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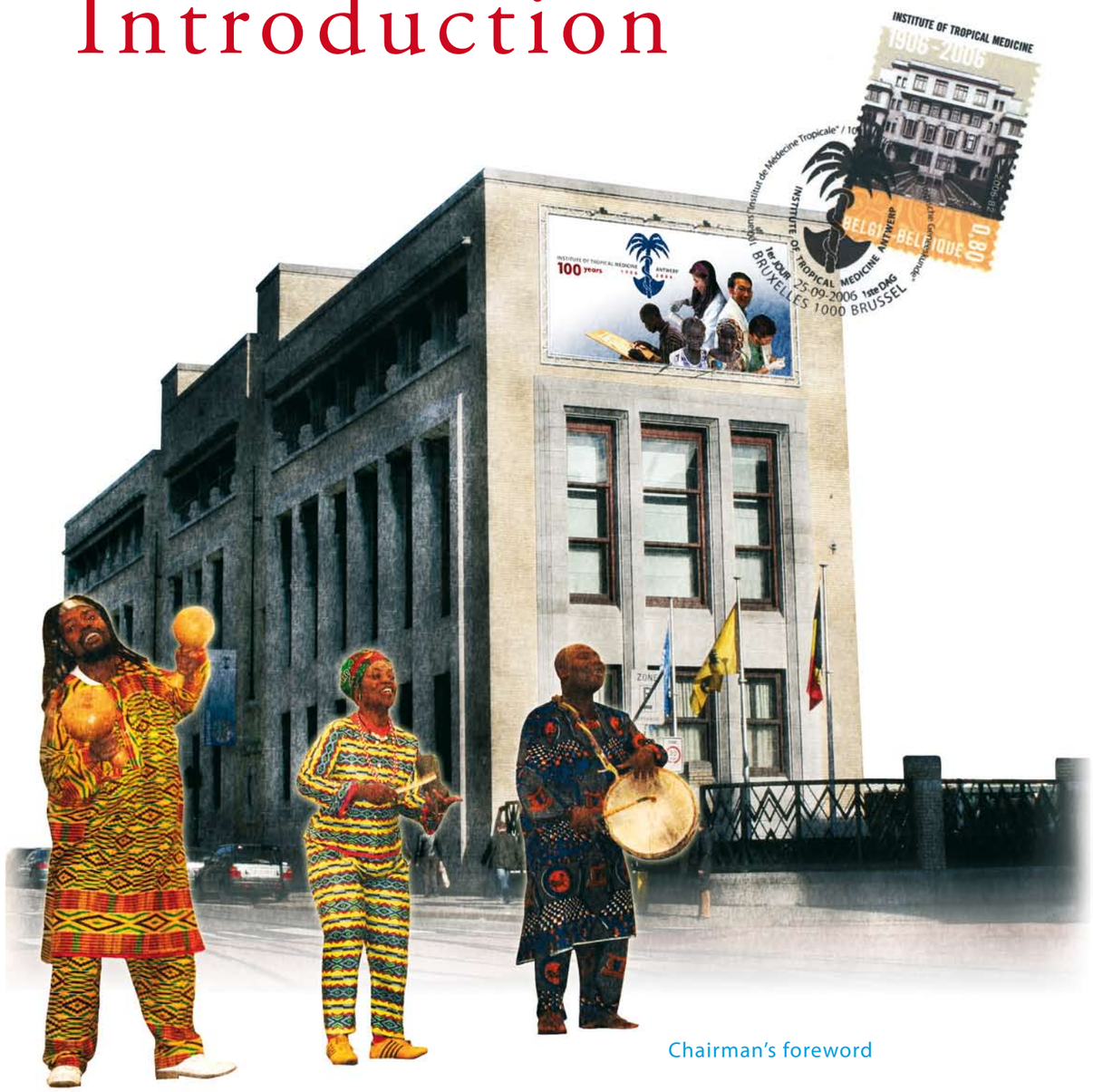
Introduction



Foreword of the chairman

The past year was one on which the Antwerp Institute of Tropical Medicine can look back with pride and joy. In the presence of Her Royal Highness Princess Astrid our institute celebrated its hundredth birthday, a festive event which illustrated once more that ITM has indeed acquired an enviable reputation with regard to education, research and the provision of services in tropical health care.

We were most pleased that directors of our partner institutions worldwide, as well as the chairmen of important international organizations, amongst whom also our former professor Dr. Peter Piot, director of UNAIDS, travelled to Antwerp to partake in the celebrations. It proves how much the efforts of our institute are appreciated.

The undisputed highlight of the jubilee, however, was the official opening of our brand new teaching campus at the beautifully renovated 17th century Capuchin convent. Once a forgotten piece of Antwerp, today it is a marvellous campus, which will not only make a lasting impression on our students, but will also contribute to the dynamism of our institute. The 'School of Thought' many always dreamed of, has thus been realized.

The outstanding achievements of ITM have not eluded our policymakers. Over the past few months both ministers Moerman and Vandenbroucke have significantly augmented the finances of our institute, a gesture for which we are most grateful and which comes at the right time, because the challenge we face, namely put an end to the dramatic health crises in the South, is not a minor one.

The many words of gratitude and tokens of appreciation we received on the occasion of our centennial, are to us an incentive to continue our efforts with enthusiasm, in the knowledge that genuine passion and true commitment can move mountains.

Camille Paulus
Governor of the Province of Antwerp
Chairman of the Board of Governors

Building the future

Our centennial year also put the crown on a decade of investment in new and renovated buildings that should take us well into the 21st century.

Biosafety level 3 laboratories

New high security (biosafety level 3) laboratories for research and diagnostics of HIV and tuberculosis had become indispensable to comply with modern safety and quality standards. The first challenge was to find a suitable place within the existing compounds. Several plans were made and the choice fell on the research building in the Sint-Rochusstraat. It provided the possibilities for seclusion as well as for the construction of the elaborate air pumps and filters on the rooftop. The work started in the spring of 2004 and was finished by the end of 2005. After proof runs and fine-tuning the laboratories were taken into use early 2006.

The "aquarium"'hall of the L3 laboratories.

They were one of the highlights of the visit of our Minister of Economy, Research and Innovation, Mrs. Fientje Moerman on 20th October (see further).
The construction costs, amounting to 2.6 million Euro, were covered by grants from the Flemish Fund for Scientific Research and the National Lottery (which featured them in a TV show on their projects), and recurrent investment and maintenance budgets from the Flemish Ministry of Education and the federal Ministry of Public Health and Social Affairs.

