA) Internship

Objectives	Target group	Language	Credits
***Focus*:** Quantitative risk assessment (QRA) in endemic disease control and disease import risk management ***Components*:** • Introduction to risk analysis • The R software environment • Probability theory • Uncertainty • Bayesian modelling • The WinBUGS software environment	Health professionals (mainly veterinary, medical and biomedical)	English	24 (equi-valent)

Educational output in 2011

Number and origin of participants in ITM-courses 2009-2010

	Belgium	EU	Europe other	Africa	Asia	Latin America	Other	Total
TM&IH-E	16	12						28
TM&IH-E Module	9	2	1	2	2		1	17
MT&SI-F	11	2		3			1	17
MT&SI-F Module	5	2		5				12
TG-D	22	1						23
MT-F	18	37	8				2	65
MPH-HSMP-FR	1			18			1	20
MPH Mod HP-FR				11				11
MPH Mod SM-FR				6				6
MPH-MDC-FR	3			17		2	2	24
MPH Mod RH-FR	1			4		1		6
MPH Mod TD-FR	1			7			1	9
MSTAH-FR				19		1	1	21
e-SCART-E		3		28	7			38
e-SCART-F				23				23
SCREM	1	1		8	3	2		15
QMM	3			7	4	1	1	16
QRA Internship				8				8
HIV Evening course	55	3						58
Telemedicine workshop				4	4	2	2	12
PhD Ongoing 31/12	29	7	0	51	11	13	0	111
PhD Graduates	8	2	0	8	1	3	0	22
Total	**183**	**72**	**9**	**229**	**32**	**25**	**12**	**562**

E = English F = French

Age and gender of participants in ITM courses 2009-2010

	Gender		Age					Prior education	
	M	F	20-29	30-34	35-39	40-44	>45	Bachelor	Master
TM&IH-E	7	21	18	8	2				28
TM&IH-E Module	6	11	5	8	3		1		17
MT&SI-F	6	11	11	2	4				17
MT&SI-F Module	6	6	1	4	2	1	4		12
TG-D	7	16	16	2	3		2	23	
MT-F	8	57	39	17	4	3	2	65	
MPH-HSMP-FR	16	4		3	3	8	6		20
MPH Mod HP-FR	7	4			5	3	3		11
MPH Mod SM-FR	5	1			2		4		6
MPH-MDC-FR	14	10		5	7	8	4	2	22
MPH Mod RH-FR	1	5		1		4	1	2	4
MPH Mod TD-FR	4	5		1	4	3	1	2	7
MSTAH-FR	19	2	2	5	8	5	1		21
e-SCART-E	20	18	6	18	11	2	1	4	34
e-SCART-F	17	6	2	7	10	1	3		23
SCREM	10	5	1	3	8	1	2		15
QMM	9	7	2	6	3	4	1		16
QRA Internship	1	7				1	7		8
HIV Evening course	18	40	29	12	6	2	9	17	41
Telemedicine workshop	4	8	1	1	1	4	5	2	10
PhD Ongoing 31/12	59	52	11	29	29	26	16	0	111
PhD Graduates	16	6	2	4	6	5	5	0	22
Total	**260**	**302**	**146**	**136**	**121**	**81**	**78**	**117**	**445**

PhD dissertations in 2011

Department of Microbiology

CAMARA Makhtar. *Study of the correlates of protection from HIV transmission in HIV-discordant couples in Dakar, Senegal.* Promoters: L. Kestens; W. Jennes (ITM), Souleymane Mboup (Centre Hospitalier Universitaire de Dakar, Senegal).

MULENGA Chanda. *Tuberculosis drug resistance and treatment outcome in the Copperbelt province of Zambia.* Promoters: F. Portaels (ITM); L. Rigouts (ITM, University of Antwerp), A. Mwinga (University of Zambia, Zambia).

PROANO Freddy. *Bovine tuberculosis in Ecuador: prevalence in cattle and impact on human health.* Promoters: F. Portaels (ITM); L. Rigouts (ITM, University of Antwerp), A. Linden (University of Liege), W. Bénitez-Ortiz (Centro Internacional de Zoonosis, Universidad Central del Ecuador).

SOPOH Ghislain. *Etude des facteurs de risque et de prognostic thérapeutique de l'Ulcère de Buruli.* Promoters: F. Portaels (ITM), S. Anagonou (Laboratoire de Référence des Mycobactéries, Cotonou, Benin).

YEMOA Achille. Identification and chemical study of plants used in the traditional treatment of Buruli ulcer in Benin [dissertation]. Promoters: F. Portaels (ITM), Prof. dr. Joëlle Quetin-Leclerq (UCL) ; Prof. dr. Séverin Anagonou (Laboratoire de Référence des Mycobactéries, Cotonou, Benin)

GALI Youssef. *Development of an in vitro model to study heterosexual HIV transmission.* Promoter: G. Vanham (ITM, University of Antwerp).

Department of Animal Health

HESHBHORNE Tindih. *Identification of virulence factors of Theileria parva.* Promoters: Prof.dr. B. Goddeeris (KULeuven) ; D. Geysen (ITM); J. Naessens (International Livestock Research Institute, Kenya).

Department of Parasitology

ADAUI Vanessa. *Molecular epidemiological approach to the understanding of emergence and spreading of drug resistance in Neotropical Leishmania.* Promoters: J-C Dujardin (ITM), L. Maes (University of Antwerp), J. Arevalo (Universidad Peruana Cayetano Heredia, Lima, Peru).

INOCENCIO DA LUZ Raquel Andreia. *Evaluation of the in vitro and in vivo pathogenicity, susceptibility to anti-leishmania drugs and genetic resistancy markers of laboratorium- and field strains of the zoonotic Leishmania infantum parasites.* Promoters: J-C Dujardin (ITM), L. Maes (University of Antwerp).

ODIWUOR Samwel Ogado. *Identification and application of molecular markers in the development of simple and robust tests for distinguishing leishmania species.* Promoters: J-C Dujardin (ITM), M. Mbuchi, M.K. Wasunna (Kenya Research Institute, Nairobi, Kenya).

VANAERSCHOT Manu. *Antimonial resistant Leishmania Leishmania donovani: relation with fitness of the parasite and influence on other drugs.* Promoter: J-C Dujardin (ITM, University of Antwerp).

Department of Public Health

BASAZA Robert. *Community health insurance in Uganda: status, obstacles and prospects.* Promoters: P. Van der Stuyft (Ghent University, ITM); B. Criel (ITM).

IR Por. *Health Equity Funds to improve access to quality health care for the poor and protect poor households in Cambodia from catastrophic health expenditure.* Promoters: W. Van Damme (ITM), E. Huot (University of Health Sciences, Phnom Penh, Cambodia).

JACOBS Bart. Access to health care for the poor in Cambodia. Promoters: W. Van Damme (ITM), T. Mets (VUB).

LACHAT Carl. *Out of home eating as determinant of unbalanced nutrition?* Promoter: P. Kolsteren (ITM, Ghent University).

MARCHAL Bruno. *Well-performing healthcare organizations: What's the role of (HR) management?* Promoters: G. Kegels (ITM), T. Mets (VUB).

PEREZ CHACON Dennis. *Procesos de implementación de estrategias participativas en el control de Aedes aegypti. Propuestas para su evaluación y transformación.* 2011: 174 pp. Promoters: Dr. María del Carmen Zabala, Facultad Latinoamericana de Ciencias Sociales (Universidad de La Habana, Cuba), Dr. Pierre Lefèvre (ITM), Prof. Dr. Patrick Van der Stuyft (ITM).

PICADO Albert. *Effectiveness of long lasting insecticidal nets in the prevention of Kala-azar.* Promoters: M. Boelaert (ITM), P. Alonso (University of Barcelona, Spain).

VANLERBERGHE Veerle. *Effectiveness and acceptance of integrated dengue vector control strategies.* Promoters: P. Van der Stuyft (ITM, Ghent University).

Department of Clinical Sciences

CASTALNUOVO Barbara. *Challenges rolling out HIV care and antiretroviral treatment in resource limited settings.* Promoter: Prof. Dr. Bob Colebunders (University of Antwerp, ITM)

GILLET Philippe. *'Malaria Rapid Diagnostic Tests: Laboratory aspects in the diagnostic setting. Maastricht: University of Maastricht; Antwerp: Institute of Tropical Medicine.* Promoters: C.A. Bruggeman (University of Maastricht); J. Jacobs (ITM).

OCAMA Ponciano. *Hepatitis B, HIV and liver diseases in Uganda.* Promoter: R. Colebunders (ITM, University of Antwerp)

ITM Master Theses

Master en Santé Publique - Orientation Contrôle des Maladies (MCM)

Belalahy V. Les défis de la prévention du VIH chez les hommes ayant des rapports sexuels avec des hommes à Madagascar; leçons apprises d'un projet de la GIZ SIDA dans la commune urbaine de Majunga. 65 pp.

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Sayon K. Audit qualité: une méthode novatrice pour l'évaluation de la qualité des services de prévention et de prise en charge des IST/VIH/Sida chez les professionnelles du sexe; cas du projet d'Assistance aux populations hautement vulnérables en Côte d'Ivoire. 62 pp.

Taybi A. Evaluation d'un projet de prévention de la transmission du VIH de la mère à l'enfant; expérience de terrain avec Médecins sans Frontières, aire de santé de Mavalane, Maputo, Mozambique. 44 pp.

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Adjahoutonon KYKB. La brucellose bovine à proximité du parc national Kruger en Afrique du Sud: prévalence et facteurs de risque. 63 pp.

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Wamba G. La problématique de l'existence de deux hôpitaux de référence dans le district de santé de Fontem au Cameroun: quelle stratégie proposer? 62 pp.

Research

Scientific research is at the core of the ITM's academic mission, and covers a wide range of subjects, disciplines and geographic areas. Many studies aim at solving real-life problems in the field, others at developing or improving tools and methods for health, and still others at advancing knowledge and understanding of biological or social processes. The holistic nature and the interaction between operational, epidemiological, clinical, translational and fundamental scientists make up a major strength of our research programmes, but requires a difficult balance and hard choices between breadth and depth. Extensive collaboration with other knowledge centers all over the world, especially in (sub)tropical and developing countries is even more important. Almost all of our research includes a component of scientific capacity strengthening in developing countries; the entire DGD Framework Agreement Programme ("Switching the Poles", see below) is specifically conceived to that end. Another difficult balance is thus to be found between resource allocation and outcome measures for science-driven and development-oriented research. The ITM succeeds in combining a strong commitment to capacity strengthening with a highly respectable scientific output in terms of publications, impact factors and citations. The key challenge for the future, translated in the ITM2020+ vision and reforms, is to keep up competiveness in the academic "Red Queen" race together with our global societal commitment.

The table below lists the main research topics by the departments and units, as they existed until 1st July 2011. Indeed, as described above, at that date the units were reshuffled and redistributed over three new departments. For the time being, however, the same units, headed by the same professors, remain the building blocks of the departments. Over the next years, the departments will further translate the ITM2020+ concepts in new units or groups on the basis of strategic planning, natural selection, dynamic growth or consolidation and generational turnover. This will surely make interesting reading in subsequent annual reports, but for this transitional year we compromised between the old and the new ITM by presenting the research per grand theme. We focus at the results that were published in 2011 (see list at the end of this chapter), and leave much other work aside for coming years. For a glimpse on these ongoing projects, the interested reader can consult www.itg.be/projects. Given the natural delay of publications and other outputs, the research statistics for 2011 will be categorized according to the old organogram, whereas those from 2012 onwards will follow the new one.

Main research focus of ITM's units (organogram until 1st July 2011):

Department of Parasitology

1. Entomology: ecological dynamics, control and insecticide resistance of malaria vectors; evaluation of impregnated hammocks; immuno-modulary role of tsetse saliva
2. Malaria: clinical trials of Artesiminin Combination Therapy (ACT), preventive therapy
3. Sleeping sickness: new diagnostic tools, stage determination, case management
4. Leishmania: functional genomics, molecular epidemiology, drug resistance
5. Helminthiasis: immuno-epidemiology, chemotherapy, control of schistosomiasis; interaction helminths and atopic diseases; human cysticercosis and strongyloides

Department of Microbiology

1. HIV-virology: viral fitness, drug resistance HIV-2
2. HIV-vaccinology: broad cross-neutralising antibodies, antigen selection
3. HIV-immunology: immuno-correlates, -reconstitution, -assays, -therapy
4. HIV-product development: microbicides, field-applicable diagnostics (CD4, P24)
5. HIV-control: microbicide trials, risk groups, international AIDS-policies
6. STD: epidemiology HSV-2, trichomonas, relation with HIV
7. TB: drug resistance, genotyping, diagnostics, shortened treatment trials
8. Buruli ulcer: diagnostics, epidemiology, transmission, control
9. HTLV-1: pathogenesis, epidemiology, genotyping

Department of Clinical Sciences

1. Travel health: imported fever; intestinal parasites; clinical consensus
2. HIV/AIDS (Belgium/EU): patient care; complications of ART; drug resistance
3. Tropical diseases (South): clinical decision-making
4. HIV/AIDS (South): ART; case management; human resources
5. Laboratory Medicine: antibiotic resistance; quality assurance; rapid diagnosis

Department of Public Health

1. Financial accessibility: community-based health insurance, health equity funds
2. Quality of care: health services management; human resources; first-line care; mother and child health; evaluation of nutritional programmes
3. Integrated disease control: sleeping sickness, leishmania, schistosomiasis, dengue, TB; international disease control policies
4. International health policies: monitoring of Global Health Initiatives; Human Resources for Health; HIV/AIDS policies; impact of economic transition

Department of Animal Health

1. Animal trypanosomiasis: diagnostics, epidemiology and control, drug resistance
2. Theileriosis: molecular epidemiology, development of DNA-vaccines
3. Taenia / cysticercosis: health impact, diagnosis, immunity, epidemiology & control
4. Gastro-intestinal helminths: mechanisms of drug resistance, epidemiology & control
5. Disease control: decision-making, interactions with human health
6. Epidemiology and biostatistics: Bayesian en risk-analysis, epidemiological modelling

The SOFI Programme

Until recently, the ITM did not benefit from 'secondary' research funding, which supplements the 'primary' academic core funding of the universities. In 2008, the Flemish Ministry of Economy, Sciences and Innovation finally created a specific budget line for innovative research at the ITM as well.

This new subsidy, which includes a grant to consolidate our Clinical Trials Unit (CTU), is assured by a renewable covenant that runs until the end of 2012 with an annual budget of 1.75 M€. In 2010 and 2011, however, it was cut by 150 000€ (9%) as part of a general austerity measure. The covenant imposes a strategic and quality requirements, as well as a set of Key Performance Indicators (KPI's), on the whole of ITM's research.

Instead of using the subsidy to complement our deficient core funding, we created an internally competitive programme dubbed "SOFI" (for 'Secundaire OnderzoeksFinanciering ITG – Secondary Research Funding ITM).

One part, SOFI-A, allows scientists working in service-oriented programmes such as the DGD-ITM Framework Agreement and ITM's Medical Services to finalize their PhD, by granting them an internal 'write up' fellowship for up to 18 months FTE. From 2009 onwards, the calls are also open to eligible external candidates. So far, 18 grants have been awarded (table) of which 12 have already resulted in a PhD defense so far; the other candidates are well on track.

jan jacobs

SOFI-A PhD Fellows, calls 2008-2011

Name	Year of graduation	Subject (University)
Call 2008		
Thérèse DELVAUX	2009	Linking sexual and reproductive health and HIV services: from needs to feasibility and evidence of benefits. (Ghent University)
Kristien VERDONCK	2008	Clinical aspects and epidemiology of human T-lymphotropic virus 1 infection in Peru. (University of Antwerp)
Katty Irma TERRAZAS ARANDA	2009	Development of microbicides in a model system of dendritic cells and CD4+ T cells, with emphasis on avoidance of resistance. (University of Antwerp)
Sabine GIES	2009	Preventing malaria in pregnancy by health promotion and intermittent treatment: a community-based intervention in rural Burkina Faso. (University of Antwerp)
Natacha PROTOPOPOFF	2008	Vector control in a highland province of Burundi: towards a targeted strategy for the prevention of malaria in African highlands. (University of Antwerp)
Katrijn VERHAEGHEN	2009	Presence and role of knockdown resistance in Anopheles species of Africa and the Mekong region. (University of Antwerp)
Lutgarde LYNEN	2009	Challenges of HIV care in Low Resource settings. Experience from Cambodia: 2003-2007 (University of Antwerp)
Pol DE VOS	2010	Strengthening public health systems: Operational Research in Cuban first line health services. (Ghent University)
Dominique ROBERFROID	2012	Prevention of Intra Uterine Growth Retardation by Multiple Micronutrient Supplements during Pregnancy in Burkina Faso. (University of Amsterdam)
Call 2009		
Bart JACOBS	2011	Did the poor benefit from innovative reforms in public health service delivery in rural Cambodia during social and economic transition? (Vrije Universiteit Brussel)
Fabienne RICHARD	2012	Quality caesarean sections in Burkina Faso: beyond the technical act. [La césarienne de qualité au Burkina Faso : au-delà de l'acte technique]. (Université Libre de Belgique)
Philippe GILLET	2011	Malaria Rapid Diagnostic Tests: Laboratory aspects in the diagnostic setting. (Maastricht University)
Call 2010		
Kevin PETERSON	-	Optimizing HIV Care in sub-Saharan Africa. (University of Antwerp)
Call 2011		
Erika VLIEGHE	-	The microbiologic spectrum of invasive bacterial infections in Cambodian adults and its implications for standard treatment guidelines. (KU Leuven)
Alonso SOTO	-	Assessment of clinical and laboratory tools for the diagnosis of smear-negative pulmonary tuberculosis in resource-constrained settings. (Ghent University)
Katrijn GRUPPING	-	Inhibiting the CD4-gp120 interaction to prevent HIV infection: insights from mutational resistance analysis. (University of Antwerp)
Freya RASSCHAERT	-	ART care delivery models to improve access and retention in ART in poor resource settings. (Vrije Universiteit Brussel)
Rachel HAMMONDS	-	Advancing towards the Right to Health for All - the value of a Right to Health Approach. (Vrije Universiteit Brussel)

The other part, SOFI-B, funds innovative, promising and strategically important spearhead projects on a competitive basis. The evaluation, selection and follow-up is entirely in the hands of an external, international and multidisciplinary panel. Two calls in 2008 and 2009 resulted in 23 submissions and 6 funded projects. Unfortunately, the budget cuts in 2010 and 2011 did not allow to launch new calls. In June 2011, the SOFI-B panel performed a mid-term review of the three projects resulting from the 2008 call, resulting in the continuation of two and the premature termination of one.

Subject (promoters)	**Budget (Period)**	**Status**
Human African Trypanosomiasis (*ad hoc* funding) (Coosemans, Van den Abbeele)		Finalized 2010
Genomics and metabolomics of drug-resistant *Leishmania* (Dujardin, Decuypere)	1 000 000 € (01/09/2008-31/12/2014)	Positive mid-term 2011
Plasmodium vivax culture (D'Alessandro)	825 000 € (01/09/2008-31/08/2013)	Positive mid-term 2011
Theileria parva transfection (Geerts, Geysen)	948 900 € (01/09/2008-31/12/2011)	Negative mid-term 2011, terminated
Novel Immunization Strategy for HIV (Van Ham, Van Gulck)	1 000 000 € (01/09/2009-31/08/2013)	Mid-term pending 2012, on track
Human African Trypanosomiasis immune modulation (Busscher, Lejon)	347.557 € (01/09/2009-31/12/2011)	Final evaluation pending, 2012

Departmental Research

The SOFI funding makes up only 16% of the ITM's research budget, and less than 3% of its total budget. Most research is funded by the academic core subsidy, own income (including substantial fiscal stimuli from the federal Ministry of Sciences), competitive external grants (of which many from the EU Framework Programme) or the DGD-supported Framework Agreement Programme for capacity strengthening (see also chapter on Finances and Development Cooperation).

What working at ITM means for me: a testimonial

I am an Infectious Diseases physician and a Medical Microbiologist trained at McGill University, in Montreal, Canada. I arrived at ITM in July 2010, with my wife and our 18 month old boy, as a "visiting Research Fellow" in the Clinical Sciences Department to work on the development and field-validation of diagnostic tools for Neglected Tropical Diseases.

My duties at ITM have allowed me to work with members of all three departments of the Institute as part of the EU/FP7-funded NIDIAG consortium, working on the development of evidence-based rapid diagnostic test-supported care pathways for patients with neurological infections at the primary care level in DR Congo. I have also had the opportunity to develop and implement a new study in Ethiopia aimed at validating peripheral blood-based parasite detection tests for visceral leishmaniasis in Ethiopia, with recruitment started in November 2011 and results anticipated in late 2012. Beyond these two main projects, working within the fertile environment of ITM has provided a unique opportunity to meet and collaborate with experts from across the world on several endeavours.

After two years at ITM, I will return to Canada in July 2012 to take a faculty position as an Assistant Professor of Medicine at the McGill University Health Centre, within the Division of Infectious Diseases and the Department of Medical Microbiology. I do so with a new "made-in-Belgium" little boy, many friendships, and a strong link to ITM that I hope will lead to more collaboration in the future.

Cedric Yansouni

Visiting fellow from Canada, Cedric Yansouni, developed new research ideas on non-invasive testing for visceral leishmaniasis (VL), which are especially useful for the monitoring of HIV-VL co-infected patients who are prone to relapses. His proposals won a Grand Challenges Canada Grant.

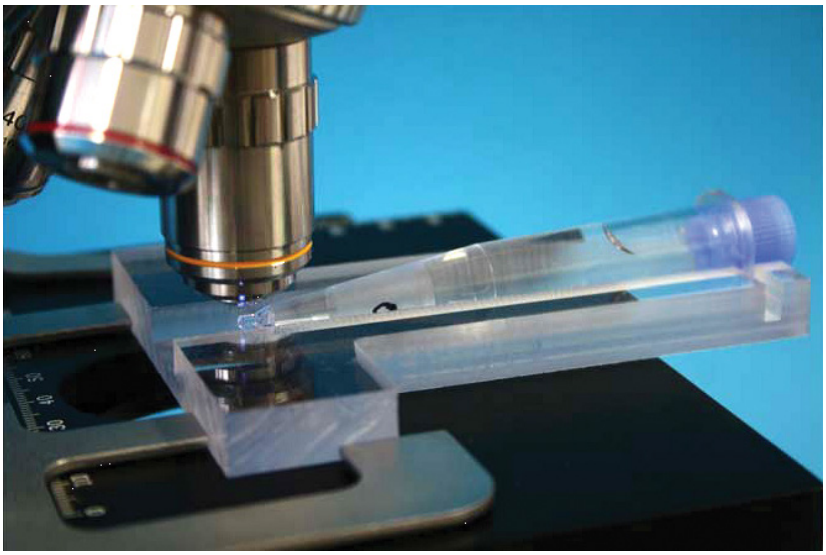
Trypanosomes: sleeping sickness and Chagas disease

Human sleeping sickness occurs only in Africa and is caused by a unicellular parasite, *Trypanosoma brucei*, which is transmitted through the sting of tsetse flies (*Glossina*). *Trypanosoma brucei (T.b.) gambiense* affects only humans and occurs mainly in West and Central Africa, *T.b. rhodesiense* causes severe disease in humans and animals in Eastern and Southern Africa. Other trypanosomes cause animal disease (with grave economic consequences) or, in South America, human Chagas disease.

The trypanosomes enter the human body with the tsetse saliva and multiplie in the blood and the lymph nodes. They then attack the heart, kidneys, other organs and eventually the brain. In a first phase, the patients develop a febrile syndrome that can go on intermittently for months to years. When the brain is affected the patients suffers from confusion, drowsiness, sleeping and equilibrium disorders. In the end they develop a coma which always ends in death if left untreated. The World Health Organisation (WHO) estimates the yearly death toll between 10 000 and 20 000 people, but the figure may be much higher as many cases are never diagnosed or reported. Animal trypanosomiasis is responsible for the death of 3 million heads of cattle yearly.

During millions of years of co-evolution, the trypanosomes have learned to block, avoid or withstand every attack of our immune system. The quest for a vaccine is therefore extremely difficult. Only a few drugs are available, but these are only effective in the first blood stage. Once the brain is affected, toxic arsenic derivates are needed which have lethal side effects in up to 5% of the patients. Patients need to be followed up for many months after treatment, as relapses are frequent. The ITM has a long and rich tradition in human as well as animal trypanosomiasis, which continues up to date in a variety of research lines.

Fundamental research focuses on the molecular interaction between the trypanosomes and the tsetse flies. We continued our study of *Sodalis glossinidius,* a maternally inherited bacterial symbiont of tsetse flies. The eventual aim is to develop a model for tsetse control with genetically modified bacteria, which might produce substances interfering with the vector and/or the pathogen. Bacterial symbionts expressing foreign proteins in vectors provide also intriguing possibilities to study insect-pathogen interactions. We showed earlier that *S. glossinidius* can be cultured and genetically modified *in vitro* and reintroduced into the fly, and that it can produce substances toxic to certain developmental stages of the trypanosomes. In 2011, our main achievement was the demonstration of a functional pathway (the TAT translocation pathway) in the bacterium that can ensure the production and export of the toxins.



Test kit for detection of trypanosomes (mini-anion exchange centrifugation technique), developed at ITM and produced in Kinshasa. The kit is still reliable after a year storage at 37 °C.

In another research line on tsetses, we showed that the offspring of female tsetse flies that are denied blood meals is significantly more vulnerable to infection by trypanosomes than normal offspring.

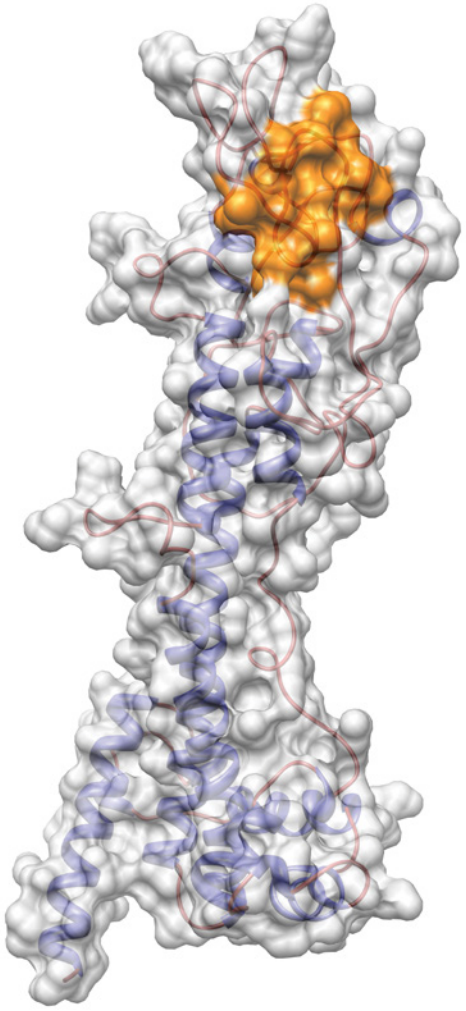
In the field of animal trypanosomiasis, we observed a high prevalence of 'primary' drug resistance in cattle trypanosomes i.e. without any history of previous drug pressure. This finding is thought-provoking about the genesis and dynamics of drug resistance, and has profound consequences for its management and control. Suspension of drug use will probably not lead to a return of drug sensitivity, and the resistant strains may actually have natural advantages for survival and/or transmission.

Our translational and clinical research on Human African Trypanosomiasis (HAT) led to the development of PCR technology for improved diagnosis and staging of *T.b. gambiense* infections. The technique is not suited for post-treatment follow-up, however, as one in five cured patients remained positive. This finding indicates the persistence of parasites or their DNA after cure, which may incite a revision of our paradigms on the pathophysiology of HAT. We also established a unique collection of *T.b. gambiense* parasites from cured and relapsed patients, isolated in the same Congolese disease focus and within a limited period.

The screening of the population at risk for gambiense sleeping sickness is based on antibody detection against predominant native variant surface glycoproteins (VSGs) of *Trypanosoma brucei gambiense*. We produced synthetic peptides ('mini-proteins') that could replace the native full length proteins. We screened a series of VSG derived peptides with mouse and human antibodies against *T.b. gambiense* and then synthesised biotinylated peptides. Some of these synthetic peptides showed a high diagnostic sensitivity and specificity and bear potential for serological diagnosis of gambiense sleeping sickness.

Our research on the epidemiology and control of HAT focused on health seeking behaviour and diagnostic strategies. Sleeping sickness is relatively rare, with few and non-specific early symptoms, which severely complicates efficient diagnosis and screening as treatment cannot be given lightly. The integration of diagnosis and treatment in general health services therefore requires strong technical support, regular supervision and efficient referral mechanisms. For the time being, active screening by specialised teams remains a necessity in the many endemic areas that are deprived of adequate health care.

In a related research line on *Trypanosoma cruzi*, the cause of Chagas disease in Latin America, we took part in a large international study evaluating PCR techniques for diagnosis and screening. This disease is a health threat to an estimated 28 million people in the Americas, and is also increasingly found in migrants in Europe to the extent that the infection is now screened for in many blood banks.



Synthetic peptide (orange) visualised on the model of a surface glycoprotein of *Trypanosoma gambiense*, the cause of sleeping sickness. The peptide can replace the glycoprotein in diagnotic tests (picture courtesy of Michael Humbert).

Leishmaniasis

Visceral leishmaniasis, also known as kala azar, is the most deadly parasitic disease after malaria. It is transmitted by sand flies and affects hundreds of thousands poor people in 88 countries. Diagnostic and therapeutic tools are deficient and their development has little commercial interest. The causative pathogen, *Leishmania*, is a unicellular parasite of humans and animals which has striking ability to evade and manipulate its host cell, the macrophage. In a holistic and ambitious collaborative project dubbed GeMiNi, we study these adaptive mechanisms from the field to the bench and back.

These studies were done on *Leishmania donovani* isolates from Nepal and Bihar (India), descending from surviving strains of intensive DDT-campaigns in the sixties, and therefore showing little genetic variation. With next generation sequencing we deciphered the complete genome of 17 *L. donovani* strains that differed in their response to drugs. We found only a few mutations that could explain the variations in drug susceptibility. We discovered, however, isolated circular DNA strings that may act as 'first aid kits' to escape drug pressure. Even more strikingly, we demonstrated 'unnatural' numbers of chromosomes, a phenomenon that had been shown in the laboratory-bred strains but never in natural ones . Moreover, the copy number varied between strains, from twofold up to fivefold. Our findings in *L. donovani* were also confirmed in *L. infantum, L. mexicana, L. braziliensis* and *L. major*, which cause cutaneous forms of the disease. Apparently, there is little variation in unique gene content between *Leishmania* species, but gene expression seems to vary widely through gene amplification and variation in chromosome number. It is not yet clear how this unique juggling mechanisms should be explained, but we hypothesise they are an evolutionary a weapon in the unremitting battle between the parasites and the human immune system, and possibly drug pressure.

In other genetic studies of *Leishmania* from Africa and South America , we discovered new, hybrid varieties , highlighting another strategy of this essentially clonal organism to promote genetic diversity. In our transcriptomic studies (the analysis of the collection of transcribed genes of a given organism at a certain time) we demonstrated that the results obtained on an individual strain are not necessarily representative for a given species. Each *Leishmania braziliensis* isolate in our studies had unique gene expression dynamics. While we could find only a few species-specific genes, we showed great genetic variability between isolates of the same species. Nevertheless, no correlation between the genotypes and their *in vitro* drug susceptibility or clinical treatment outcome could be shown.

Apart from the puzzling biological conclusions, these results indicate a potential for molecular markers of biological and clinical traits. An AFLP protocol (amplified fragment length polymorphisms) adapted to the *Leishmania* genome which we developed proved to be highly reproducible and delivering trustworthy data, and may allow random screening of entire *Leishmania* genomes for phenotypical properties as fitness, drug resistance and disease profile.

The technique can also be used in studies of speciation and population dynamics. We already showed that the genetic relations between strains of *Leishmania donovani* reflected geography and identified four main groups: *L. infantum,* African *L. donovani,* Indian *L. donovani,* and a mixed group consisting of *L. donovani* from Africa and India. The AFLP technique also helped us in the cited discovery of the first natural hybrid between *L. donovani* and *L. aethiopia.*

Apart from - but related to - these molecular studies we perform collaborative research on clinical, epidemiological and public health aspects of leishmaniasis. In high-transmission areas in India and Nepal, we found that a large number of infected individuals mount a protective cellular immune response and so remain asymptomatic carriers. New asymptomatic infections were up to nine times more frequent than new disease cases, and only 1 in 50 of these asymptomatic cases evolved to disease in the next 18 months. Together with Indian colleagues, we developed an interferon-gamma release assay as a novel marker for such latent *L. donovani* infection.

We developed a mathematical model to support the regional leishmaniasis elimination programme of India, Nepal and Bangladesh. By feeding it with basic numbers on transmission, disease and intervention parameters, we could predict the potential impact of different intervention strategies. In summary, individual treatment is not sufficient to reduce transmission; control of the sandfly populations and/or of human exposure is required to that end. As new cases may appear years after infection and can then initiate new outbreaks, control interventions and surveillance need to be sustained over a very long time.

In another study we concluded that adequate and well-supervised treatment is essential to reduce the risk of post-treatment dermal complications and infectivity to sand flies.

Did medicine create a superbug?

Leishmania parasites that develope resistance against medicinesseem to increase their capacity to withstand the human immune system. With some hyperbole it could be feared that medical interventions could eventually lead to the development of "superbugs".

This sremarkable possibility was observed in *Leishmania donovani,* the parasite causing kala-azar, a deadly form of visceral leishmaniasis. The parasite destroys the human blood cells, leading to spleen enlargement and hyperactivity, generalized inflammation and cachectic wasting. If left untreated, the outcome is almost certainly fatal.

On the Indian subcontinent, where most cases occur, the disease was treated for decades with antimonial compounds. As is so often the case, the parasite adapted its genome and/or metabolism to the constant drug pressure. The antimonials, however, work closely together with the human immune system, more precisely the macrophage cells, to kill the parasite. This synergy seems to have led *Leishmania donovani* to simultaneously develop resistance against the drug as well as to the macrophages. While absolute proof *in vivo* must still be delivered, the clinical, genetic and biochemical data strongly suggest that drug-resistant *Leishmania* not only increase their "fitness" to survive in the human host, but also their "virulence" to make their host sick. It seems even that these *Leishmania* strains also benefit from their adaptations in the absence of drug pressure. Such observations contradict usual evolutionary paradigms, but then drug pressure and other human interventions are indeed not normal evolutionary conditions.

Fortunately, the antimony-resistant *Leishmania* are still susceptible to a more recent drug, miltefosine. Research and development should heed, however, the cunning adaptive strategies of pathogens, and design or protect available and new drugs accordingly. As for other infectious diseases, combination therapies may eventually become a standard in leishmaniasis and other parasitic diseases.

A typical village in the Siraha district, Nepal, where leishmaniasis is endemic.

Mosquito nets do not always work

Long-lasting insecticidal nets (LLIN's) brought along an important breakthrough in malaria prevention, but this does not automatically work as well for other vector-borne diseases. We demonstrated earlier that LLIN's have no impact on the transmission in India and Nepal of Kala Azar (visceral leishmaniasis) a disease that affects half a million people annually and is transmitted by sand flies (phlebotomes).