Researchers from North and South continue to investigate HIV and TB under updated safety conditions.

The L3-building with elaborate technical machinery on the rooftop.

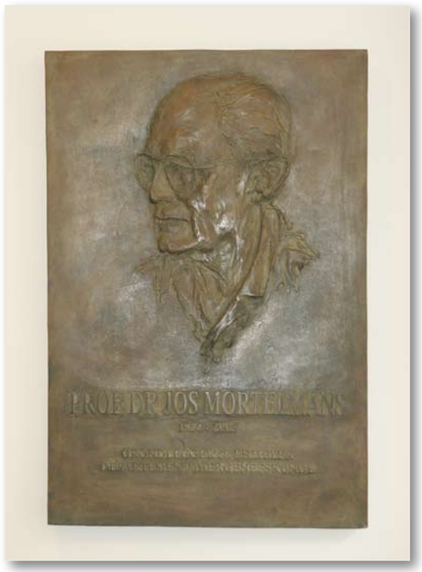
Department of Animal Health: Mortelmans Building

The renovated building of the Department of Animal Health.

Modern teaching facilities in the Mortelmans building.

In November 2006, the department dedicated its new home to founding father prof. J. Mortelmans. His bust, which from now on keeps watch over the entrance of the department, was unveiled by Honorary Governor and ITM Chair Andries Kinsbergen and current Governor and ITM Chair Camille Paulus, in the presence of hundreds of former students, staff and family of Prof. Mortelmans.

The separate building in Kronenburgstraat 25 was formerly used by Department of Public Health, and later on by laboratories for trypanosomiasis research and diagnostic kit production. As part of departmental regrouping plan, the worn-out building was entirely renovated in 2000-2002. In the following years, it was occupied by a re-united department of Animal Health, including the master classes. The initial reluctance to leave the main building quickly turned to enthusiasm about the modern infrastructure, the resulting scientific interaction and the demarcation of the "ITM School of Tropical Animal Health".



The commemorative bust of Prof. Mortelmans.

The International Rochus Campus

The most important and exciting extension of the ITM is the new campus in the St. Rochusstraat 45, a purpose-renovated 17th century convent with magnificent halls, gardens and a baroque church. We were searching to move most non-laboratory activities out of the main building so as to accommodate the growth of the ITM as well as modern safety and quality requirements. As a godsend, in 2001 the three remaning Capuchin sisters offered for sale their monastery to the ITM. Situated in front of the ITM side façade in the St. Rochusstraat, this closed convent was almost unknown to the outside world. The discovery of its beauty quickly seduced us to strike a deal, in spite of the renovation challenges ahead. After years of planning and preparation, the works started in 2004 and were finished by September 2006, just in time for the new academic year and the official centennial celebrations. Rochus, the saint to which the street is named, was the patron of all those suffering from infectious diseases: a suitable name was thus easily found.

The beauty of the convent was a hidden secret.

The church now houses a teaching and convention centre.

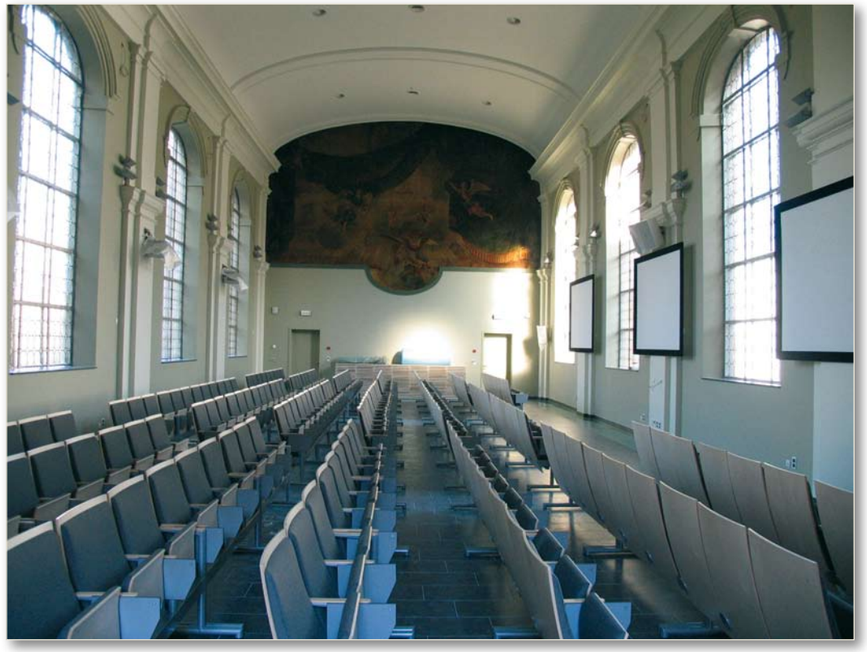
The convent garden, restored to its original beauty.

The convent hall, now a vibrant meeting place for students and staff.

The convent was built in the 17th century by Carthusians. Capuchin nuns moved into it in 1835 and lived there until 2001. While the French revolution had left little of the sober decorations, the building as such was still in good shape. In close collaboration with the conservation of monuments and security authorities, the original character of the buildings and the gardens was preserved or restored. The church was partitioned with an additional floor, giving room to two auditoriums with 200 seats and 80 seats respectivily and a multifunctional hall. The first use for the centennial celebrations was an instant hit. The new teaching facilities became quickly also an academic success, promoting continuous exchanges between staff, students and visitors and generating new ideas, initiatives and debates almost every day.

The total cost of the Rochus building amounted to 7,6 million Euro, covered by the recurrent investment subsidy of the Flemish Ministry of Education, own income and grants from the Flemish Ministry of Monuments and Landscapes, the Provincial government and the City Antwerp.
We are very grateful to all those that contributed to this lasting achievement.

Engraving over the original entrance to the church dedicated to the Carthusians' founder and uncovered during the restoration - much to the delight of the director.


The auditorium Janssens is on the top floor of the previous church.

Director's report

On 31st December 2006 we were all very tired but also very happy. The centennial of the ITM was marked by stylish ceremonies and memorable parties, but also with the opening of exciting new pages in a rich history book.


Opening of the centennial celebrations.

The centennial celebrations and the inauguration of new premises (see above and below) were highlights against a background of continued activity. To start with, the move of entire departments and teaching facilities to the new campus freed up much-needed space for the other departments, the medical services and the support units, setting off another round of renovation and removals in the main building.