India, Nepal and other countries on the subcontinent have considered the massive distribution of LLIN's as an alternative for DDT spraying as the main strategy for the prevention of leishmaniasis. Such interventions demand huge investments, however. In a collaborative effort with groups from India, Nepal, the UK and Switzerland we provided the scientific evidence base for or against a possible strategy shift. In Sudan the approach had worked, but there the disease is transmitted by different sand flies. In Syria and Iran, LLIN's had an impact on cutaneous leishmaniasis, caused by another *Leishmania* species. The sand flies transmitting *Leishmania* on the Indian subcontinent are assumed to bite mostly indoors, and at night. Our hypothesis was thus that LLIN's would be effective to reduce transmission and incidence. We followed twenty thousand people during two years, in 26 hamlets in India and Nepal, all with a high incidence of visceral leishmaniasis. In half of the hamlets the normal spraying strategy was continued, in the other half LLIN's were distributed as an additional intervention. The follow-up consisted of sociological, clinical, entomological and epidemiological surveys. in the intervention villages 90% of people slept under LLIN's for more than 80% of the nights, while in the control hamlets only 30% of people slept regularly under an untreated net. In the intervention hamlets the density of indoor vectors was reduced by a quarter. However, the incidence number of infection and of disease was not significantly reduced. In contrast, the number of malaria cases decreased significantly in the LLIN-villages.

A likely explanation is that outdoors transmission of *Leishmania* is more important than previously assumed, once more showing that our understanding of the transmission dynamics of parasitic diseases is still deficient.

Distribution of longlasting insecticide-treated bed nets for the prevention of kala-azar in Nepal..

Malaria

Malaria is caused by unicellular parasites (protozoa) of the genus Plasmodium, which are transmitted through the bite of Anopheles mosquitoes. The parasites invade the red blood cells, multiply and destroy the cell upon which the daughter parasites infect a new cell. The cycle of cell destruction causes the typical fever episodes, anaemia, renal problems and brain damage. Each year an estimated 800 000 people die from malaria, most of them young children and pregnant women in sub-Saharan Africa.

In recent years the number of cases worldwide has decreased considerably, thanks to the large scale distribution of bed nets impregnated with long-lasting insecticides, improved treatment with artemisinin-based combination drugs (ACT's) and the introduction of rapid diagnostic tests (RDTs). Some countries are even on their way to the elimination of malaria, which is the ultimate goal world-wide. The road is still long and bumpy, however, and time is not on our side as mosquitoes are becoming resistant to insecticides and parasites to drug, even ACT's. ITM scientists are coordinating the Vector Control Working Group of the international WHO-backed Roll Back Malaria program. They participated in the follow-up of the scale-up of insecticide-treated nets, indoor residual spraying and artemisinin-combination therapy in Zanzibar, and developed a research project on the impact of repellents on residual transmission in South East Asia. In another study, they showed that the classical Elisa-tests can considerably overestimate the infection rates in *Anopheles*; this 'entomological inoculation rate' should preferably be confirmed with other assays.

In 2011 we concluded a landmark clinical trial comparing four artemisinin-combination therapies (ACT) against uncomplicated malaria in children, the "4ABC Trial". The collaborative network included sites and clinical researchers in Burkina Faso, Gabon, Mozambique, Nigeria, Rwanda, Uganda and Zambia (see highlight).

In another line of research, we concluded and published a large collaborative study in Burkina Faso on point of care malaria tests (RDT's) and concluded that their introduction may actually be harmful for young children, as other severe diseases may go unnoticed. We also demonstrated that RDT's can be used as a reliable source of DNA for real-time PCR. Some commercial RDT's appeared unreliable under certain circumstances (see highlight).

We were part of a large, international team that performed and published the first large-scale efficacy trial with RTS,S, the most advanced malaria vaccine candidate. The trial is still on-going, in 11 sites in seven African countries. We are involved in the work at the Burkina Faso site (Nanoro Clinical Research Unit), a successful spin-off our DGD-supported "Switching the Poles" capacity strengthening programme (see below). The initial results in 6 000 children after one year of follow-up indicate that RTS,S is safe and reduces clinical and severe malaria by half. Data on long-term protection should be available by the end of 2014.

With CRU Nanoro and other partners we also conduct trials on the safety and efficacy of antimalarials during pregnancy and on iron supplementation in adolescent girls at risk of malaria, as well as studies on antimalarial drug resistance.

Other on-going research lines on malaria include fundamental work on the *in* vitro cultivation of *Plasmodum vivax*, and statistical approaches for estimating true prevalences of malaria.

Experienced malaria technician (Agnes D'Hondt) coaches enthusiastic starter (Gwendoline Deslypere)

The 4ABC trial

Artemisinin, a group of molecules originally derived from the plant *Artemesia annua* by Chinese scientists seeking to treat allied soldiers in the Vietnam war, provides currently the most effective drugs against malaria. It is also the only drug class against which so far no resistance has been detected, even though ominous signs have recently been published. To avoid that such a catastrophe would occur and threaten hundreds of millions of lives, the scientific community and the World Health Organisation (WHO) strongly recommend to use only combinations of artemisinin with other anti-malarial drugs, the so-called Artemisinin-based Combination Therapy (ACT). These exist under different formulations, combinations and dosages. In collaboration with a great number of African and European clinical researchers, and with support from the European - Developing Countries Clinical Trials Partnership (EDCTP) and the Belgian Cooperation Agency, Umberto D'Alessandro and an international team set up and coordinated a head-to-head comparison of the four most common ACT's in seven African countries. This "4ABC" trial is the largest ACT study ever done, and resulted in concrete recommendations for the optimal use of ACTs especially in areas of intense transmission.

Malaria can be caused by several related *Plasmodium* parasites, of which *P. falciparum* is the most dangerous. Plasmodia have a complicated life cycle, and are transmitted by *Anopheles* mosquitoes which contract the parasite from infected humans. The parasites undergo a complex transformation in the guts and saliva glands of the mosquito, after which they become infective again. When the mosquito bites a human, the parasites are injected into the blood, transform in the liver, and finally attack the red blood cells in which they multiply exponentially. After a few days the red blood cells burst which causes fever, anaemia, cerebral and renal problems. It is estimated that each year about 1 million people die of malaria, mainly children in sub-Saharan Africa.

In recent years, the burden of malaria has declined substantially in several sub-Saharan countries, due to the upscale of insecticide spraying, distribution of insecticide-treated bed nets, and the use of ACTs. The WHO advises each region and country to select the optimal ACT based on the local patterns of resistance against the partner drug in the ACT's.

The 4ABC consortium compared four ACT treatments, in more than 4 000 under-five children with uncomplicated malaria. The randomised trial took place in twelve sites in seven countries, which were all strengthened, equipped and trained to run trials according to Good Clinical Practices (GCP). Three of the regimes had excellent and similar efficacy, but dihydroartemisinin-piperaquine (the most recently developed ACT) resulted in significantly fewer re-infections. Because of the large size of the study, these findings can most likely be generalized to other African countries and can inform national anti-malarial drug policies throughout the region.

Analysis of malaria blood samples in the 4ABC trial.

Rapid malaria tests should be improved

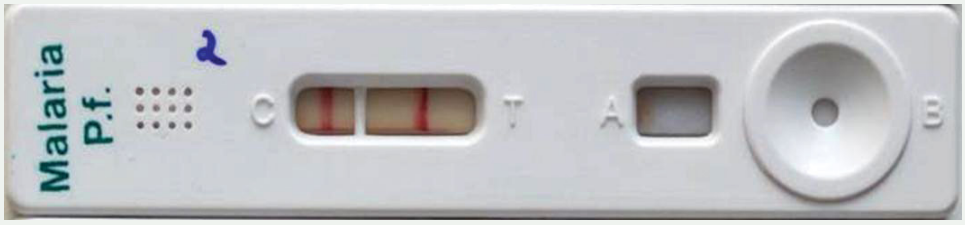
Rapid diagnostic tests (RDTs) for malaria, usually under the form of dip-sticks, have transformed the "point-of-care" diagnosis of malaria in the past years. Traditional microscopy is accurate, but requires considerable training, equipment and supplies. RDTs are more simple, supposedly reliable and relatively robust. But errors do occur, through misuse or by design. We put them to the test and made a series of suggestions for improvement.

Malaria is still the most important tropical disease (see above). Until recently the diagnosis and treatment of malaria was most often based on clinical suspicion; many cases of fever in the tropics are considered and treated as malaria by default, until a microscopic examination (if available) proves otherwise. The spread of drug-resistant malaria and the sparseness of remaining medicines makes it increasingly necessary, however, to make sure that the treatment is really appropriate and required. Microscopy necessitates tools, time and expertise, however. In recent years, reliable rapid diagnostic tests (RDTs) based on reagent strips (picture) have become widely available and are strongly recommended by experts and the WHO. They do not offer the ultimate panacea, however, as was shown by Philippe Gillet and co-workers at the ITM and partner institutes.

Existing RDTs cannot, for instance, differentiate *P. falciparum* from other species such as *P. vivax*, which is less virulent but must be treated differently. Paradoxically, RDTs may react negatively or very weakly when there is an overload of parasites in the blood.

Local technicians sometimes use water or another liquid instead of the specific reagent that comes with the RDT kits, in which case the result may be falsely positive. RDTs do not allow to distinguish recent from present infections, and thus to verify the effectiveness or failure of treatment.

Packaging and labelling are often of poor quality, ineligible or unclear; auxiliary material such as reading scales or pipettes suffer from poor design. These flaws could be easily remediated, starting with more stringent regulation, registration and control. Finally, up to half of the health workers were not familiar with international standard symbols on medical products; continuous training remains key to quality diagnosis and care.



A positive RDT for malaria.

Colloquium on Zoonoses and Neglected Infectious Diseases of Africa

In 2011 we held our annual colloquium in Johannesburg, South Africa. It was the second in a series of three colloquia on neglected infectious diseases, each on and about a different tropical continent. The previous one was held in Lima (Peru) in 2009, the next one will be organised in Bangalore (India) in 2013. In Johannesburg, we focused on the neglected infectious diseases of Africa, with special attention for zoonoses. The colloquium was jointly organised by ITM and the Department of Veterinary Tropical Diseases of the University of Pretoria, and was sponsored by the Belgian Directorate-General for Development Cooperation (DGD).

The gathering offered a platform for animal and human health researchers and professionals to debate common challenges. The burden of neglected infectious diseases and zoonoses in Africa, both in terms of disability-adjusted life years and economic cost, is huge by any standard. Sustainable, cost-effective and well informed control efforts are key in tackling these diseases, a goal which requires significant input from the academic world. Much can also be gained from a cross-disciplinary approach to disease control. The recent rise of the 'one-health' philosophy, which acknowledges the link between human, animal and environmental health, illustrates this notion.

The participants reviewed current disease knowledge at the interface of human and animal health, and pondered how to effectively manage these diseases at national, regional and global levels. They also defined future research directions and made recommendations on policy and organisational changes. The workshop on research priorities was co-organised – and attentively listened to – by the European Commission. On the eve of the colloquium, an academic session was held in honour of our colleague Peter Van den Bossche, who died all to young in 2010 and who devoted much of his life and career to veterinary and zoonotic infections in Africa.

A mix of plenary and parallel break-out discussions ensured room for debate, exchange and learning. For instance, a workshop was based on the new ITM course on qualitative and mixed research methods, another on e-tools and mobile communication in research.

The international attendance raised awareness among scientists on African research expertise in this field. The presence of two Belgian journalists (De Standaard and Artsenkrant / Journal du Médecin) resulted in highly visible press coverage back home.

Dengue control works better with local help

When used properly, insecticide-treated curtains keep mosquitoes out of the house. Bednets do not work as well against the mosquitoes transmitting dengue as against those transmitting malaria, probably because the former are also active during the day.

Dengue is a tropical viral disease causing fever and muscle pains, and sometimes mortal complications, also in tourists. It is currently emerging as a global health problem due to climate changes, travel and international trade. There is as yet no specific drug or vaccine available, and the only way to control or prevent dengue is by fighting the mosquitoes transmitting the disease, mostly *Aedes aegypti.* As their larval breeding places are scattered over villages and landscapes, the involvement of local communities is an important contributing factor to successful control. Under well-controlled circumstances, several dengue control strategies have been proven to be efficacious. Under real-life conditions, however, practical and cultural factors are not so easy to ensure. People do not easily change behaviour, at least not permanently. Insecticide-impregnated curtains may be used for other purposes, such as fishing. Larvivore fishes in household water tanks may not be very appealing to the consumers.

In a joint study with partners institutes in Cuba, we showed that the environmental management of water reservoirs and other mosquito breeding sites works better when the local community is involved. People were prepared to go the extra mile in the government-led programme, and continued to do so after the end of the research programme. The long-term effects made the involvement of local communities not only more effective, but also considerably cheaper.

Curtains keep dengue out - when used properly.

In Venezuela and Thailand, our collaborative studies documented the importance of cultural and practical-use factors. While an overwhelming majority of people accepted the use of insecticide-treated curtains, for instance, only one in five was willing to use insecticide-treated jar covers. Still, long-term compliance should not be taken for granted. While being impregnated with long-lasting insecticides, the actual use of the curtains was much shorter as people gradually gave up their proper use. Continuous promotion and education could help, but does not come for free.

Vectors of bluetongue are named

Veterinary scientists of the ITM have developed a pioneering molecular technique to e identify the midges that spread bluetongue disease in Europe. The technology helps to understand how the disease spreads, and how it can be controlled.

Bluetongue primarily affects sheep, but also cattle and other ruminants. It is not dangerous to people, but causes great economic damage. Until a few years ago, the disease did not hit northern Europe; it was assumed that only tropical midges could transmit the Bluetongue Virus (BTV) at a temperature above 15 °C. In 2006 the Netherlands and Belgium were hit by surprise, with local midges as apparent vectors. There are many sorts of *Culicoides* (midges), and with microscopic and morphological methods it is very difficult and laborious to differentiate species. A precise identification of the vectors is essential, however, to understand the conditions and dynamics of transmission, and to develop effective control strategies.

Veterinary entomologists at the ITM developed a simple and cheap molecular technology that allows to identify and differentiate *Culicoides* species with 100% certainty. We concentrated on the most important species in northern Europe, *Culicoides obsoletus, C. scoticus, C. chiopterus* and *C. dewulfi,* but we can reliably identify more than twenty species. Also tests on larvae are very promising.

The test is made up of a 'gene chip' or micro-array, a glass slide to which short pieces of DNA are attached, that are characteristic for each species. In this case we used the ITS1 gene of which several dozens of pieces were attached on the slides in well-documented positions. After washing the gene chip with DNA from unknown midges, matching identical pieces of DNA will cause a blue colour reaction that can be recognised with the naked eye, a robot or a computerised camera.

The new test is very specific, and allows to recognise several species at the same time. In a ring test by CIRAD (Centre for International cooperation and Research for Agronomy and Development) only the ITM test identified all samples correctly.

Midges or Culicoides are usually much smaller than mosquitoes, and therefore also known as "no-see-ums".

Helminth diseases

Parasitic helminths or worms are still a scourge in large parts of the world, especially were food and water tend to be unclean and people walk barefoot. Though usually not fatal, these worms sap the energy of their hosts and prevent them to work or attend school.

Taenia solium is a tapeworm of pigs but humans can also be infected, by the adult worm (after eating insufficiently cooked pork) or as intermediate hosts by cysts (by ingesting *Taenia* eggs). The latter form or cysticercosis is the most dangerous, particularly if cysts form in the heart or the brain. Epilepsy, other neurological problems and heart disease can be the (sometimes mortal) consequence. The transmission chain can be broken by preventing contact between pigs and human excrements or by treating infected humans and pigs. An experimental pig vaccine has shown some efficacy, but is still far from operational application.

Together with Indian colleagues, we evaluated the cost-effectiveness of three strategies for the control of taeniasis in a community. Screening by stool microscopy was shown to be less cost-effective than indiscriminate mass therapy, and can be integrated with existing control programmes for filariasis or other helminths.

We developed and tested an antigen detection test for humans which can be used in serum as well as urine. Field evaluations in Ecuador and Zambia showed a high sensitivity in blood but not in urine.

We conducted prevalence studies of *Taenia solium* in pigs in Burkina Faso and in humans in RD Congo. In the latter study we found prevalences of up to 20%. In another collaborative study in India we found indications that the population seems to be protected from brain cysts by specific antibodies against *Taenia*. We revisited, half a century after its description, an old focus of the disease in Soutou, Senegal, and still found 8% of the villagers to be infected, with 2 % having brain cysts.

Fasciola worms or liver flukes infect cattle and humans. We measured the infection rate of *Fasciola* (liver flukes that can infect ruminants and humans) in cattle in Binh Dinh, Vietnam, and advised on a possible control programme for livestock and humans.

Schistosomiasis is one of the major parasitic diseases in the world. Infection occurs through contact with water contaminated with larval forms of the parasite, which are released by freshwater snails and then penetrate the human skin. The snails are, in turn, infected by schistosome eggs in human faeces or urine, according to the species. We analysed these relation quantitatively in a highly exposed village in Senegal, but found no unambiguous correlations. Other factors than exposure, presumably innate or acquired immunity, appear to play a role in determining intensity of infection.

Schistosoma infection is known to down-regulate the adaptive immune responses of the human host, but its impact on innate immunity has hardly been studied. We investigated the effect of *Schistosoma haematobium* infection on cytokine responses of Gabonese schoolchildren, but found no significant relationship.

Genetic work on *Schistosoma*, performed in collaboration with the University of Leuven, concentrates on strain variations and hybridisation. In 2011, we evaluated sample storage and extraction protocols, and developed a novel method to incorporate genotyping errors through re-amplification in the analysis.

Testing pigs for infection with *Taenia* by novel serological assays.

HIV and AIDS

Human Immunodeficiency Virus or HIV, the cause of AIDS, has been discovered only thirty years ago. Since the beginning of the pandemic, some sixty million people have been infected of which more than half have died. ITM researchers were among the first to describe the African origin and the heterosexual transmission of HIV. Over the past decade, ITM's research on HIV/AIDS has expanded into virus biology, immunology and vaccine development, diagnostic tools and strategies, treatment and patient management, co-infection with tuberculosis and parasites, medical and psychosocial care, prevention and control.

In 2011 we made a number of significant contributions to international policies and guidelines for the case management, prevention and control of HIV/AIDS.