The reform of the post-graduate diploma course in two separate but linked modules lived up to the expectations groomed over several years of reflection, preparation and innovation. They should become the basis of new, modular master courses which will complete the ITM's educational offer thematically as well as organizationally. The Master of Public Health shed its venerable skin of "International Course in Health Development" and became a "MPH in Health System Management and Policies". At the same time, an ever closer cooperation with the Master of Disease Control moved both further on the road to an integrated Master of Public Health with a "horizontal" (health services) and a "vertical" (disease control) major, reflecting ITM's dedication to comprehensive and coherent health systems. The enhanced doctoral programme of the ITM grew further to over 80 PhD fellows, the majority of which from abroad. The scientists of the ITM produced hundreds of fine papers, and were very successful in attracting new project funding, taking the lead among others in several major international consortia funded by the EU.

The medical services maintained their high level of quality and commitment, while further expanding the curative as well as the preventive activities. The federal Ministry of Public Health and Social Affairs increased its support to reference HIV/AIDS care, and awarded a substantial subsidy for patient-based prevention in urban high risk groups. The Flemish Ministery of Welfare renewed its multi-annual subsidy for the primary prevention of HIV in African migrants.

A comprehensive external audit of our programme for collaboration and capacity strenghtening in the South, funded by the Belgian Ministry and Directorate-General for Development Cooperation (DGDC), was highly positive and rewarding in terms of future perspectives. These were further developed and consolidated in a meeting with all our institutional partners in the South, which laid the foundation of a new and extended multi-annual programme for 2008-2013. Few institutes have the privilege of such a genuine long-term partnership with its national authorities on one hand, and an outstanding set of collaborators in the South on the other. For ten years now we have been supporting, to mutual benefit, the scientific and structural development of over twenty sister institutes in Africa, Asia and South America. With an annual budget of nearly 10 million Euro, all very well spent, this programme has become one of Belgium's most important contributions to sustainable health research and health care in the South - and there is much more to come.

The multiplication of our project and programme funding over the past ten years, in volume as well as intensity, had reached the limits of what was humanly achievable with our core staff and resources. We are therefore very grateful to the Flemish government, and Ministers Vandenbroucke and Moerman in particular, for the 10% increase of our academic subsidy and the opening of a new budget line for specific research. The centennial exposure of the ITM was the perfect occasion to respond to a longstanding need and much-earned due. We will make good use of the tax payers' money, which is multiplied by competitive international funding and rewarded by great scientific and societal impact.

So indeed, we had very good reasons to be tired but happy on the eve of a new century. On top of it, we have had terrific times together, as you may picture from the next few pages. The ITM is a fantastic team to work and party with. Many thanks to all, especially Andrea, Kristien and Daphné who put such great efforts in an unforgettable series of events.

Bruno Gryseels
Director

With Tine Verdonck on the Amazon river near Iquitos, Peru.

Addressing the Belgian Senate on Malaria Day on 25th April 2006.

Meeting with Hon. Gilbert Bukenya, vice-president of Uganda and an old friend of the ITM, during regional alumni meeting in December.

2006 in figures

Education

Students	489
Certificate Courses	163
Masters	75
PhD	86
Short Courses	88
Evening Course HIV	77
Theses	105
PhD	11
ITM Masters	73
University Masters	21
Distance learning courses	2
Educational CD-roms	4
University teaching commitments	12
Educational Cooperation Projects	14

Research

Researchers	187
Publications	233
Projects	**212**

Medical Services

Patients	29,792
Laboratory Tests	116,327
Reference centres	7
Preventive Programmes	3

Development Cooperation

Institutional Partnerships	25
Master Fellowships	60
PhD Fellowships (DGDC/BTC)	27
Policy Support Projects	5

Management

Staff (FTE)	322
Scientists	119
Support	203
Income (million Euro)	44,7
Ministry of Education	8,7
DGDC	9,2
Medical Services	5,1
External Funds	11,9
Own income	7,7
Investments	2,1
Quality Management	
Number of accredited laboratories	8
Number of accredited employees	100
Special Events	
Centennial celebrations	
Inauguration of Rochus Campus	
Occupation of BSL-3 Laboratories	
Audit DGDC Programme	
New ministerial subsidies	

The ITM Centennial

In 1906, King Leopold II established a small "Ecole de Médecine Tropicale" in Brussels, to train medical doctors for practice in Congo Freestate. In 1908, Belgium took over Leopold's protectorate and the School became part of the Ministry of Colonies. In 1933, it was transferred to its current monumental art-deco buildings in Antwerp, and became the "Prince Leopold Institute of Tropical Medicine", after the later King Leopold III.

On 15th October 1906 the first course on tropical medicine was organized.

The first "Ecole de médecine tropicale" was housed in Villa Duden in Brussels.

A course for nurses in the early thirties.

Research and vaccine proproduction in the forties.

Most professors were retired colonial doctors. The graduates, next to doctors now also nurses, veterinarians and technicians, worked in the health services and laboratories of the Belgian Congo. Nowadays we look back at this period with different eyes, but the colonial health services undeniably reached a high level of coverage, quality and impact.

After the decolonisation in 1960, the ITM was summarily transferred to the national Ministry of Education. Devoid of its natural hinterland, without adapted statutes and mandates, in rapidly changing national and international contexts, an existential crisis was almost unavoidable. Nevertheless, quality, commitment and partnership under the leadership of some extraordinary individuals kept the ITM on the forefront of tropical medicine and global health development. The training of young medical and veterinary doctors, nurses and technicians for a career in the tropics remained a major mission. In the first few decades after 1960, thousands of these

Screening and testing school children for helminth infections.

Mother and child care in colonial times.

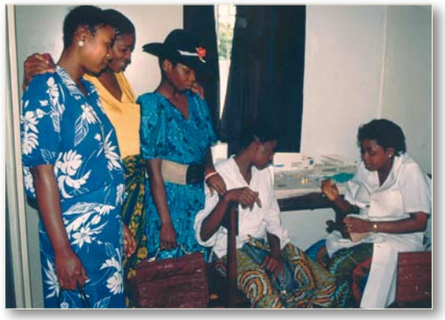
alumni were recruited by the Belgian cooperation agency ("cooperants"), private companies and church organizations; after 1990, non-governmental organizations such as Médecins sans Frontières became the main employer. The educational programme was extended, however, by advanced international Master courses in public health, animal production and tropical biomedical sciences which primarily aimed at training experts from the South and strengthening the human resource capacity of the developing countries themselves.

Also research became an ever more important part of the ITM's mission, in the laboratory as well as in the field. The traditional focus on tropical diseases was complemented by pioneering work on new scourges such as HIV and Ebola, on health systems organization and on epidemiological determinants of health. Support of the Belgian cooperation agency and the World Health Organization allowed setting up large-scale field projects such as the primary health care demonstration zones in Kasongo and Kindu (Zaire), the University Laboratory of Parasitology and the "Projet SIDA" in Kinshasa, the CENETROP research station in Santa Cruz, Bolivia, the ASVEZA veterinary programme in Zambia, and many others.

The post-colonial staff was gradually replaced by a generation that had gained their experience in development and partnership projects, but strong roots in the field remained a trademark of the ITM. In 1988, education and science were devolved ("defederalized") to the regional level. Due to its location, the ITM was transferred to the Flemish Community but remained an ill-defined part of the university system. As a bi-lingual institute with no counterpart in French-speaking Belgium, its position was at times frankly

Field research in the early 1960's.

The Ebola-pioneers in Yambuku, Congo, 1976, from left to right Guido Van der Groen, Stefan Pattyn and Peter Piot.



The first "Projet SIDA" (AIDS-project) in Kinshasa, DR Congo, in the 1980s.

The Asveza-project in Zambia: innovation and capacity strengthening in the 1990s.

awkward. The update of the statutes and mandates dragged on a long time, paralysing the modernisation of management as well as of the academic programmes. On the other hand, the ITM could build on its long-standing expertise in sexually transmitted diseases to acquire a strong competitive edge in the emerging field of HIV/AIDS.

In 1993, more than four decades after the decolonisation, the ITM finally adopted its new statutes. A period of profound reform, innovation and investments was set in, which goes on until today. A clear mission statement for the 21st century has become the basis of all activities and reforms, and was further strengthened with strategic declarations such as "Health Care for All" declaration" (2001) and "Switching the Poles" (2006, see further). The ITM's academic, medical and international mandates are now legally enshrined and supported by the different responsible authorities at the Flemish and federal level, making the ITM also a small institutional miracle in today's Belgium. The management is based on clear objectives and procedures, laid down in five-yearly policy plans, quality systems and formal agreements with authorities, universities and other partners. Administrative and financial reforms have enhanced efficiency, transparency and solvability allowing also substantial investments in new and upgraded infrastructure. Over a decade, budget, activities and staff have more than doubled, almost exclusively on external funding. Most important, the training and research programmes of the ITM have been strongly expanded and upgraded, and obtained top marks in a number of educational evaluations and comparisons. The collaborative activities in the South have been very substantially extended, thanks to a renewed and fruitful partnership with the Belgian cooperation agency. The medical services offer top-level curative and preventive care to an ever-growing number of patients, travellers and migrants.

In 2006, a renewed ITM could thus celebrate its centennial with satisfaction and pride, and we are happy to share some of the highlights in the next few pages.

International master classes: participants from all over the world.

Centennial highlights

The ITM shared its 100th anniversary with all passers-by. Huge banners decorated the building throughout the celebration months.

Rochus Campus opens its doors

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1. The official celebration om 22th November was attended by her Royal Highness princess Astrid. She was greeted by our chairman, governor Camille Paulus and director Prof. Dr. Bruno Gryseels and by sister Rosa, the last nun of the Capuchin convent and ministers of State Frank Swaelen and Andries Kinsbergen, Parliament Chairman Herman De Croo and City Mayor Patrick Janssens (2). The official opening took place in the new auditorium P.G. Janssens (3).






Successive speakers at the academic session: Governor and Chairman Camille Paulus; ITM-director Bruno Gryseels; Belgian Minister of Development Cooperation Armand De Decker; Dirk Van Damme, speaking for Flemish minister Frank Vandenbroucke; Awa Coll-Seck, Director of WHO/Roll Back Malaria; Peter Piot, director of UNAIDS.

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5. Peter Piot, ex-ITM and now director of UNAIDS, is a favourite of the press.

6. The official inauguration of the Rochus Campus by Princess Astrid and Antwerp Governor and ITM Chairman Camille Paulus.

7. Princess Astrid and sister Rosa in lively conversation.

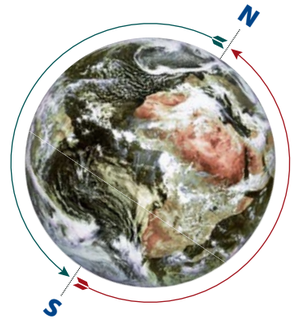
8. The princess with ITM-director Bruno Gryseels and Kristien Wynants.

Joint Partner Meeting

The second Joint Partner Meeting of the ITM/DGDC framework took place on 20 and 21th November. It reunited directors and delegates from 23 partner institutes from 18 countries in Africa, South-America and Asia.

Centennial colloquium

"Tropical Medicine in the 21st Century: switching the poles"



On 23 November, the ITM organized a special edition of its annual colloquium series for the scientific invitees to the celebration as well as for other interested parties. This Centennial Colloquium gathered an international and interdisciplinary body of 150 top scientists, experts and policy makers. Together they explored the face of tropical medicine in the 21st century, and particularly the challenge of "switching the poles": how can scientists and institutes in the south truly take the lead in the international efforts to improve the health situation in their countries through research, training and policy support?

In this 21st century, "tropical medicine" as in ITM's name covers a wide range of disciplines, from basic biology over tool development to intervention research and global health policies. In the North, the "historical" tropical institutes have been joined by other players such as university departments, science-driven development organizations and product-oriented public-private partnerships. In the South, the centres of excellence are still too scarce and unevenly distributed. Many scientists and groups cannot compete or even function without earmarked financial and scientific support from abroad. The institutional capacity to perform autonomous research, organize training and provide technical assistance remains far stronger in the North than in the South.
Partly as a consequence, health development policies are still largely defined in the North. The many new global health initiatives have their seat and power base in Europe or the US. The scientific literature and policy guidelines on disease control in developing countries are still heavily dominated by the North. Health authorities often have to satisfy foreign donors and experts, but not necessarily the real needs of local health systems and populations.
This is no reason to reduce tropical medicine capacity in the North. Yet, resetting the balance is in the interest of all stakeholders, in the first place the populations that have to benefit from health research. North-South partnerships, while maintaining their scientific objectives, should give much greater prominence to this part of their agenda.