We reviewed for WHO the challenges in developing national HIV clinical practice guidelines, based on experiences from the Eastern Mediterranean region, and found many methodological weaknesses and inaccuracies. The countries need assistance to validate and update their national guidelines.

Together with an international group of experts, we explored ways to reduce (or even stop) the HIV infection among newborns, by treating pregnant seropositive women more intensively than proposed in the current WHO guidelines. With Malawi as an example, we substantiated why this approach in developing countries would be more cost-effective than current policies.

We also took part in the international Investment Framework Study Group, which aims at improved management of national and international HIV/AIDS responses.

In a user survey, we showed that telemedicine for physicians dealing with HIV/AIDS in developing countries significantly improved the management of special or complicated clinical cases.

In Cambodia we documented the effectiveness of linking prevention, care and treatment of HIV/AIDS, sexually transmitted infections and reproductive health.

In DR Congo, we identified the bottlenecks in a semi-rural health zone, and compared coverage in urban and rural areas. The main bottleneck was shown to be the detection of HIV in symptomatic as well as asymptomatic cases. We showed that by testing all pregnant women and all TB cases, 28% of all HIV-infected people could be detected in an area with a relatively low prevalence.

We studied the health workforce shortage as a constraint in the scale-up of antiretroviral treatment, and the success stories in this respect of Malawi and Ethiopia. Additional international HIV funding and strong political commitment were instrumental, as well as the involvement of community and lay health workers. However, while task shifting may partly bridge the gap, continued political commitment and continuous training are essential to maintain quality of care.

In a collaborative European study we analysed the determinants of sexually protective behaviour among HIV-positive gay men in 14 countries, using the classical information-motivation-behavioural skills model. We added HIV-specific variables to the model to determine factors decisive for condom use. Those variables, including sexual partners' serostatus and mental health, indeed explained condom use and should be considered in promotion and prevention. We also took part in the EuroSIDA study group, producing an algorithm for determining whether the cause of death in HIV-infected people is AIDS-related or not.

In Belgium, we conducted a venue-based study of HIV prevalence and behaviour of men who have sex with men in two Flemish cities. The prevalence was as high as 14.5% in cruising venues, as compared to around 5% in more general gay venues. These results were sufficiently alarming to start new information campaigns.

In the field of HIV virology and immunology, we found that cellular immune responses against the virus can be stimulated by therapeutic vaccination of six HIV-1-infected patients with their own dendritic cells transfected with mRNA coding for HIV-proteins. The patients remained on their anti-HIV medicines, and the stimulation was not sufficient to cure the patients.

We test microbicides for potential application in the vagina, preventing or blocking transepithelial infection. We thereby raise two main concerns regarding the large-scale introduction of microbicides. First, their use in undiagnosed HIV+ women may select drug-resistance strains which may compromise subsequent therapeutic options. Second, they might promote the selective transmission of drug- or microbicide-resistant strains. We studied several microbicides from the class of new

Youssef Gali at work in the BSL-3 laboratory for HIV research. He obtained his PhD in 2011 on the subject *Development of an in vitro model to study heterosexual HIV transmission* (promoter Prof. Vanham).

non-nucleoside reverse transcriptase inhibitors, and examined their potential against viruses already resistant to older molecules. Two such strains displayed a high genetic barrier to resistance, but their activity was low. Potential cross-resistance should thus incite caution with the large scale introduction of microbicides based on mono reverse transcriptase inhibitors. Natural killer cells play a role in the reaction of the human immune system against HIV-infection, and their genetically determined regulation has been shown to influence HIV-1 disease progression. We observed a significant association between a certain genotype (group B KIR haplotype) and lower CD4+ T cell counts, while other genotypes showed a higher count. Our data suggest that genotypes considered to favour activation of natural killer cells indeed are predictive of HIV-1 disease progression.

CD4+ T cell counts are a classical way of assessing the disease level, a low count meaning a heavy burden and a poor prognosis. We evaluated several counting methodologies, from point-of-care instruments to laboratory monitoring for resource-limited settings.

We published a review of the current understanding of the mechanisms of sexual transmission and the biology of the transmitted HIV. More empirically, we compared virus isolates from halfway the eighties with samples from the late nineties, both from an Amsterdam cohort of volunteers. Within these fifteen years the virus had become 'fitter', i.e. more suitable to infect human cells and to survive in them - a grim example of rapid evolution.

We measured the prevalence of *Mycoplasma genitalium* among female sex workers in Kampala, Uganda. Its relatively high prevalence and its association with HIV calls for further research on the potential role of this emerging sexually transmitted infection in the acquisition and transmission of HIV infection.

Tuberculosis

Tuberculosis (TB) kills almost two million people each year, mostly in developing countries. Nearly one-third of the world population carries a non-active (latent) TB infection. The pathogen, *Mycobacterium tuberculosis*, is usually transmitted through the air by people carrying the baccilus in their lungs. Until far in the 20th century, the disease ravaged Europe and the USA as well until it gave way to the discovery of antibiotics, healthy nutrition and housing.

Not so in developing countries, unfortunately. Hygienic and nutritional standards are low, people are weakened by other infections and HIV/AIDS is often complicated by TB. Even if the antibiotics are available, many patients drop out of the long and complicated schedules. Many strains have become resistant to one, several or even all available drugs and are spreading rapidly over the world. The diagnosis of TB and of drug resistance is still difficult, expensive and time consuming. Tuberculosis is therefore re-emerging as a truly global health priority. Resistant TB, HIV-associated TB, weak health systems and globalisation raise concerns for unmanageable TB epidemics. New tools to prevent, treat and diagnose the disease are urgently needed.

In 2011 we published the results of collaborative research in a high endemic area in Peru, demonstrating that even in a general population with no known risk factors or prior exposure, multi-drug-resistant TB (MDR-TB) was highly prevalent. Some cases even carried "extensively drug resistant" strains (XDR-TB), which do not respond to any antibiotic anymore.

A simple, rapid, and affordable test to detect drug resistance in *Mycobacterium tuberculosis,* suitable for low-resource countries, has been a main research priority of the ITM for more than 10 years. Special focus has gone recently to two new methods for the detection of drug resistance, based on visual colorimetric detection i.e. the Colorimetric Redox-Indicator (CRI) and the Nitrate Reductase Assay (NRA). Their results are comparable to those of commercial methods, and they have now been recommended by the World Health Organization (WHO) for use in low-income countries.

In 2011 we published a general review of the available testing methods for drug susceptibility, and analysed the challenges and opportunities for their implementation in resource-limited settings. A widely recommended test for the diagnosis of rifampicine-resistance (an excellent proxy for multi-drug-resistant TB) is the GeneXpert® MTB/RIF, a cartridge-based and automated molecular (PCR) test. It can be used with minimal training and provides a result within hours instead of days or weeks. Our analysis showed, however, that relevant use critically depends on the availability of the entire chain of multi-drug-resistant TB management - which is, unfortunately, seldom the case.

We also evaluated an algorithm based on WHO recommendations for diagnosis of smear-negative pulmonary tuberculosis in HIV-negative patients. Its sensitivity and negative likelihood ratio were poor, and we concluded it should be re-evaluated and adapted to local circumstances.

In a comparison of 13 clinical prediction rules for isolation of patients with suspected pulmonary TB in an emergency department of a hospital, we showed that only one combined high sensitivity with satisfactory specificity. Our results highlight the need for local validation of the prediction rules before application.

Gambian pouched rats (*Cricetomys gambianus*), a known reservoir for mycobacteria.

Tuberculosis should be followed up more closely

We do not know very well how tuberculosis bacilli reach new victims. "If we want to force back the silent killer, we will need to closely watch its propagation", says Zambian scientist Chanda Mulenga. She studied the treatment of TB in an urban district in Zambia, and found room for improvement. Her recommendations earned her a PhD in 2011.

Tuberculosis was a dreaded killer in Europe up to the middle of the 20th century. We fought back *Mycobacterium tuberculosis* with antibiotics and economic growth: well-fed people living in healthy houses can suppress the bacillus, even if infected. In poverty and misery, the infection turns into disease much easier, and in addition patients become highly infectious to the community.

Alas, large parts of the world population still lives in poverty, and tuberculosis remains a scourge in most developing countries. In addition, many strains have become multi-resistant to many or even all drugs. Tuberculosis is a frequent and serious complication of AIDS. Both factors have made tuberculosis again a global emergency.

In most countries, passive case detection followed by intensive treatment is the main or only control strategy. While clinical patients are helped, the epidemiological impact in the community is limited. Mulenga studied in the Zambian urban district Ndola a more pro-active "treat it as soon as you see it" approach. She concluded that resistance to first-line drugs (9%) was relatively low (9%), and to second-line drugs almost non-existent. Molecular techniques showed that that most patients had only recently been infected.

More disquieting was the finding that 70% of the patients delayed efforts to seek diagnosis and treatment, even when they suspected having TB. In the meantime they not only developed serious diseases, but also infected other people. In conclusion, a more intensive strategy is needed to detect, treat and follow up patients not only to reduce disease, but also to reduce transmission and new infections.

Tuberculosis infection is relatively frequent among travellers to high incidence-countries. We therefore assessed the value of interferon-gamma release assays as a complement to, or replacement of the classic tuberculin skin test for screening in travel clinics. We identified some practical advantages for well-defined patient groups, but the evidence is incomplete and ambiguous.

In collaboration with investigators in Uganda we assessed the knowledge, attitude and health-seeking behaviour of patients, to inform the design of interventions. We also identified the incidence of TB in HIV-infected children before and after initiation of HIV-therapy. Anti-retroviral therapy in AIDS patients co-infected with TB is frequently complicated by an overshooting of the recovering immune system, the "Immune Reconstitution Inflammatory Syndrome" (TB IRIS). There are no adequate laboratory tests for the diagnosis or prediction of TB IRIS. We investigated whether the detection of lipoarabinomannan , a surrogate marker of TB infection, in urine could be useful in this respect. Its potential was confirmed, but the classical CD4 T-cell counts remains a more powerful predictor.

We reviewed the WHO guidelines of 2007 for the diagnosis of TB in ambulatory HIV-positive adults. We found them to be still acceptable, awaiting point-of-care rapid diagnostic tests. Non-compliance with immediate treatment initiation remains a major concern, however, and other strategies need to be developed to reduce mortality including further integration of HIV and TB services.

We concluded and published a collaborative clinical trial with a 4-drug fixed-dose combination against pulmonary TB in 11 sites on three continents, as a strategy to prevent the emergence of drug resistance.

In Ecuador, we performed post-mortem examinations and compared laboratory tests for the diagnosis of bovine tuberculosis in dairy cattle - a disease that can also cross over to humans. We concluded that the current diagnostic tests need to be combined in order to generate acceptable results, and that new tools with better sensitivity and specificity need to be developed.

During years of research in the field and in the lab, the ITM built up one of the largest and finest collections of tuberculosis species and strains in the world. In 2011, the collection obtained the ISO9001 certificate. It is part of a national and international network and is accessible to external researchers as well.

Prize for doctoral work on reservoirs for mycobacteria

The doctoral thesis of ITG-scientist Lies Durnez on "The role of rodents and insectivores in the epidemiology of mycobacteria in Africa" was awarded the biannual prize Henri Schouteden of the Belgian Royal Academy.

Durnez proved that in Africa, small rodents and insectivores play a role as reservoir for *Mycobacterium avium,* genetic nephews of the human tuberculosis bacillus. She also developed more effective detection techniques for mycobacteria in general.

Mycobacteria cause tuberculosis, leprosy and Buruli ulcus in humans, and tuberculosis and paratuberculosis in cattle. Vaccinating or treating every patient in the world would still not eliminate the disease, as it can at any time jump back to humans from the animal reservoir.

Examining wild animals for their capacity to harbour *Mycobacteria* is no small feat, however. Durnez courageously examined a whole range of rodents and insectivores in Africa. Motorbikes and four wheel drives were as important as the new molecular techniques she developed to analyse her catch. She could prove that the small mammals under investigation did not harbour cattle tuberculosis *(Mycobacterium bovis),* which causes great economic harm, nor *Mycobacterium ulcerans,* the cause of Buruli ulcer in humans.

Durnez did find, however, members of the *Mycobacterium avium* complex, a group of closely related subspecies that can cause diseases such as Lady Windermere syndrome (chronic lung pathology) in humans and paratuberculosis (chronic bowel inflammation) in cattle. Lies demonstrated that the microbes were not only in the rodents' bodies, but also in their droppings and skin parasites, making transmission to humans and other animals all the more likely.

Jan Jacobs

Lies Durnez collecting small rodents in Benin, with a bag to transport living rats and mice on the back of her motor cycle, and heavy gloves to protect her from their incisors.

Oral treatment of Buruli ulcer might be possible

Buruli ulcer, a crippling and deforming disease of the skin and the flesh that causes great havoc in West-Africa, can so far only be treated with surgery. Oral medicines would substantially alleviate the patient as well as the health services. Ghislain Sopoh studied the options in Benin, including the risk factors that may predispose people to the disease.

Buruli ulcer (BU) is caused by a mycobacterium, as are tuberculosis and leprosy. *Mycobacterium ulcerans* causes skin lesions, which can grow to crippling ulcers that eat into the flesh and even the bones. If detected early, the lesion can be excised with minor surgery, or sometimes stopped with antibiotics. The disease occurs mostly in poor people in remote tropical and subtropical areas, far from the interests and incentives for pharmaceutical or academic research. During the last decade, however, great advances have been made in the fight against Buruli ulcer by the adoption of the recommendations of the World Health Organization, that were in turn inspired by the collaborative research of the ITM. Since 2005, Benin uses a combination therapy with streptomycin and rifampicin for the treatment of early lesions. Dr. Ghislain Sopoh, chief physician of the treatment centre of Allada in Benin, compared a series of BU patients to 'healthy' persons from the same village, matched for age and sex, to explore risk factors for developing the disease. He identified environmental, genetic and behavioural factors, which are currently being used to improve early case detection and control. His epidemiological studies demonstrated the success of the surveillance system of Benin, that answers to the focal distribution of the disease, and of the current medical and surgical treatment. Early lesions can be treated on an out-patient basis, and can thus be delegated to local health workers. Sopoh's research also helped in making surgical decisions, to maximize the potential of antibiotic treatment, and to find oral alternatives e.g. for pregnant woman which cannot take streptomycin.

Ghislain Sopoh analysing the data of a long-term, systematic clinical follow-up of Buruli patients in Benin..

Algorithms for the diagnosis of tuberculosis

The firm diagnosis of tuberculosis in resource-poor settings relies on the detection of *Mycobacterium tuberculosis* in samples from patients with clinical suspicion of the disease. However, half of the patients diagnosed with pulmonary tuberculosis have *negative* sputum smears. Millions of cases are thus diagnosed, and treated, on clinical, non-standardised grounds. Extra-pulmonary tuberculosis is less frequent, but is even more complex in terms of diagnosis. In collaboration with the Institute of Tropical Medicine in Lima, Peru, and with the financial support of the Damian Foundation, we tackled this difficult but far-reaching operational research question.

We developed and tested an algorithm for the diagnostic management of patients with clinical suspicion of pulmonary tuberculosis and negative sputum smears. It is based on a simple clinical score of symptoms and radiologic findings Sputum concentration and new, inexpensive, liquid cultures were used to improve the diagnostic yield. Based on our results, we challenge the current recommendations to use broad spectrum antibiotics as a diagnostic trial therapy. A considerable number of patients with tuberculosis respond favourably, but are consequently misdiagnosed as bronchitis or pneumonia, and not treated adequately for the underlying tuberculosis. The findings can contribute to the update of the national Peruvian tuberculosis control guidelines and of standing international recommendations.

Antibiotics for sale at the fish market in Iquitos, Peru.

Nutrition

Malnutrition of pregnant women, breastfeeding mothers, infants and young children remains a huge problem in many low-income countries. Most countries in Sub-Saharan Africa will probably not reach the Millennium Development Goal of a 50% reduction in underweight among children less than five years old by 2015.

Food insecurity not only compromises health and resilience, but also brings along poor school attendance and educational attainment. We demonstrated this indirect impact in a study on two thousand Ethiopian teenagers. The study also indicated that in situations of chronic food shortage, parents tend to give boys preferential treatment. The prevalence of food insecurity was 15% in boys and 25% in girls. In food-insecure households, girls were twice more likely to report suffering from illness, and reported seven times more difficulties than boys with activities due to poor health, or feeling tired. Food-insecure girls had their first menstruation a year later than normal girls. These gender differences need to be taken into account in nutritional and other health-related intervention programmes.

In a longitudinal study of over thousand pregnant women in Burkina Faso, we showed that the extra intake of iron is only beneficial in anaemic women. In non-anaemic women haemoglobin levels still dropped slightly, even with additional intake. Socio-epidemiological studies on eating out of home in different countries showed that the offer, rather than information, determines meal choices and nutrient intakes. Posting nutritional information in school canteens made little difference, but free servings of fruits and vegetables did have a positive effect on the quality of food intake (see highlight).

A new collaborative project "Sunray" (Sustainable Nutrition Research for Africa in the Years to come) will bring together 5 European an 4 African research institutes to set up an ambitious scheme for nutrition research in Africa (see highlight).

How to tackle malnutrition in Africa?

The European Commission has given the green light for an ambitious research and fact-finding project called SUNRAY, which stands for 'Sustainable Nutrition Research for Africa in the Years to come'. The project will be implemented by a consortium of four African and five European institutions, and be coordinated by the Institute of Tropical Medicine (Unit of Nutrition and Child Health). Over a period of two years, about a million euros will be invested in an effort to redefine the research agenda for nutrition in Africa.

This project is a timely investment in nutrition research. Malnutrition rates remain high, particularly in sub-Saharan Africa, where only nine out of 46 countries are on track to achieve the first Millennium Development Goal target (a 50% reduction in underweight among children less than five years old). Undernutrition is only part of the problem; obesity and other diet-related diseases are increasing as well, due to lifestyles changes.

Despite the huge cost of this double malnutrition burden – early deaths, reduced quality of life and lower gross national product – investment in nutrition has been inadequate. The SUNRAY-project intends to identify new and innovative ways to address malnutrition under all its forms, primarily by African researchers in order to ensure ownership and sustainability.

The researchers will map current nutritional research efforts and funding sources in sub-Saharan Africa, and identify barriers, constraints, opportunities and unmet needs. In addition, they will explore emerging or future research challenges due to changes in climate, biodiversity, demography, urbanisation, water availability, economy, politics, agriculture, international markets, socio economic dynamics and conflict. The outcome will be a roadmap and strategy for nutritional research in the years to come.

Policy-makers at the highest level need to be persuaded that investment in nutrition is essential. The image of the starving child is no longer enough to incite action. The SUNRAY project intends to replace emotional appeals by facts and figures, and to promote research that produces evidence for imperative action.

SUNRAY

Eating out is bad for the figure

More than ever in history, people eat out of house, also in developing countries. By doing so, they ingest more calories, and less micronutrients than with home-cooked meals. Such eating habits are an important cause of ill health and premature death, however. World-wide, overweight and diet-related chronic diseases have surpassed undernutrition as the main cause of ill health.

The last few decades, school and company canteens, vending machines and food stalls, lunch rooms and bistros have become ever more important sources of the daily meal. The urbanisation and the growing number of two-earner households have strongly promote this evolution, also in developing countries. These new life styles brings along new, different and increased health risks.

We reviewed 7139 publications on the topic of out-of-home eating, but only 29 papers fulfilled the criteria for further analysis.

World-wide, out-of-home eating is an important source of energy in all age groups, especially youth. People eating regularly out of home consume on average more fat and calories, more salt, and less vitamin A and C, iron, fibres and calcium. In the United States, where fast food is the dominant calorie source, men take up a quarter of their daily calories out of home, women 15%. In northern Europe, where the company canteen is the first source, out of home meals account for 15% to 33% of energy intake. In Kenya, where people chiefly eat from food stalls along the streets, men get 20% of their energy intake out of home. A third of the Belgian population above 15 years of age obtains more than a quarter of their calories out of home; that group also eats less fruits and vegetables than the average Belgian. Eating out of home also is correlated with the consumption of sweets.

The authorities have little power over our private kitchens, except for guaranteeing the safety and traceability of the ingredients. However, they can impact the offer of school refectories, company canteens and fast-food restaurants. Yet, half of the European countries do not have a regulation on the healthiness of catering. Can interventions make a difference? A 'fat tax' may affect the diet choice of richer people, who are already more food-conscious. We tested some simple interventions in a student restaurant. At lunch, we gave the students two portions of fruit and one serving of vegetables for free. This increased the average intake of fruits with 80 grams and of vegetables with 108 grams daily. In addition, the students also increased their vegetable consumption at other meals, including home dinners. Similar simple measures can probably be taken also regarding portion size, calories, choice and nutritional information.

Furthermore, we explored what the catering sector deemed necessary to offer healthy meals. Technical support and capacity building to compose a healthy meal were most needed, just as a working definition of "healthy foods". Such a definition must, however, not only be tailored for large industries, but also and especially for the many small enterprises that provide meals and snacks. The policymakers must balance commercial interests against public health and sustainability, but also collaborate with the catering sector to improve eating patterns and health.

Clinical research

The clinical researchers of ITM collaborate with clinicians in several reference hospitals and laboratories in Africa, Asia and Latin America on patient-based research. In addition, such research is also performed in our own travel and HIV clinics in Antwerp.

In collaboration with the Sihanouk Centre of Hope and other partners, we concluded a first and comprehensive review of melioidosis in Cambodia, and completed a study on resistance against fluoroquinolone and azithromycin antibiotics in *Salmonella* infections.

With the Institute of Tropical Medicine in Lima, Peru, we reviewed hospital-acquired multi-resistant bacteria in the cities of Lima and Callao, assessed the molecular characteristics of hospital-and community-acquired *Staphylococcus aureus* and introduced molecular typing (Pulsed-Field Gel Electrophoresis) for bacterial pathogens.

With the Institut De Recherche Biomédicale in Kinshasa, in RD Congo, we studied the emerging resistance of fluoroquinolone-resistant *Salmonella typhi* and investigated an outbreak of invasive *Salmonella enteritidis* in Kisantu.

We completed a knowledge, attitude and practice survey on the prescription of antibiotics in Peru and RD Congo, and will continue this survey in Cambodia and Laos.

In the field of travel and migrant health, we studied and published on the ambulatory treatment of malaria, imported schistosomiasis, dengue fever, rabies vaccination and the application of clinical decision-making tools.

The "Switching the Poles" Clinical Research Network unites researchers and trialists from a dozen countries in north and south to develop adequate procedures to comply with universal standards in resource-limited settings and non-commercial clinical research. Its third workshop, organised as special session at the EDCTP Forum in Addis Abeba, focused on the protection of patients taking part in clinical trials and the results of a multidisciplinary research project on the quality of informed consent procedures in vulnerable populations.

Tai Sopheak and Olivier Koole preparing a presentation on risk factors associated with late presentation for ART care in Cambodia.

Health systems research

The health systems research at the ITM focuses on equitable and sustainable health systems in developing countries, including organisation, policies, financing and management of health services.

An important and contemporary topic concerns the negative and positive interactions between 'vertical' programmes dealing with specific health problems and 'horizontal' programmes stimulating general health services. We surveyed perceptions of experienced health professionals and managers in francophone Africa. In general they feel that vertical programmes have positive effects on the short term and on specific problems, but may undermine the long-term capacity and sustainability of the general health system. We argue for the systematic monitoring of the vertical / horizontal interface, in order to identify and address disruptive systemic effects of disease control programmes. Fast-track, "quick-win" interventions, also those focusing on meeting the Millennium Development Goals, need to be complemented by sustainable and cross-cutting strategies for general health care on the mid- and long term.

We investigated this interface also more empirically in different settings. In RD Congo, a Buruli ulcer programme positively affected clinical outcomes. In Bihar, India, we compared periodic surveys for visceral leishmaniasis with health facility-based routine monitoring and found that the latter, if well designed, performed better. We reviewed the experiences and systems impact of programmes for the control of neglected tropical diseases in Sub-Saharan Africa, and suggested scenarios for an optimal interaction with general health services.

Ever more inspiration for the health systems and policy work comes from 'communities of practice', in which stakeholders of all sorts and origin share knowledge, information and experience on policies and their implementation.

In most developing countries, households nowadays use a wide range of public and private health care providers. Health authorities need to maintain the overview, which is not evident in poorly regulated contexts. We explored whether household surveys could be a useful source of information in Cambodia, where massive donor efforts in favour of public services go hand in hand with the development of a strong private sector. We found that the disaffection of the population with public health facilities varies across places, socio-economic groups and health problems. Such knowledge is vital for the steward role of the state, and must be used also in relation to health financing mechanisms, be it by the state, the community or the households (see focus).

Free health care: yes, but with caution

Over the last years, many low and middle-income countries have removed user fees in their health care sector. Together with researchers from all over the world we studied the merits and drawbacks of these policies, focusing on experiences in Afghanistan, Burundi, Burkina Faso, Mali, Nepal , Rwanda and Uganda. The findings were compiled in a supplement of the journal «Health Policy & Planning», edited by Bruno Meessen of ITM. The over-all conclusion is that removing user fees is feasible and effective, but should not be considered lightly.

The main findings of the studies can be summarized as follows.

- Removing user fees is a political rather than an technical decision, usually taken by the national top level, sometimes during electoral campaigns.
- Many countries opt for selected free health care (e.g. maternal and child health, HIV/AIDS), in alignment with the Millennium Development Goals.
- When decisions are taken without adequate consultation of the stakeholders, including the health workers, the health care systems may experience difficulties to cope with the increase in patients, drug shortages and other shocks.
- The commitment and involvement of community leaders, health workers and managers is vital to implement the decisions in daily practice.
- If appropriately designed, prepared, funded and implemented, user fee removal improve access to health services. Insufficient funding, however may lead to a paradoxical rise of household spending on health care due to over-demand, crowding out and drug shortages in public facilities.
- Removing user fees is one option to provide free health care, health insurance is another. Any solution requires a certain level of complexity, for the population, the services as well as public finances. It is therefore vital that politicians consult the technical specialists in order to build fair, efficient and sustainable health care systems.
- Donors, aid agencies and NGO's can play an important role and promote equity, but must do so in respect of national sovereignty.
- Beneficial outcomes for vulnerable groups require a sustained political and financial commitment as well as technical soundness which take account of the complexities.

Bruno Meessen and colleagues conclude with some promising trends in the ownership of these policies. "African experts working on these issues are organizing themselves in communities of practice. Modern information and communication technologies help them to constantly share experiences and knowledge. Opportunities to learn from each other are plenty."

Bringing health care to the very poorest

Providing quality health care to deprived populations in resource-poor countries requires the simultaneous overcoming of numerous high barriers. The local community and social networks play an important role, as well as authorities at various levels..

In the previous half century, the average life expectancy rose from 46 to 65 years, but the poor did not have an equal share in this improvement. More than 90% of childhood mortality takes place in 42 countries, all of them poor. Even if vaccines, drugs, mosquito nets and other cost-efficient interventions are available, they may not automatically reach the poor – and vice versa.

Together with researchers in Cambodia, we investigated how demand and supply could be better matched by financing health care through local communities, by setting up "equity health funds" for the poorest, or similar interventions such as 'Pagoda-initiatives' in which monks beg the richer people in the community to pay for health care of the poor.

But who is poor, and who decides so? The decision cannot be made at the time when somebody presents at the hospital. Poor people may not seek health care to start with, unless they have free access - and know it. It was shown that the local communities themselves were best placed to identify their poor members that should be eligible to free care, effectively leading to enhanced health seeking. On the supply side, we examined the impact of user fees and performance monitoring of health care providers. Somewhat surprisingly, the introduction of user fees led to an increase of patients at health centres and hospitals. Apparently, better paid and more motivated doctors provided better services. These additional patients, however, did not include the poor members of the community. Even if entitled to free care, they had to borrow money to cover travel costs and loss of income which should thus also be considered in the design of health equity funds.

Cambodia has now started a nationwide effort to identify the poorest of the poor, eligible for free health care and/or support of the health equity funds. The chief monks are stimulated to create pagoda health equity funds in their region, a system that by now reaches 300 000 people.

Meeting of the head monks of pagodas in Kirivong district, Cambodia. They supervise the pagoda volunteers who collect and administer health equity funds for the poor.

In memoriam Francine Matthys

Our colleague and friend, Francine, 53, died on the 25th of September after a long and courageous fight against cancer.

Francine was internationally recognized for her work in humanitarian aid and her research on tuberculosis control. She got acquainted with the reality of the field while working for Médecins Sans Frontières between 1985 and 1996, among others in Chad, Mozambique, Ethiopia, Sudan and Angola. Francine always wanted to move forward and had clear ideas on how to optimize humanitarian medical aid. In 1996 she became the medical director of Médecins Sans Frontières Belgium; she was a member of the Board of Directors from 2003 to 2006. In line with her dedication to humanitarian aid and her concern for assuring and improving the quality of the medical interventions, she remained a member of the ethical review committee of MSF

Driven by her desire to improve the health of the poor on the basis of scientific evidence, Francine joined the Unit of Epidemiology and Disease Control of ITM in 2002. With Indonesian and Peruvian partners she developed and validated, among others, clinical algorithms for the diagnosis of smear-negative and extra-pulmonary tuberculosis. Francine was for many years the motor of the institutional collaboration and strengthening programme with the Instituto Pedro Kouri in Havana, Cuba.

Francine was a great and dedicated teacher in epidemiology, statistics and TB control. 'Evidence' was her code and she mobilized her network of to upgrade the TB teaching modules, to the great appreciation of her students.

Francine remained always true to her values in whatever position she worked in. She rejected without compromise work of substandard quality or of doubtful impact on health for all. She was the most faithful friend one can dream off, a loving mother and wife, and many more things. Her bravery, compassion and good spirits until the very end have impressed us all, and her memory will be with us forever.

Library and bibliometrics

Early 2011 we boosted our online offer with a license for the *CEBAM Digital Library for Health*. Next to the direct subscriptions our clients can access large collections as *Ebsco Medline* (1 500 journals), the *Wiley Online Library* (1 200), the *Mary Ann Liebert* collection, the *American Society of Microbiology* collection *Elsevier* (700), *SpringerLink* (1000) and *Lippincott Williams and Wilkins* (350). The *Directory of Open Access Journals (DOAJ)* currently lists some 7 400 free journals, but only part have biomedical or health-related content.

In spite of the increased online offer, internal document requests still increased with 12% to 6 444 items, of which we could deliver over 95%. We can rely ever more on our own resources rather than on external providers. External requests, mainly from Belgian universities, remained at the same level as previous years (1 473). The DGD-supported "Docdel" (document delivery project) handled 1 207 requests for partners in Latin America, Africa, and Southeast Asia, an increase by 50% as compared to 2010.

The library's own Reference Manager databases now include 95 500 records. Keeping track of the institute's ever growing output requires considerable time investment for the permanent update of the *ITM Staff Publications* database (13 830 records) and the *TropMed Central Antwerp* institutional open access repository (5 634 records). Other additional tasks include the annual bibliometric report, the preparation of a new academic information management system (PURE), and the development of a new tool to disaggregate bibliometrics based on journal impact factor (JIF) values.

We organised several training sessions for students e.g. on Hinari (free information system for developing countries), library tours and introductions, and a training week for librarians from partner institutes.

Bibliometrics 2011

The ITM's output in terms of publication numbers was somewhat lower in 2011 as compared to 2010 (table 1), partly because PhD dissertations are not counted as ITM publications anymore. Journal Impact Factors were comparable to 2010, but increased substantially for the category of full text research papers.

Significantly, electronic free-access journals, especially PLoS ONE (20 items) and PLoS Neglected Tropical Diseases (18 items) have in 2011 become the most frequent outlet for ITM's researchers, before Tropical Medicine & International Health (15) and The Malaria Journal (13). The top ten is completed by Veterinary Parasitology (10), Health Policy and Planning (9), The International Journal of Tuberculosis and Lung Disease (8), BMC Infectious Diseases (7), Journal of Acquired Immune Deficiency Syndromes (7) and The Lancet (7).

E-publications as PLoS and BMC now make up one third of the total ITM output. Some 30% of the ITM output consists of articles in non-listed journals, books or book chapters, and miscellaneous grey literature.

Table: Summary of research output of the ITM, 2001-2011

Indicator	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total number of publications	245	223	206	252	235	227	272	308	319	392	351
All journal contributions	164	180	166	205	191	203	240	262	275	325	321
Research papers only *	147	158	142	175	165	183	220	240	253	288	296
Papers in JIF - journals **	121	135	138	161	151	166	201	217	221	279	264
Research papers in JIF - journals *	107	114	117	135	130	149	183	198	198	242	243
Sum JIF values all contributions	425	490	510	596	561	790	897	833	1060	1217	1174
Average JIF all contributions	3.5	3.6	3.7	3.7	3.7	4.8	4.5	3.8	4,8	4,4	4,4
Sum JIF research papers *	327	317	348	364	338	626	642	730	743	808	921,5
Average JIF research papers *	3.1	2.8	3.0	2.7	2.6	4.2	3.5	3.6	3,8	3,3	3,8
Journal Impact factor (JIF) values based on	averages of 2001-2005 JIFs					2006 JIFs		2007 JIFs	2008 JIFs	2009 JIFs	2010 JIFs

* excluding editorials, letters and published abstracts.

** JIF = Journal Impact Factor according to ISI Journal Citation Report

Library statistics 2011

Books

Acquisitions	437
> Purchased	344
> Donated	93
Total number of books	22087
Total number of individual e-books*	135
Total number of e-books in packages**	ca. 4100
Total number of CD-ROMs	288
Total number of videos	382
Total number of ITM dissertations (non-PhD)	2877
> Total number of digital ITM master theses	2056
Total number of PhD theses in collection	851
> Total number of digital PhD theses	21

Journals

Print subscriptions	331
> Volumes bound in 2010	245
> Total number of volumes	ca. 36600
Online subscriptions	ca. 4200
> Online package subscriptions	6
> Free open access journals	ca. 7400

Databases

Electronic Reference Library (ERL)	
> Number of databases	12
> ITG Staff Publications: nr of records	13830
> TropMed Antwerp: nr of records	5616
> ERL logins	3046
> ERL Database logins	15898
Other database subscriptions***	4
Major free online databases	5

Document Delivery

Internal document delivery	6444
Outgoing ILL requests (for ITM)	1072
> Success rate	95,1%
Incoming ILL requests (from other libraries)	1473
DGDC Framework requests	1207
> Success rate	97.0%
Photocopies & prints**	69971
Scans**	27440

User training

Teaching hours	38

* Individual e-book purchases, excl. open access e-books from e.g. WHO or NCBI

** SpringerLink medical and biomedical collections 2005-2010

*** ISI Web of Knowledge (Thomson Reuters) + The Cochrane Library (Wiley) + Global health (CABI) + Veterinary Science (CABI)

**** 1 photocopy = 1 scan + 1 print; multiple photocopies = 1 scan + multiple prints

ITM publications in 2011

Department of Microbiology

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Medical Services

The Medical Services were integrated in the Department of Clinical Sciences as of July 1st 2011, but the internal structure, staffing and operations remained in essence unaffected.

Their mission is to provide curative and preventive care for tropical and imported diseases, HIV/AIDS and sexually transmitted infections (STI), and to assure national diagnostic and clinical referral services. The hospital ward is integrated in the Antwerp University Hospital, and the "Helpcenter" is a low-threshold extra muros dependence for anonymous testing for HIV and STI, counselling and secondary prevention. Most of the out-patients are seen, however, in the main clinic, a landmark art-deco building adjacent to the scientific institute. The interaction with teaching and research is easy and intense; most departmental staff is part-time consultant in the clinic, while most clinicians also perform academic duties.