The ITM Centennial Colloquium confronted this challenge through concrete case studies rather than global theorems. Her Excellency Flore Agmande Gangbo, Minister of Health of Benin, chaired the meeting. Directors, scientists and experts from developing countries, many of whom partners of ITM, presented their work in its institutional, national and international context. They provided the audience with a wide scientific and geographic range of top-level research with great societal impact. While amply demonstrating the scientific capacities in developing countries, they seamed common threads relating to the meetings' objectives, such as:

- Autonomy in formulating and negotiating scientific projects
- Institutional capacity to manage research and training programmes
- Leadership and coordination of donors, networks and partners
- Sustainability of scientific institutes and career structures
- Translation of research in policies and practices, and vice versa
- Adhering to scientific and ethical normative standards

These and other issues were further analyzed in panel discussions and plenary debates. The exercise was not limited to the obvious responsibilities of politicians and sponsors, but also critically analyzed whether and how the scientific community in the North itself can contribute more forcefully to the empowerment of their colleagues in the South.

Further switching the poles is one of the major commitments of the ITM in the 21st Century, and the over-arching objective of its partnership programme with the Belgian Directorate for Development Cooperation (DGCD). We are convinced that these efforts will not only pay off for our partners and the populations in the South, but also for the academic excellence and societal relevance of the ITM itself.

New for Animal Health

The department of Animal Health dedicated its building in the Kronenburgstraat to its founding father Prof. Jozef Mortelmans. Honorary governor Andries Kinsbergen and governor Camille Paulus inaugurated the building on 16th November.

That same day the Belgian platform on tropical animal health and production organized its first symposium "Strengthening livestock services in the tropics". The platform unites Belgian partners such as universities, NGOs, development organizations, the government and individuals, who all work on tropical animal health and production.

Minister De Decker in Peru

In January the Belgian Minister of Development Cooperation Armand De Decker and a large Belgian delegation visited the Institute for Tropical Medicine "Alexander von Humboldt" (IMTAvH) in Lima, Peru, that has an institutional collaboration with the ITM. Eduardo Gotuzzo, director of IMTAvH, and ITM-director Bruno Gryseels, elucidated that collaboration. Afterwards the minister visited the institute and talked to young Peruvian scientists.

Minister Moerman visits the ITM

On 30th October the Flemish Minister of Science Fientje Moermans visited the Institute of Tropical Medicine. After a short introduction she met several scientists from the institute. She announced that ITM from 2007 on will receive 500,000 Euro additional research funding.

For sale

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The "Friends of the ITM" organized an charity auction in art gallery Campo & Campo. Sale items included clothes from George Michael, Kris Wouters from Clouseau and Natalia (1), a huge banner from the 0110-concert, a harmonica of Toots Thielemans, etc. The famous "Six of Antwerp" fashion designers donated a unique bottle of "Esprit du Siècle" and several collection items.

The evening gathered many Antwerp VIPs, such as Walter van Beirendonck, Tom Barman, Dirk Van Saene (3). Baron Bertrand graciously accepted the chairmanship of "The friends of the ITM" (4).

4.

Miscellaneous

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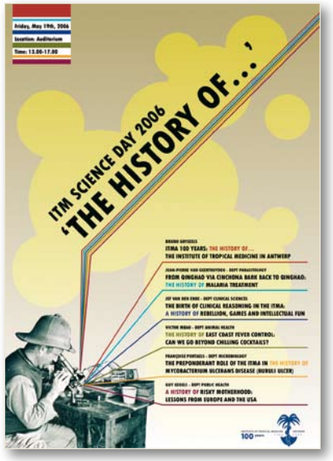

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1. In marching order to start the centennial festivities.

2. The ITM's annual "Science Day" on 19th May was dedicated to the 100th anniversary. The theme was 'The History of…' and ITM scientists from the different departments presented their work in the perspective.

3. The Belgian Mail created a special stamp for the 100th anniversary of our institute. On 22-23th September the collectors' club Imperator organized an exhibition at the ITM.

4. During the month of December the MuHKA (Museum of Contemporary Art Antwerp) projected old and new films about tropical health. The projection included recent films about AIDS and Ebola but also vintage footage on the institute, leprosy and sleeping disease in the 1930s-40s.

5. 100 recipes for 100 years of ITM. The staff gave away their cooking secrets in this fascinating and original cookery book.

Let's party

Staff, retirees and families gathered on 26th November for a fabulous closing party.

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Everybody could visit the new Rochus Campus (1) or participate in the African dance sessions from the group Adessa (2). Children were the guests of honour (3). Speeches were kept to a strict minimum (4), but food was plentiful (5).

5.

Education

The ITM's training programme

Distance learning

Alumni networks

Academic coordination

Theses

Library

Education

The educational mission of the ITM is to provide postgraduate training in human and veterinary tropical medicine and public health. It consists of postgraduate certificate courses, advanced Master degrees, doctoral training and specialized short courses. Its main strengths are the link with research and field work, the international dimension, the interdisciplinary collaboration and the underlying concepts of equity and integrated health care. The ITM covers a specialized niche within the Flemish higher education system and fully participates in the European ambition to strengthen and harmonise higher education.

All students attend the opening of the academic year.

In 2006, curriculum reform remained focused on programmatic flexibility and didactic innovation. The ever increasing diversity of the students' professional backgrounds and futures calls for still more skills in scientific analysis and decision making, and for courses tailored to individual needs. The Master in Public Health introduced optional modules, new learning methods and skills development, in intense collaboration with the Master of Science in Disease Control. The MPH students can now choose between two options in the third quarter, "Health Policy" or "Strategic Management of Health Services".

The 100th postgraduate course in Tropical Medicine and International Health tested a new problem-based module for biomedical graduates. A new Short Course in Clinical Research and Evidence Based Medicine (SCREM) in low-resource settings was developed and will be offered from 2008 onwards. New e-learning initiatives on HIV/AIDS were developed and ICT was integrated to all teaching programmes, among others by the introduction of Blackboard as Learning Management System and of Content-e as course development tool.

The steering groups of the different Master programmes prepared extensive self-assessment reports in preparation of a government audit in May 2007. By mid-2008, when the current license expires, the process should lead to the accreditation of our Masters by the newly established Netherlands - Flanders Accreditation Organisation (NVAO). The further modularisation of the Master programmes, the increased offer of short specialist courses and the development of new teaching methods and e-learning also fit in a strategy to intensify and structure educational networking within and outside the European Union, and in particular with partner institutes in the South.

The female MPH-students gather for a picture.

THE ITM TRAINING PROGRAMME

The ITM offers a high-quality educational programme at postgraduate level. We present here a description of the various courses taught in 2006, as well as an overview of the Master and PhD theses produced during the past year.

The Postgraduate Courses in Tropical Medicine

The postgraduate courses in tropical medicine primarily aim at the training of physicians and other health professionals in tropical medicine, health care in resource-poor settings and the principles of international health. The courses take five (medical and biomedical graduates) or four (paramedical graduates) months and are awarded with a postgraduate certificate

Tropical medicine and international health for medical, pharmaceutical and biomedical Masters

This specialization course (now in English and French) has been entirely revised in 2005 and is now built up in 2 consecutive modules: "Introduction in international health" and "Biomedical and clinical tropical medicine". The former is accredited as core module of the Master in International Health of the tropEd network. In 2005 - 2006, 60 students, from four continents and 16 countries, took the first module (27 French and 33 English); 62 students took Module 2 (26 French and 36 English). Apart from the modularization and the internationalization, the main reforms included:

a) Module 1 (12 weeks, 20 ECTDS credits) consists of thematic blocks of one to two weeks on major health problems, such as HIV, Tuberculosis and vector-borne diseases, or on care provision for specific social groups. It integrates the basic diagnosis and clinical care of main health problems as well as the management of disease control and health care systems, within a global context of development and universal human rights.

b) Module 2 (8 weeks, 10 ECTS credits) focuses on clinical tropical medicine and methods for clinical decision making. A specific problem-based track was developed for biomedical and pharmaceutical scientists in Module 2.

c) Both modules are followed by an integrated test which results in a credit certificate. Students that take both modules successfully obtain the full postgraduate certificate.

d) Quality assurance mechanism was streamlined into one coordinated and formalized system.

Tropical medicine course for nurses and midwives

This course lasts four months (March-June), is equivalent to 20 ECTS credits and is taught in Dutch and French. It is open to qualified nurses with at least one year of professional experience. In 2006, 113 students took this course (40 Dutch and 73 French), the majority from Europe (89 or 79%). 111 students (98%) successfully completed the course.

International Master Courses

The Master courses contain 1,500 - 1,800 hours (10-12 months) of postgraduate study, equivalent to 60 ECTS credits. These advanced Master courses are meant for health professionals, bio-medical scientists and veterinarians who already have a substantial (minimum 2 - 5 years) working experience in developing countries. They can also serve as a run-up to a doctoral program and a scientific career. All students prepare a final dissertation, usually drawing on their own experience, and defend this work and their newly acquired knowledge for an international jury.

About 80 students from all five continents register for the ITM Master courses. The interactive teaching concept limits the number of participants to twenty per course. With the support of the Belgian Ministry of Development Cooperation (DGDC), the ITM can offer a full scholarship to sixty participants from developing countries, including registration, tuition, travel and subsistence costs. Other students are supported by various national or international organizations.

The ITM international Master program counts of three main orientations:

Master of Public Health (MPH)

The International Course in Health Development (ICHD) is an international advanced Master course (60 ECTS credits), leading to the degree of Master in Public Health (MPH). It is offered simultaneously to two groups of twenty university-trained health professionals (mainly medical doctors), with a minimum of four years relevant professional experience, alternatively in English and in French (Cours International pour la Promotion de la Santé – CIPS). One of its essential characteristics is its international dimension, bringing together participants from many countries in a learning environment that stimulates exchange, confrontation of experiences and critical analysis.

The general objective of the ICHD is to improve the capacity of professional health workers for developing and managing health services and systems. It is organized along five main tracks:

- Principles and practice of Health Service Organization (242 contact hours)
- Methods for the analysis of diseases and health problems (66 contact hours)
- Specific techniques and skills (145 contact hours)
- Widening the horizon beyond the traditional medical or health disciplines (60 contact hours)
- Autonomous study and exchange (seminars, conferences, essay writing (92 contact hours).

Thirty five students (M/F: 23/12) participated in the 2005-2006 (English spoken) edition. They came from 22 countries (Belgium, Italy, Bolivia, Costa Rica, Cuba, Cameroon, DR Congo, Eritrea, Ethiopia, Ghana, Liberia, Mozambique, Tanzania, Uganda, Zambia, Zimbabwe, Cambodia, China, India, Myanmar, Palestine and Thailand). Twenty-eight participants received a DGDC scholarship, of whom 10 women. Thirty four students successfully completed the course.

Major reforms of the course are planned in 2006-2007. Students will be able to choose between two options: "Strategic management of health services" or "Health policy". These options will also be open to external students as a short course.

Master of Science in Disease Control (MDC)

The MDC/MCM is an international advanced Master course (60 ECTS credits) taught alternately in French and English. The curriculum focuses on the epidemiological, technical and organizational aspects of specific disease control, with Reproductive Health Care and Tropical Diseases as options (10-week modules in the third trimester) that are also open to external students. Graduates must be able to formulate, manage and evaluate national and international disease control programmes. Emphasis is on the integration of sustainable disease control programs into regular health services.
In 2005-2006, 19 participants from 16 different countries (Bangladesh, Belgium, Cambodia, Cameroon, Côte d'Ivoire, DR Congo, Ethiopia, Fiji, India, Italy, Malawi, Peru, Uganda, USA, Vietnam and Zimbabwe) attended the English course. Eighteen students obtained their diploma. Sixteen students received a DGDC scholarship.

MDC-participants enjoyed themselves during a trip to Keukenhof in the Netherlands.

Master of Science in Tropical Animal Health (MSTAH)

This training course, organized by the Animal Health Department, seeks to improve the animal health participants' capacity to analyze epidemiological situations, make rational decisions about animal disease control and develop and conduct veterinary research or development programmes. The participants can choose between animal disease control or epidemiological data collection and processing. The course runs from September to July, and is lectured alternately in English and French. Twenty-one animal health professionals from 14 different countries (Bangladesh, Cameroon, Ecuador, Egypt, Ethiopia, Ghana, Lesotho, Senegal, Swaziland, Tanzania, The Gambia, Vietnam, Zambia, and Zimbabwe) attended the training programme and 20 completed the course successfully. A single student enrolled for a specific module (geographical information systems). Sixteen students could attend the training programme thanks to a scholarship from DGCD.