An important duty is furthermore to be permanently on call for clinicians, authorities and medical organisations requesting information or advise on tropical, infectious and imported diseases. Many staff members act as key resource persons in national and international scientific meetings, expert committees and consensus groups.

The Medical Services performed 34 384 consultations in 2011, of which:

Travel clinic (pre-travel)	17 363 (50%)
Tropical and import pathology (post-travel)	6 444 (19%)
HIV / AIDS	6 596 (19%)
Sexually Transmitted Infections	1 219 (4%)
Dermatology	492 (1%)
Paediatrics	175 (0.5%)
Helpcenter (extra muros)	2 095 (6%)

We administered 38 250 vaccinations, the Travel Phone for tourists received over 10 000 calls, and our trilingual travel website www.travelhealth.be was consulted over 200 000 times.

We registered 210 new HIV infections and followed up 2 147 HIV-infected patients, of which 80% under antiviral treatment and 25% from sub-Saharan Africa. The Helpcenter offered 1384 HIV tests, of which 20% were anonymous and 16 (1,2%) were positive.

The Tropical Disease Ward at the University Hospital of Antwerp hosted 170 inpatients, half of with HIV/AIDS complications and most others suffering from malaria. In the day-care hospital ward we cared for 181 patients, mainly for lumbar punctures and specific drug treatments. The ITM medical staff is also responsible for infectious diseases in the University Hospital, including daily reviews of laboratory, joint rounds to selected patients and on-demand in-house consultancies on demand (312 in 2011).

Medical Laboratory

The Medical Services of the ITM houses several national and international reference laboratories. In 2011 the international reference laboratory for STI was also confirmed as National Reference Centre (NRC) as part of a new network of NRC's. The "tropical" laboratory was recognised as NRC for Arboviruses and for *Coxiella/Rickettsia* (in with the Military Hospital and the Veterinary and Agrochemical Research Centre).

The HIV laboratory was appointed as reference laboratory for the evaluation of HIV viral load tests. It evaluated seven simple rapid tests for HIV diagnosis on request of the WHO, and initiated a multi-centre study with Médecins sans Frontières evaluating different HIV testing strategies in resource poor settings. We also started a study on HIV testing in oral fluid samples, and characterised novel biomarkers for the safety of microbicides in Africa.

The Central Laboratory for Clinical Biology processed 35 000 patient samples in 2011 and performed 130 000 analyses for tropical and imported diseases. We improved our diagnostic tools for a series of viruses, bacteria and parasites and evaluated nucleic acid extraction equipment for high- throughput purposes. We designed and developed in-house molecular diagnostic tests for *Schistosoma* and West Nile virus infection; those for *Enterozoon bieneusi*, *Encephalitozoon* sp. and dengue, developed in 2010, were formally accredited.

Development Cooperation

Since 1998, the ITM works with the Belgian Direction-General for Development Cooperation (DGD) in a coherent and comprehensive Framework Agreement (FA) programme that aims at sustainable scientific, medical and veterinary capacity building in the South.

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The first two FA programmes (1998-2002 and 2003- 2007) were successfully concluded and evaluated. The third ("FA3") runs from 2008 through 2013, divided over two 3-year periods. The first period was finalised with over 99% of the budget (36 million €) spent. The second period took off in 2011 with an annual budget of 12,8 million €, and some uncertainty due to the protracted government crisis.

The overall objective of the FA3 programme remains "to strengthen the rational basis and the country ownership of health care systems and policies in developing countries, in order to improve the health status of the populations and thereby contribute to the reduction of poverty and inequity". More specifically, the objective is to "build, reinforce and support appropriate and sustainable capacity to conduct the research, training and reference services that are needed to improve the health status of the population". The FA-motto, 'Switching the Poles', was further emphasized in order to transfer not only expertise and resources, but also ownership, leadership and accountability. The Busan declaration of December 2011 confirmed our commitment to that roadmap, in full awareness of the varying country contexts.

The over-all plan of FA3 maintained its structure with 5 subprogrammes:

- **Training:** strengthening the capacity of individuals from developing countries
- **Institutional collaboration:** strengthening the capacity of institutes, organizations and networks in those countries
- **Strategic cooperation:** addressing and completing strategic priorities by targeted additional projects and partnerships, and through networking within and outside of FA3
- **Policy support and advocacy:** supporting the Belgian development cooperation in the formulation, implementation and dissemination of its policies
- **Management:** ensuring adequate administrative and financial management of the programme and its projects, including planning, monitoring and evaluation

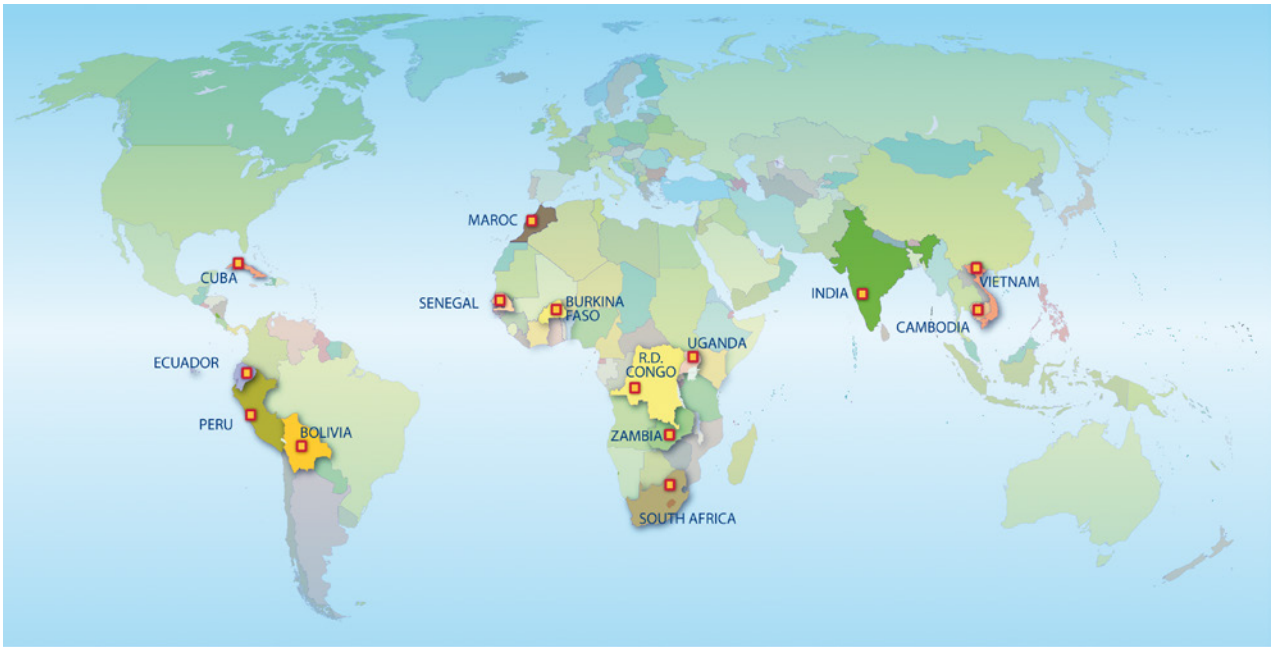
The **Training** sub-programme focuses on mid-career professionals from developing countries in the master and short expert courses at ITM, and on doctoral training for health scientists from developing countries, mostly in a "sandwich" setting in cooperation with a partner institute in their homeland. While at ITM, we provide them with administrative, financial, social and cultural support. For students and scientists abroad we develop and provide novel educational tools and updated scientific information, e-learning programmes and expert telemedicine support, networking with and between alumni. In 2011 the educational activities incorporated further progress to partner autonomy, "blended" learning and institutional networking. The "short course on antiretroviral therapy" (SCART), which had reached its objectives, was succeeded by a distance learning course ("e-SCART"). In three experimental projects, seed money is provided to initiated the development of courses by alumni Lubumbashi MPH, Nepal DTM, Community of Practice for SCART Alumni).

Under the heading of **Institutional Collaboration,** we develop long-term partnerships with with 17 sister institutes in Africa, Asia and South-America: the Institut Nationale de Recherche Biomédicale (INRB) Democratic Republic of Congo; the Institut National d'Administration Sanitaire, Morocco; the Makerere University School of Public Health, Uganda; the Institute of Public Health at the Pontificia Universidad Católica del Ecuador, Quito, Ecuador; the Institute of Tropical Medicine Pedro Kourí, and the National Institute of Hygiene, Epidemiology and Microbiology, Cuba; the Universidad Mayor de San Simón of Cochabamba, Bolivia; the Institute of Public Health, Bangalore, India; the Sihanouk Hospital Centre of HOPE in Phnom Penh, Cambodia; the Tropical Diseases Research Centre in Ndola, Zambia; the Instituto de Medicina Tropical Alexander von Humboldt in Lima, Peru; the National Institutes for Malaria, Parasitology and Entomology of Vietnam and Cambodia; the Centre Hospitalier Universitaire, Dakar, Senegal; the Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, South Africa; the International Centre for Research and Development of Livestock in the sub-humid zone of West Africa, Bobo-Dioulasso, Burkina Faso; the Centro Internacional de Zoonosis, Universidad Central del Ecuador.

The original FA3 plans were largely on track, so the mid-term updates were mainly a matter of revisions and refinements. The **Strategic Programmes** are thematic complements to the Institutional Collaboration, among others on HIV/AIDS, tuberculosis and neglected tropical diseases. We reinforced selected networks and south-south interactions on health systems and policies, neglected tropical diseases, tuberculosis, quality management in laboratory and clinical research. A new network "Quamed" aims at quality assurance of medicines and diagnostics, and involves agencies and NGO's besides scientific partners.

Under **Policy Support and Advocacy** we collaborate with DGD and other government agencies in the development, implementation and follow-up of international health policies, and coordinate related platforms for medical and veterinary stakeholders in Belgium (Be-Cause Health, Be-TropLive). Many documents produced by ITM found their way in DGD technical and speaking notes used in in national and international forums.

Institutional Collaboration projects in the third ITM-DGDC Framework Agreement Programme.



Instituto Nacional de Higiene, Epidemiologia y Microbiologia (INHEM), Havana, Cuba and Instituto Pedro Kourí (IPK), Havana, Cuba
Centro Internacional de Zoonosis (CIZ), Universitad Central, Quito, Ecuador
Institute of Public Health, Pontificia Universidad Católica del Ecuador (IPH-PUCE), Quito, Ecuador
Instituto de Medicina Tropical "Alexander von Humboldt" (IMTAvH), Universidad Cayetano Herredia, Lima, Peru
Post-Graduate Medical School, Universidad Mayor de San Simon (UMSS), Cochabamba, Bolivia
Centre Hospitalière Universitaire (CHU), Université Cheik Hassan Diop, Dakar, Senegal
Institut National d'Administration Sanitaire (INAS), Ministère de la Santé, Rabat, Morocco

Centre International de Recherche-Développement sur l'Elevage en Zone Subhumide (CIRDES), Bobo-Dioulasso, Burkina Faso
Institut National de Recherche Biomédicale (INRB), Ministère de la Santé Publique, Kinshasa, RD Congo
Tropical Diseases Research Centre (TDRC), Ndola, Zambia
Department of Veterinary Tropical Diseases (DVRD), University of Pretoria (DVTD), South Africa
Institute of Public Health (IPH - MU), Makerere University, Kampala, Uganda
Institute of Public Health (IPH), Bangalore, India
Sihanouk Hospital Center of HOPE, Phnom Penh (SHCH), Cambodia
National Institute of Malariology, Entomology and Parasitology (NIMPE) of Vietnam and Cambodia

Management

The reshuffling and responsabilisation of the academic departments brings along new management concepts as well. The three new departmental managers carry substantial responsibilities for personnel, finances, administration. In team, they are also a pivotal resource group for the administrative reforms that lie ahead in the ITM2020+ process.

San-Ho Correwyn

Support Services

The Support Services of the ITM had another busy year, incorporating the institutional reforms, rolling out and upgrading ERP (Enterprise Resource Planning) software, harmonising printing systems, constructing student halls, moving units and services, handling ever more complex project files, charting work flows and data streams for the design of a Master Information System, and so forth.

The **Purchasing, Shipping and Travel Service** handled 4485 orders for over 10 000 laboratory and office supplies, and exported over 500 items to overseas partners. The internal storeroom keeps 445 different items and registered over 5200 transactions. We shipped more than thousand courier parcels, 66 items under IATA regulations for dangerous goods, 100 air cargo packages and registered 2180 incoming shipments. Quality assurance procedures were rolled out and positively audited. We processed the 816 staff travel requests and 266 visa applications. In collaboration with IT we implemented the second phase of an institutional printer policy, offering high-performance infrastructure to all services and allowing more economical and ecological printing practices.

The building site of the students residence hall adjacent to ITM's main building, with the surprise finding of a 14th century cobbled cattle drinking site.

The **Technical Services** in started up the exploitation of ITM's first boarding house (24 rooms). A second hall (18 rooms) is near completion and a third, larger wharf (69 rooms) was started up. The latter surprised us and archaeologists with the remains of a cobbled cattle watering site from the 14th century (see picture). The historical laboratory training class room were converted to offices which now house Human Resources, Accountancy and Project Management.

The **Applied Technology and Production Unit** produces and distributes on a non-commercial basis the CATT (Card Agglutination Test for Trypaniosomasis) screening kits, which are at the core of most sleeping sickness control programmes in Africa. Over the past ten years, more than 24 million of kits were shipped, of which over 2 million in 2011. We shipped also 200 000 DAT kits (Disk Agglutination Test) for visceral Leishmaniasis 29 000 CATT for the horse parasite *Trypanosoma evansi* (for which we are an OIE reference centre).

Our **Cryopreservation** and **Laboratory Animal** services remained status quo, while the demand on the Laboratory Culture Kitchen declines by the year in favour of commercially available supplies.

For the **Project Management Service** the year 2011 brought new software, new staff, and a further rise of the number of project files to nearly 500, of which 300 are active. We started up 36 new projects and concluded 238 legal contracts. The rules imposed by donors become ever more complex and demanding, ever more audits and surveys have to be completed and intellectual property regulations have become a constant concern. The time registration software is now completely rolled out and is being used by 275 staff, of which the salary costs are (partly) charged to externally funded projects.

The **Information Technology Service (IT)** realigned its processes and activities to the new structure and policies of the ITM. A strategic group was installed to rethink the priority needs for IT, in view of long term objectives and added value. We took stock of all internal processes, workflows, data streams and their relationships, in order to chart and redraw the ITM's electronic landscape and to prepare a new Master Information System. Much work went into the development

City wide campaign to promote our Music for Life charity dance marathon.

of a new Electronic Patient Files and the upgrade of the ERP. The computer class was completely re-equipped, a central data platform was installed, phase 2 of the printing policy was implemented, a new electronic mail archive was installed, and the audio-visual equipment of class and meeting rooms was upgraded. Meanwhile, the Help Desk supported hundreds of users on a daily basis.

The **Graphics Service** assured the lay-out and printing of numerous reports, publications, courses, theses, posters, brochures, art and photo expositions etc. We worked on a new corporate identity, contributed to the new printing system and steadily enriched our digital imaging archives.

The **Accounts Services** prepared the upgrade of the ERP system, and planned the merging of the general and medical accounts. We expanded on the Full Cost model, and further implemented the quality assurance system.

Our **Human Resources Service** formulated a telework policy, structured the staff training programmes, implemented new Standard Operating Procedures for the in- and outflow of employees. They concluded 118 new employment contracts and handled the termination of 106 contracts.

The **Communication Service** edited reports and the internal magazine ITGazet. We assisted several groups, units and activities for the establishment of dedicated websites and social media outlets, and prepared a mobile version of out travel health website. Much time went into the preparation of a new project and publication information management system (PURE), which would link up automatically with the public Flanders Research Information Space (FRIS).

We produced 41 press releases, resulting in some 175 press national coverages including a dozen on national radio and TV and a BBC TV report on our tsetse work. We invited journalists to our annual colloquium on zoonotic diseases (see highlightpage 28) in Pretoria, resulting in formidable coverage. Further contributions included a booth at the biotechnology trade fair "Knowledge for Growth" and at two job fairs for university students, participation in the annual poem festival "Zuiderzinnen" and hosting photo shoots for the Antwerp Fashion Academy.

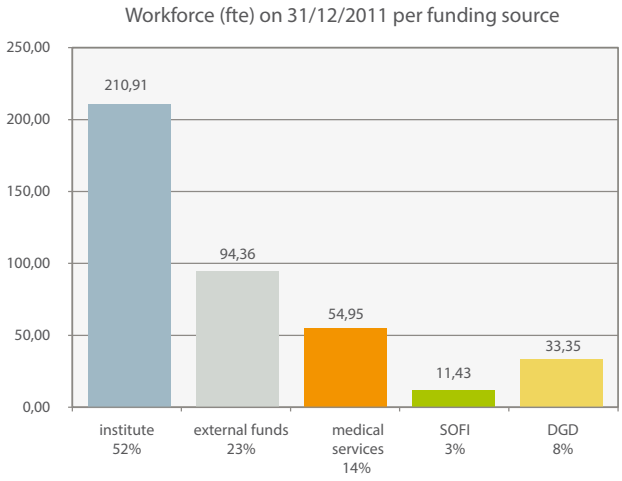
One of our new student residence halls nearing completion.

Human Resources

On December 31 2011, the ITM employed 445 people, corresponding to 405 Full Time Equivalents (FTE), a reduction of 10 FTE (-2%) compared to 2010.

52% of the employees are paid with institutional funds, 34% with project and programme funds and 14% with income from the medical services. 12% are non-Belgians from 21 different countries all over the globe. Our staff categories and policies are similar to those of the Flemish universities and consist of senior scientific staff (academic, scientific and medical staff with a permanent employment contract); junior academic staff (academic, scientific and medical staff with a temporary employment contract); and administrative and technical staff. Apart from the staff with an employment contract, the ITM houses also a sizeable number of researchers with a PhD or postdoctoral fellowship, guest scientists, volunteer workers and retired academics. The numbers in this chapter include doctoral fellows on a Belgian grant, long-term guest scientists and active emeritus professors.