The Doctoral Training Programme

The ITM Institute does not award doctorates independently; each doctoral student also enrols at a university, which co-supervises the quality of the work and formally awards the degree. Most or all of the training and research take place at the ITM and/or its partner institutes in the South. The research subjects relate to the ITM's specific activities and fields of expertise, and can thus range from sociology to molecular biology. Currently, the ITM supervises 75 PhD fellows in its laboratories and/or in the field. 30 are employed as research assistants or Belgian or European research fellows, 45 are fellowship students from developing countries, 43 of whom with a sandwich fellowship.
The doctoral training also includes Biomedical Research Seminars, Epidemiological and Public Health Research Seminars, Journal Clubs, Innovative Method Seminars, and debates on specific country or policy issues.

Short Courses

The ITM also organizes a number of shorter specialized courses:
The **Short Course on Anti-retroviral Therapy & Comprehensive Care for People living with HIV/AIDS in Countries with Limited Resources (SCART)** was organized for the fourth time in August/September 2006. During three weeks 42 physicians with 18 different nationalities, working in 24 different countries, were trained in anti-retroviral treatment and comprehensive care for people living with HIV/AIDS in countries with limited resources. Over 90% of former SCART participants are conducting trainings themselves after returning home, using training material from the SCART, 85% (vs. 45% before SCART) get involved in consultancy work and 78% (vs. 29% before SCART) in the development of HIV treatment guidelines.
The **Short Course on Planning and Management of Reproductive Health Programmes** and the **Short Course on Planning and Management of Tropical Diseases Control Programmes** are the optional parts of the Master of Science in Disease Control. They are open to a limited number (maximum 10 each) of external participants with adequate training and professional experience such as disease control programme managers or modular Masters students from other institutions. The ITM can provide scholarships for up to 10 candidates from developing countries. In 2006, 16 external students took these modules.
The **MSTAH modules** are also open to external candidates; in 2006, only one student enrolled for a separate module.
The **Special Course in Medical and Veterinary Mycology** is organized annually (from March to June, taught in French and Dutch) for clinical biologists, physicians and technicians. Most Belgian and Dutch participants integrate this "one-day a week" course in their professional practice. Students from other countries usually combine this course with other courses at the ITM or elsewhere in Belgium. Due to an increase of opportunistic fungal infections (as a complication of immunosuppression, cancer and AIDS) the demand for this course remains important. In 2006, 18 people attended the course.
The **HIV/AIDS Refresher Course** (held annually in Dutch, as an evening class of 13 x 2 hours) keeps Flemish doctors, paramedics, lecturers and other professional groups up to date with rapid advances in the treatment and control of HIV/AIDS and Sexually Transmitted Diseases. In 2006, 77 health professionals attended this course.

MSTAH-students sharing dinner in one of the many excellent restaurants in Antwerp.

Admission and selection criteria, fees and fellowships

Admission requirements

The ITM courses are open only to students with a university Master degree, except for the Tropical Medicine course for nurses and midwives (Bachelors). For the mid-career ITM Masters, a minimum of 2-5 years relevant experience is an additional requirement. The admission criteria allow some flexibility, so that also non-medical health professionals with relevant experience can enrol, subject to approval by the course director and ITM director's committee. For the SCART, previous clinical experience with HIV/AIDS patients is required.

Selection criteria

The postgraduate certificate courses allow students on a "first come – first served" basis, with a maximum of 80 students per language group. For the Masters courses, selection committees screen all applications on the basis of previous academic qualifications, professional experience, certified language skills, motivation and references. As the number of eligible candidates by far exceeds the number of students that can be admitted, additional criteria are used to balance the group with respect to gender, professional and geographic diversity.
For the academic year 2005-2006, 35 out of 154 applicants were admitted to the MPH, 19 out of 142 for the MDC and 17 out of 91 applicants for the MSTAH.

Fees and fellowships

The tuition fees of the ITM courses are based on a full cost calculation, equity and accessibility for all students, and international benchmarking.
In general they cover approximately 50% of the full course cost. The fees vary with the length of the course (number of credits), the size of the classes and the level of individual tutoring.

Graduation day for the paramedics: a huge applause for the choir and themselves.

The registration fee for the postgraduate certificate courses in Tropical Medicine and International Health is half the credit cost of a Masters course as group size is almost twice as big and much less individual tutoring is provided. The fee for university graduates (30-credit course) is 2,500 euro, students from EU/EFTA countries are entitled to a 50% reduction. For professional bachelors (20-credit course) the fee is 1,100 Euro.
The fee for the international courses at advanced Masters level (60 credits) is 14,300 Euro (2005-2006) and includes all research and study costs. For an additional fee (700 euro) The package includes a subsidised portable PC giving wireless access to ITM student servers and the internet. This PC remains the student's property.
Almost all participants from developing countries receive a full grant (tuition fee and living allowance) from the DGDC (60 fellowships per year) or from other organizations. The ITM offers a limited number of partial grants to Master students from the European Union, covering 60% of the fee.
In 2006, 16 participants of short courses (10 MDC options, 6 SCART) received a full ITM-DGDC grant.

External Teaching Commitments

Many ITM lecturers hold part-time positions at Belgian or foreign universities and teach among others at:

- University of Ghent: International Health (Faculty of Medicine and Faculty of Political and Social Sciences); Human Nutrition, Tropical Animal Production (Faculty of Bioscience Engineering); Tropical Veterinary Medicine (Faculty of Veterinary Medicine).
- University of Antwerp: Tropical Infectious Diseases and AIDS (Faculty of Medicine); Public Health and Epidemiology, Health Projects, Humanitarian Assistance (Institute for Development Policy and Management); Tropical Ecology and Parasitology, Tropical Infectious Diseases, Immunology of Tropical Infectious Diseases, General Parasitology (Faculty of Biomedical, Pharmaceutical and Veterinary Sciences).
- Free University of Brussels (Flemish): Tropical Virology and Bacteriology, Tropical Molecular Biology (Faculty of Medicine); Parasitology, Infectious Diseases (Faculty of Sciences).
- University of Namur: Parasitology (Faculty of Biology).
- Université Catholique de Louvain (French): Maternal Health, Sexually Transmitted Diseases (Institut de Démographie).
- Université Libre de Bruxelles (French): Parasitology (Faculty of Medicine), Applied PCR techniques (Faculty of Pharmaceutical Sciences).
- Royal Institute for the Tropics in Amsterdam (the Netherlands): Public Health and Tropical Medicine; Tropical Parasitology.
- University of Bergen (Norway); Tropical parasitology.
- The University of Limoges, France: Erasmus Mundus programme in Tropical Neurosciences.
- The ITM participates in the European course in Tropical Epidemiology (ECTE), rotating annually between European institutes of tropical medicine.
- ITM staff supervises numerous Masters and Bachelor dissertations of students from Belgian universities and graduate schools, as well as international trainees from different parts of the world.