Figure 1 shows the number of FTEs on 31/12/2011 per category and per funding source.



Old hands retiring: Kristien Wynants, the office manager of the director and a pillar of the entire institute (top); and Jan Claes, who served for 37 years and headed the reprography unit (left).

Senior scientific staff at 31/12 per funding source

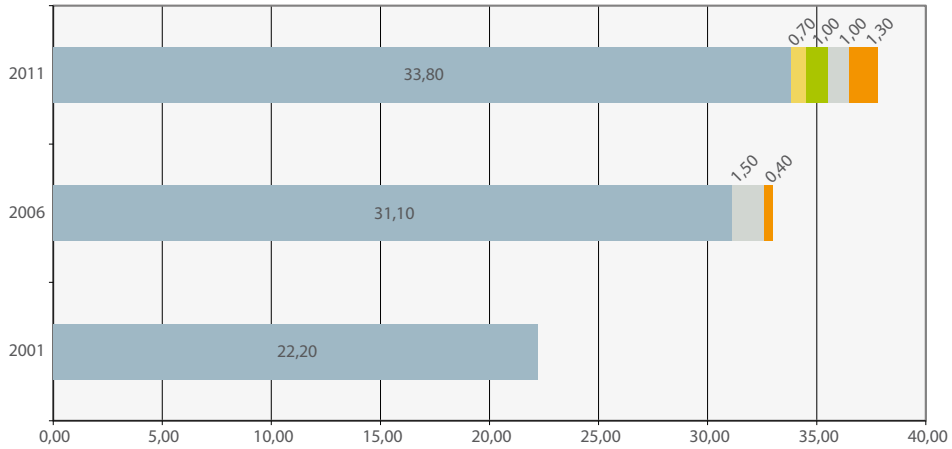


Figure 2 shows the evolution of senior academic staff over the last ten years.

The senior scientific staff (tenured professors and scientists) consists of 37,8 FTE or 8% of total staff, almost all on institutional funding. In 2011, six new senior scientists were appointed as educational coordinators or scientific team leaders in the new departments, as a first step towards the strengthening of the academic cadre.

Junior scientific staff at 31/12 per funding source

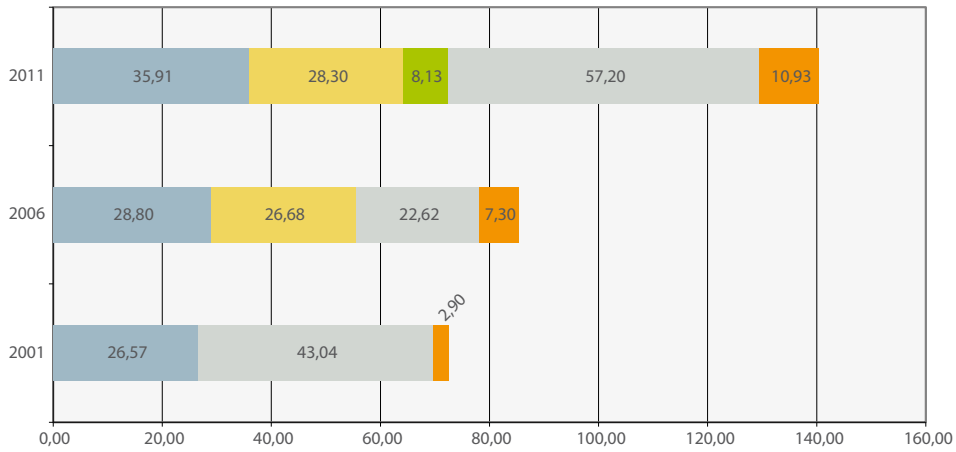
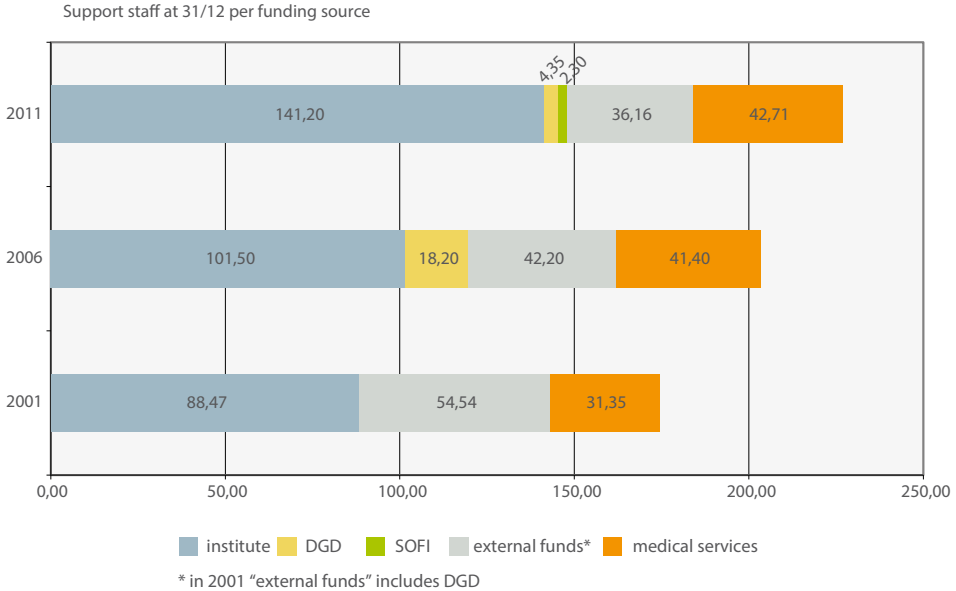


Figure 3 shows the evolution of other scientific staff over the past ten years (+50%).

At the end of 2011, the work force comprised non-tenured scientists (37% of total staff), many of them with senior curricula.

Support staff at 31/12 per funding source

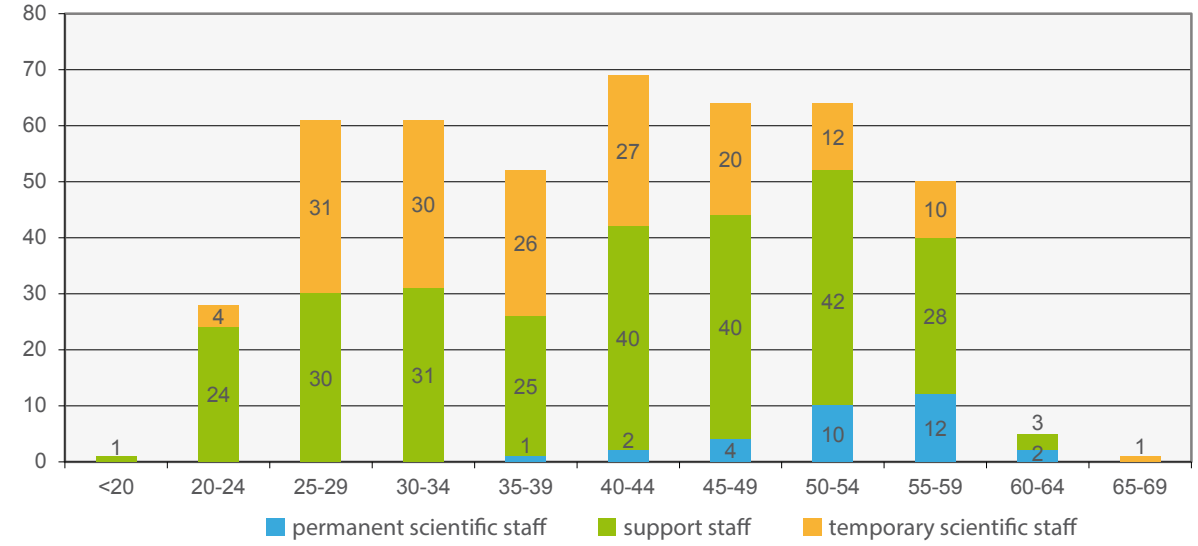


* in 2001 "external funds" includes DGD

Figure 4 shows the evolution of administrative and technical staff over the past 10 years.

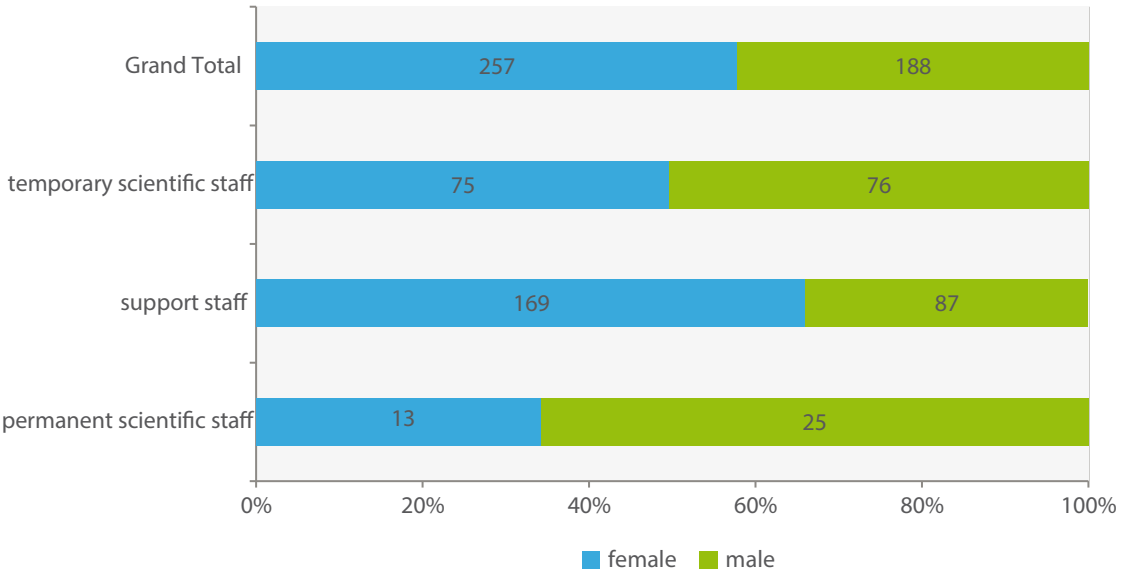
The administrative and technical staff counted 227 FTE in 2011, or 55% of the total. The relatively high percentage is due to the inclusion of nurses, technicians and clerks in the medical services, and reference laboratories.

Figure 5 shows the number of staff according to age and staff category.



The average age of ITM's employees is 42 years, but over-all the age distribution is fairly equal. A noticeable feature is the seniority among non-tenured scientists. Of all senior scientific staff, 55% will retire within 10 years, which is a challenge for continuity but also an opportunity for renewal and innovation.

Figure 6 shows the male/female ratio per staff category.



There are more women (58%) than men (42%) working at the ITM, but the ratio differs considerably between categories: 66% women among administrative and technical staff, 50% of non-tenured scientists, 34 % of the senior scientific staff. We come from far, however, as the latter percentage has tripled over the past ten years.

Finances

Income

In 2011 the **net income** of ITM totalled 49,7 million Euros, almost double the amount of 2000 but a decrease of 3% compared to 2010 (**Figure 7**). The **core funding from the Flemish Ministry of Education ("primary funding")** makes up 22% of the total revenue. While it increased nominally with 37% over the past 11 years, the real value actually decreased by some 22%. **Own revenue** (non-earmarked) accounts for 20% (up from 7% in 2001) and comes from overhead on external funds, internal billing, the sale of diagnostics and fiscal and parafiscal rebates . The latter are awarded by the federal government for advancement of scientific research, and have allowed the ITM to sustain its cadre in spite of the value loss of the core funding.

The income of the **Medical Services** makes up 14% of the total and has more than doubled since 2000. Apart from a steady increase of patient numbers, the increase is explained by federal allowances for our reference tasks in tropical medicine as well as HIV/AIDS.

The **"tertiary" and "quaternary" Project Funding** amounts to 15% of total income. The cyclical movement is partly due to the dynamics of the European Framework Programme for Scientific Research, which accounts for 28% of external project funding. Other sources include the World Health Organisation and other UN agencies, the Bill & Melinda Gates Foundation, Family Health International (FHI), US President's Emergency Plan for AIDS Relief (Pepfar), Medicines for Malaria Venture, the Damian Foundation, Doctors without Borders, and other NGO's.

Since 1998, the **DGD Framework Agreement Programme has grown steadily** and now accounts for 22% of the total income; the largest part is transferred to partner institutes in the south. The "secondary funding" from the **Flemish Ministry of Science and Innovation** is awarded only since 2008 and is still relatively modest (2.5% of total income). It is used to fund the SOFI programmes and to maintain a core Clinical Trials Unit.

Figure 8 illustrates the evolution since 2006 of project funding, including SOFI and CTU, and categorised according to Flemish university system.

Figure 7: Overview of the income 2000 - 2011 (X 1000 euro)

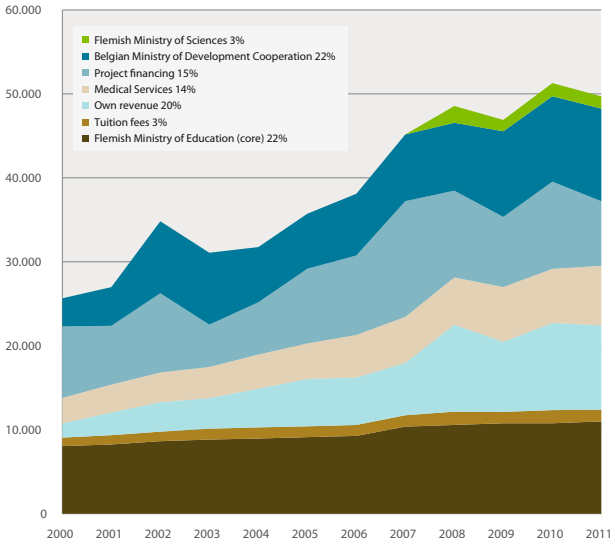


Figure 8a: Research and project funding 2006-2011 (excluding DGD programme)

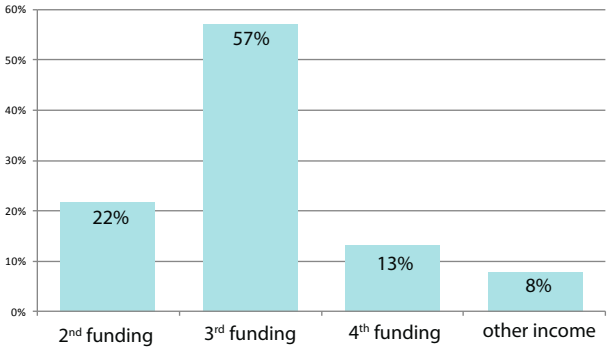


Table 8b: Research and project funding 2006-2011 (excluding DGD programme)

Projects and SOFI according to official categories for Flemish Universities	2006	2007	2008	2009	2010	2011	%
Government funding for basic research (2nd funding source)							22%
BOF / SOFI (Secondary Research Funding ITM)			2.000.004	1.355.877	1.563.855	1.462.753	16,0%
IUAP (Inter University Attraction Poles, Federal)	0	47.893	182.122	140.017	133.826	135.219	1,5%
FWO (Fund for Scientific Research Flanders)	255.108	409.938	293.913	323.084	303.918	398.218	4,4%
Government funding for applied research (3rd funding source)							57%
Other Federal Government	983.418	1.810.181	1.206.896	992.532	2.160.844	1.557.575	17,0%
Flemish government	561.739	643.812	1.163.166	855.346	557.131	191.129	2,1%
IWT					20.399	116.871	1,3%
Cities & provinces	34.676	10.636	24.000	55.965	51.924	11.734	0,1%
European Union	613.958	2.888.862	2.537.203	1.645.429	2.709.232	2.521.341	27,5%
International organisations	204.287	224.590	134.167	406.121	804.745	364.511	4,0%
Other foreign governments	542.498	453.772	857.694	881.223	737.112	466.207	5,1%
Contract research with the private sector and scientif services (4th funding source)							13%
Contract research - non profit organisations	1.059.915	1.803.977	3.045.786	1.289.191	1.718.102	1.115.036	12,2%
Contract research companies	140.800	136.666	142.028	189.126	95.396	84.573	0,9%
Other project income from education, research and services							8%
Project funding: various income and transfers	598.748	854.115	697.821	592.882	796.681	727.297	7,9%
Other income							
Other income Institute (Bank intrests)	26.836	0	47.755		0		
Total	**5.021.983**	**9.284.442**	**12.332.555**	**8.726.792**	**11.653.164**	**9.152.463**	**100%**

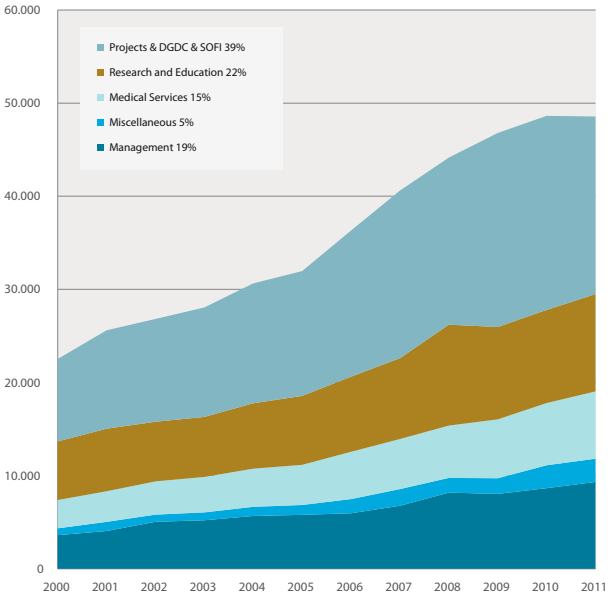
The account service in their brand new office.

Expenses

Figure 9 shows the evolution of ITM's expenditure since 2000. In 2011, it amounted to 48.9 million euros of which 62% went to education and research, 15% to medical services and 19% to management and support.

Table 10 details the expenditures of the 3th DGD-funded Framework Agreement Programme (FA) in 2011, and compares them with the 2th FA programme. 67% of the budget goes directly to the partners in the South, of which 49% to Africa, 17% to Asia and 34% to South-America. Management costs and scientific staff support account for 33%.

Figure 9: ITM Expenditure 2000-2011



Financial results 2011

Table 11 summarises ITM's financial accounts for 2011 following the model of the Flemish Universities.

The financial result, including transfers from previous years, amounts to 360 219 €. It is made up by a surplus of 495 816 € in the Section "Institute" (core + own income) and a deficit of 135 597 € in the section "Medical Services". The latter is mainly due to reduced income from the radiology department and increased costs in general. The institutional balance is partly reserved for the "Reserve Pension Fund", a buffer for lesser years

Salary costs made up 59% of total expenditure, 75% in the section Institute and 56% in the section Medical Services. Of all staff costs, 55% are covered by the Section Institute, 9% by DGD 9%, 20% by Project Funds including SOFI/CTU and 14% by the Medical Services .

Capital investments are only accounted after the building or renovation works have been finished, after which an annual depreciation rate of 3% is applied.

Results account (**Table 12**)

For the sake of completeness and legal compliance, we also publish the results accounts following the model for foundations and non-profit organisations And used by financial auditors. The difference with the university model consists mainly of presentation issues, the final result is the same.

Table 10: DGD Framework Agreement (FA) expenditures (x 1000 euro)

	FA 2 2003-2007							FA 3 2008-2013					
	2003	**2004**	**2005**	**2006**	**2007**	**Totaal**	**%**	**2008**	**2009**	**2010**	**2011**	**Totaal**	**%**
Training in Belgium	1.958	2.045	2.152	2.195	2.549	10.899	26%	2.543	2.791	4.197	2.698	12.229	26%
Institutional Collaboration	1.519	1.805	1.854	1.697	2.031	8.906	21%	3.346	3.741	3.395	3.706	14.188	31%
Other projects	866	1.034	1.115	1.220	1.752	5.987	14%	679	797	779	862	3.117	7%
Policy support	123	288	346	268	365	1.390	3%	97	155	364	205	821	2%
General expenses & scientific support	2.437	2.913	2.975	3.593	3.446	15.364	36%	2.825	3.693	4.940	4.393	15.851	34%
Total	**6.903**	**8.085**	**8.442**	**8.973**	**10.143**	**42.546**	**100%**	**9.490**	**11.177**	**13.675**	**11.864**	**46.206**	**100%**
AIDS Impulse Programme	1.470												

Table 11: State Profit & Loss Account (according to Flemish University template)

	2011	2010
Income (+)	50.114.684,64	49.694.033,57
Income from education, research and service provision	45.202.669,02	46.839.543,45
Government Grants - basic funding (primary funding source)	11.000.000,00	10.787.000,00
Government contribution to fundamental and basic research (second funding source)	1.996.189,46	1.851.599,69
Government contribution to applied research (third funding source)	17.590.428,18	18.326.954,66
Contract research with the private sector and scientific services (fourth funding source)	1.199.608,34	1.869.955,04
Other income from training, research and services	13.416.443,04	14.004.034,06
Funds & legacies	11.171,61	13.584,02
Other income	4.900.844,01	2.840.906,10
Expenditure (-)	48.538.853,27	45.497.457,30
Goods for resale		119.181,30
Goods and Services	15.576.873,32	14.471.894,02
Personnel Expenses	28.952.532,15	27.602.403,08
ZAP / VWK (Senior Academic Staff)		**3.372.672,89**
Projects	-	14.079,52
Institute	3.669.275,23	3.358.593,37
AAP / BAP / TWP (Temporary Scientific Staff**)**		**10.128.286,84**
DGD		2.418.924,94
Projects	3.081.258,27	2.954.652,19
Institute	3.806.924,06	3.696.586,97
SOFI		1.058.122,74
ATP (Administrative and Technical Staff**)**		**10.098.923,47**
DGD		277.335,87
Projects	1.918.622,44	1.920.253,44
Institute & Production	8.308.160,43	7.675.202,69
SOFI		226.131,47
Staff Medical Services	**4.069.951,16**	**3.470.965,52**
Other staff costs (provision holiday pay and early retirement)	**601.096,81**	**531.554,36**
Depreciation of Formation Expenses, Tangible and Intangible Fixed Assets	1.019.913,81	844.893,78
Value depreciation on stocks and commercial dues (additions +, withdrawals -)	-	-
Risk Provisions (additions +, expenses and withdrawals -)		-236.109,90
Other Operating Expenses: payments to DGD partners	2.865.558,79	2.695.195,02
Operating profit (loss)	1.575.831,37	4.196.576,27
Financal profits (+)	171.057,96	178.398,38
Financial Expenses (-)	267.559,38	125.375,53
Profit (loss) from regular activities	1.479.329,95	4.249.599,12
Exceptional profits (+)	49.659,35	2.399,51
Exceptional Expenses (-)	57.589,97	39.744,39
Devaluation on the realisation of the fixed assets	56.093,38	26.547,12
Other Exceptional Expenses	1.496,59	13.197,27
Profit (loss) of the financial year	1.471.399,33	4.212.254,24
Transfers (PROJECT FUNDING/DGDC/SOFI/INVESTMENTS)	1.111.180,71	1.915.970,32
RESULT	**360.218,62**	**2.296.283,92**

Table 12: Profit & Loss Account (template Foundations)

	2011	2010
Operating Income (+)	**49.544.753,63**	**59.499.706,69**
Turnover	6.780.137,34	6.557.453,00
Work and Services in Progress (additions +, withdrawals -)	2.080.450,08	-1.651.852,05
Member fees, funds, legacies and subsidies	25.341.867,80	40.361.165,22
Other Operating Income	15.342.298,41	14.232.940,52
Operating Expenses (-)	49.255.437,60	57.272.986,41
(Cost of) Goods for Resale & Raw Materials	1.957.031,97	1.792.288,65
Purchases	1.998.887,88	1.775.042,29
Stock (withdrawal +, addition -)	-41.855,91	17.246,36
(Cost of) Goods and Services	16.849.944,54	26.544.926,75
Personnel Expenses	28.610.155,06	27.600.407,69
Depreciation of Formation Expenses, Tangible and Intangible Fixed Assets	1.019.913,81	844.893,78
Depreciation of Stock, Orders in Progress & Accounts Receivable	790.581,38	463.151,41
Other Operating Expenses	27.810,84	27.318,13
Operating Expenses activated as Restructuring Expenses	-	-
Operating Profit (Loss)	289.316,03	2.226.720,28
Financial income (+)	308.470,08	199.656,90
Revenue from Current Assets	74.302,94	16.805,19
Other financial income	234.167,14	182.851,71
Financial Expenses (-)	256.977,95	119.295,50
Costs of debts	230.927,59	73.894,27
Value depreciations on floating assets other than stocks, orders in execution and commercial receivables (additions +, withdrawals -)	11.227,07	1.881,83
Other financial costs	14.823,29	43.519,40
Profit (loss) from regular company activities	340.808,16	2.307.081,68
Exceptional income (+)	49.659,35	2.399,51
Other exceptional income	49.659,35	2.399,51
Exceptional Expenses (-)	30.248,89	13.197,27
Other Exceptional Expenses	30.248,89	13.197,27
Profit (loss) of the financial year	360.218,62	2.296.283,92

Balance (Table 13)

The assets have increased with 8.5 million € compared to 2010, of which 5.2 million € through the fixed assets due to the investments in the main building and the student halls.

The decline in "Stocks and orders in execution" (-0.3 million €) are expenses on external project funds that have not yet been refunded.

Under "Liabilities" these changes are translated in an increase of Capital and Reserves with 0,3 million €, of Provisions with 0,8 million € and of Long-term debt with 7,4 million €. The latter is mainly due to a mortgage loan on the new student halls.

The financial indicator for "Floating assets", calculated as the ratio between "Floating assets" (25 million €) and "Short term debts" (12 million €) is 2.08, implying that sufficient funds are available to cover short-term debts.

Table 13: Balance sheet (template Foundations)

ASSETS	2011	2010
Fixed assets	**27.656.207,79**	**22.384.059,38**
Intangible fixed assets	119.778,03	49.542,98
Tangible Fixed Assets	27.523.338,76	22.321.425,40
Land and buildings	23.982.186,76	19.577.390,13
Plants, Machinery and Equipment	516.025,44	553.948,25
Furniture and Motor Vehicles	475.623,09	557.448,35
Leasing	-	-
Assets in course of construction and Payments on Account	2.549.503,47	1.632.638,67
Financial fixed assets	13.091,00	13.091,00
Current Assets	**25.025.577,11**	**21.796.839,93**
Stock and Orders in Progress	3.046.579,06	3.350.821,88
Stock	164.787,57	122.931,66
Orders in Progress (Projects in Progress)	2.881.791,49	3.227.890,22
Debtors due in one year or less	2.270.193,86	1.603.884,81
Receivables	2.249.948,03	1.601.746,67
Other Debtors	20.245,83	2.138,14
Investments	2.494.938,13	2.506.165,20
Cash and Bank Balances	16.220.022,47	13.591.346,34
Prepayments and accrued income	993.843,62	744.621,70
TOTAL ASSETS	**52.681.784,90**	**44.180.899,31**

LIABILITIES		
Capital and reserves	**20.267.515,32**	**19.963.583,82**
Funds of the Foundation	345.711,60	345.711,60
Revaluation surpluses	11.891.000,00	11.891.000,00
Reserves	2.300.323,61	2.535.069,18
Profit (Loss) brought forward	3.917.821,93	3.322.857,74
Capital Grant	1.812.658,18	1.868.945,30
Provisions	**8.281.525,69**	**7.501.525,74**
Provisions	8.281.525,69	7.501.525,74
Provision for pensions and similar obligations	1.009.233,60	865.577,69
Other provisions	7.272.292,09	6.635.948,05
Debts	**24.132.743,89**	**16.715.789,75**
Creditors due in over one year	10.100.309,25	2.650.307,05
Financial debts	10.100.309,25	2.650.307,05
Creditors due in one year or less	12.026.931,90	12.414.488,30
Creditors becoming due within one year	433.230,69	306.989,72
Payables	1.964.188,47	1.824.762,68
Received advanced payments on orders (Project funding)	5.909.120,32	6.550.204,75
Debts in reference to taxes, salaries and social contributions	3.496.141,86	3.295.986,11
Various debts	224.250,56	436.545,04
Accruals and deferred income	2.005.502,74	1.650.994,40
TOTAL LIABILITIES	**52.681.784,90**	**44.180.899,31**

Statutory auditor's report to the Board of Governors of the Prince Leopold Institute of Tropical Medecine on the financial statements for the year ended on 31 december 2011

PKF
Business advisers

In accordance with the legal and statutory requirements, we report to you on the performance of the mandate of statutory auditor, which has been entrusted to us. This report contains our opinion on the true and fair view of the financial statements as well as the required additional statements.

Unqualified audit opinion on the financial statements

We have audited the financial statements for the year ended 31 December 2011, prepared in accordance with the financial reporting framework applicable in Belgium, which show a balance sheet total of EUR 52.681.784,90 and a for the year of EUR 360.218,62.

Management is responsible for the preparation and the fair presentation of these financial statements. This responsibility includes: designing, implementing and maintaining internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error; selecting and applying appropriate accounting policies; and making accounting estimates that are reasonable in the circumstances.

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the legal requirements and the Auditing Standards applicable in Belgium, as issued by the Institute of Registered Auditors (*Institut des Réviseurs d'Entreprises / Instituut van de Bedrijfsrevisoren)*. Those standards require that we plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement, whether due to fraud or error.

In accordance with the above-mentioned auditing standards, we considered the 's accounting system, as well as its internal control procedures. We have obtained from management and from the 's officials the explanations and information necessary for executing our audit procedures. We have examined, on a test basis, the evidence supporting the amounts included in the financial statements. We have assessed the appropriateness of accounting policies and the reasonableness of the significant accounting estimates made by the as well as the overall financial statement presentation. We believe that these procedures provide a reasonable basis for our opinion.

In our opinion, the financial statements for the year ended 31 December 2011 give a true and fair view of the 's assets and liabilities, its financial position and the results of its operations in accordance with the financial reporting framework applicable in Belgium.

Additional statements

The compliance by the with the Law related to not-for-profit associations, international not-for-profit associations and foundations is the responsibility of management.

Our responsibility is to supplement our report with the following additional statements, which do not modify our audit opinion on the financial statements:

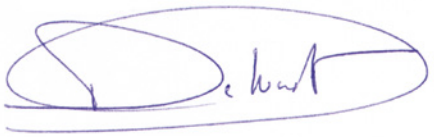
Taking into account that the audit of the report of the board of directors is not part of our legal mission, we do not give an opinion upon its contents.

Without prejudice to formal aspects of minor importance, the accounting records were maintained in accordance with the legal and regulatory requirements applicable in Belgium.

There are no transactions undertaken or decisions taken in violation of the association's statutes or the Law related to not-for-profit associations, international not-for-profit associations and foundations that we have to report to you.

Antwerp, 21 May 2012

PKF bedrijfsrevisoren CVBA
Statutory Auditors
Represented by



Paul De Weerdt

Registered Auditor

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Representative of the Province of Antwerp

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Representative of the Assisting Academic Personnel of the ITM

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Catholic University of Louvain (UCL)

Dr. Rafaël Lagasse
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Marketing Director, KMDA ('Antwerp Zoo')

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Director, Biotech Flanders

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Mrs. Els Barbé (**).
Liaison officer of the Flemish Ministry of Education

(*) Member of the Bureau
(**) Observer in the Bureau

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Prof. dr. Dr J. Zinnstag
Swiss Tropical Institute, Basel, Switzerland

Retirees & jubilees 2011

left to right

Jean Van der Vennet - 20 years of service

Dirk Schoonbaert - 25 years of service

Bart Criel - 20 years of service

Isa Bogaert - 30 years of service

Lieve Schueremans - 25 years of service

Jean Claes - Retired

Erwin Van den Enden - 20 years of service

Alexia De Smet - 20 years of service, retired

Robert Lezaire - Retired

Yvonne Peeters - 20 years of service

Bruno Gryseels - Director

Diane Jacquet - 30 years of service

Jean-Claude Dujardin - 25 years of service

Sabine Desager - 35 years of service

Carina Dillen - 25 years of service

Not on the picture

Baelmans Rudy - 20 years of service

Kristien Wynants - Retired

Marc Vercammen - Retired

Rita Verlinden - 25 years of service

In memoriam (* retired)

Eddy Thijs*

Patricia De Lathouwer*

Jan Desager

Francine Matthys

Georges Vanros*

Paule De Vooght*

Word of thanks

We are grateful to many organisations and individuals that support our activities and objectives. The Flemish Ministries of Education and of Economy, Sciences and Innovation provide our primary and secondary funding for teaching and research. The Belgian Ministry of Development Cooperation supports our international capacity strengthening programme. The Federal Ministry of Public Health and Social Affairs funds our medical reference tasks.

Abbott NV • Ackermans & van Haaren NV • Agence Nationale des Recherches sur le Sida (ANRS) • American Foundation for AIDS Research (AMFAR) • Antwerp Aids Foundation • Antwerp Dinner Foundation • Armand Féron Foundation • Artsen zonder Grenzen / Médecins sans Frontières • Belgische Nationale Bond tegen TB • Belgische Technische Coöperatie (BTC/CTB) • Becton Dickinson Benelux • Bill & Melinda Gates Foundation • Bio Merieux Benelux NV • BNP Parisbas Fortis • Boehringer Ingelheim • Bristol-Myers Squibb • Centers for Disease Control & Prevention (CDC), USA • Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) • Central Science Laboratory, UK (The Food & Environment Research Agency, UK) • Centrum voor Informatie en Samenlevingsopbouw vzw (CISO) Stad Antwerpen • Conrad, USA • Cordaid • Damiaanaktie • Danish National Research Foundation • Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) • Dries Van Noten • Eurogenetics • European Commission • European & Developing Countries Clinical Trials Partnership (EDCTP) • Family Health International (FHI) • Federaal Agentschap voor de Veiligheid van de Voedselketen (FAVV) • Federaal Wetenschapsbeleid • Foundation for Innovative New Diagnostics (FIND) • Fonds Bastanie-Cant • Fonds voor Wetenschappelijk Onderzoek – Vlaanderen (FWO) • Glaxo SmithKline NV • INBEV-Baillet Latour Fund • Institut Pour la Recherche au Développement, (IRD), France • International Atomic Energy Agency (IAEA) • International Fund for Agricultural Development (IFAD) • Intervet International BV • The International Union against Tuberculosis and Lung Diseases (UNION) • Innogenetics NV • InWEnt, Capacity Building International, Germany • Janssen Pharmaceutica NV • KBC Bank • Koninklijke Maatschappij voor Dierkunde Antwerpen (KMDA) • Medicus Mundi Belgium • Merck Sharp & Dohme Interpharma • Nutricia Research Foundation • Pfizer Ltd • Provincie Oost-Vlaanderen • Provincie Antwerpen • Rijksinstituut voor Ziekte- en Invaliditeitsverzekering (RIZIV) • Roche NV • Roche Diagnostics Belgium • Stad Antwerpen • Tibotec/Virco BVBA • The Medicines for Malaria Venture (MMV) • The World Bank • UBS Foundation • UCB Pharma NV • UNAIDS • Unicef • United States Agency for International Development (USAID) • University of North Carolina at Chapel Hill, USA • Van Breda International • Instituut voor de Aanmoediging van Innovatie door Wetenschapen Technologie in Vlaanderen (IWT) • Vlaamse Interuniversitaire Raad (VLIR) • Vlaams Agentschap voor Internationale Samenwerking (VAIS) • Vlaams Ministerie voor Welzijn • Voeding Derde Wereld/Nutrition Tiers Monde • World Health Organization (WHO) • WHO Special Programme for Research and Training in Tropical Diseases (WHO/TDR) • The Wellcome Trust • World AIDS Foundation

and many other organisations, companies and individuals.