Educational Cooperation with the South

The ITM supports the development of different teaching programmes in the South through its capacity building programme (see further). The most important are:

- The "Post-Grado en Medicina Tropical y Control de Enfermedades" at the Universidad Mayor San Simon of Cochabamba in Bolivia, comparable to our postgraduate course in Tropical Medicine & International Health.
- The "Instituto de Salud Pública" (ISP) and the Master of Public Health programme at the Pontificia Universidad Católica del Ecuador (PUCE) in Quito, Ecuador.
- Regional training programmes at the Centre for Ticks and Tick-Borne Diseases in Lilongwe, Malawi.
- The web-based Veterinary Master of Science Programme at the University of Pretoria (see also under Distance Learning).
- The international training programme in clinical tropical medicine at the "Instituto de Medicina Tropical Cayetano Heredia" in Lima, Peru.
- Specialist training in internal medicine and HIV/AIDS at the Hope Hospital in Phnom Penh, Cambodia.
- Training of medical specialists and clinical researchers at the 'Centre Hospitalier Universitaire" in Kigali and the University of Butare in Rawanda.

DISTANCE LEARNING

In recent years, the ITM has developed a portfolio of sharable course materials and different e-learning modules.

Institutional development of ICT for e-learning

In 2006 the ITM installed a Learning Management System (LMS) to enhance electronic exchange of courses and information between students and teachers within and outside the campus. This learning platform is hosted by the University of Antwerp, but gives full access to a personalized ITM electronic environment. We also developed own online courses. Two test modules of the e-SCART course have to define an institutional strategy for future online courses. The content of the test modules was provided by medical specialists at the ITM while the instructional design was developed by ITM's IT specialists.

Tropical medicine on CD-ROM

The educational CD-ROMs on tropical medicine produced by the ITM are widely used by ITM students, the Royal Institute for the Tropics in Amsterdam and different institutions worldwide. The content is continually updated. We will implement an integrated Learning Content Management System which will allow our teachers to publish and update their courses simultaneously in different media, including MS-Word, HTML and PDF. A single-source test platform Content-e was installed in December 2005 and staff was trained. A broader platform will be installed February 2007. Conversion and updating of a databank of clinical images and relevant didactic teaching material is also planned. Existing course material will be gradually converted and updated for web-based and taught courses. All course material will be Sharable Courseware Object Reference Model (SCORM)-compatible to allow seamless integration into a Learning Management System (LMS).

Document delivery by the ITM library

The programme for electronic document delivery (DocDel) to the ITM's South partners received 994 requests in 2006. This DocDel service was especially appreciated by our Latin American partners (over 95% of all requests). Some partners, like the Cambodian HOPE, were able to get most of their scientific literature directly from the international HINARI project, and no longer used the DocDel service.

Animal Health e-courses

The web-based Master Course in Veterinary Tropical Diseases and the Certificated Online Modules in Tropical Animal Health (a joint venture with DVTD Pretoria) focuses on the infectious and ecto- and endoparasitic diseases of domestic and wild animals in sub-Saharan Africa. Thirteen students registered for the complete Master of Science (MSc) Course and 138 subscriptions were recorded for separate modules for part-time MSc or Continuing Professional Development (CPD) purposes, 116 completed their module successfully. The students came from DR Congo, Lesotho, Mozambique, Namibia, New Zealand, Saudi Arabia, South Africa, the United States of America, Zimbabwe and Zambia.
A new GIS (Geographic Information System) module, initiated in 2006, will be available as part of the MSc program or for CPD by the end of 2007.
Master of Science in Veterinary Tropical Diseases MSc: http://www.up.ac.za/academic/veterinary/depts_vtd_mscweb/index.htm
Certificated Online Modules in Tropical Animal Health for Continuing Professional Development (CPD): http://www.up.ac.za/academic/veterinary/depts_vtd_cpdweb/index.htm

Interactive computer-assisted clinical decision-making teaching programme (KABISA)

KABISA (www.kabisa.be) is a computer-based programme for training in clinical decision making in (sub-)tropical regions. It challenges the individual student with a randomly generated clinical case. The built-in tutor follows the student's input with complex logical algorithms and mathematical computations, gives comments and support, and accepts the final diagnosis if sufficient evidence has been built up.
In 2006 the logic of the expert module was converted to an interactive one, with step-by-step assistance by the tutor. The logic of the consultation was completely revised, with an accent on excluding serious and treatable diseases, bringing the teaching program in line with actual training in clinical reasoning. Data from the study on imported fever (see Department of Clinical Sciences) were included in the databases.

Not only when the sun shines, but also during winter time the garden is a well liked place.

Telemedicine as a tool to accelerate access to ARV in resource-limited settings

In 2003, the ITM set up a hybrid web/e-mail discussion forum, accessible on a medical website (http://telemedicine.itg.be) to support physicians working in resource-limited settings in treating difficult HIV/AIDS cases. Between April 2003 and December 2006 we received 619 second opinion requests, from more than 30 countries: 75% of the tele-consultations concerned the management of complex medical problems in a specific patient and 25% were questions about the organization of health services for HIV prevention, treatment and care, vaccination programmes and guidelines delivery. (see also chapter on Clinical Sciences)

Student service

In 2006 the Student Service assisted over 700 international Master, short-course, doctoral and individual participants with travel, housing, social support, and practical advice. Preparing visa-applications, finding appropriate accommodation, opening bank accounts, disbursing scholarships, sorting out health insurance: these are just a few of the headaches the Student Service alleviates for ITM students. Besides trying to help them feel at home, the Student Service guides students to medical and psychological support when needed, and organizes a wide range of social and cultural activities to help complete the 'Belgian experience'. We also stimulate interaction between students and staff through weekly sport activities.

ALUMNI NETWORKS

Networks of alumni of ITM's Masters Courses are active in many countries and receive support from their Alma Mater. The aims are to maintain the continuous learning process, provide support in all sorts of ways, in particular to former students working in difficult conditions and professional isolation, and to generate feedback as a tool for permanent evaluation, inspiration and improvement of the courses.
The ITM supports alumni in several ways by:

- stimulating and supporting national, regional and international networking;
- organizing regional meetings and national workshops;

- maintaining and exchanging addresses and working environments of the alumni;
- communicating and exchanging ideas with and between alumni by e-mail, and through reciprocal visits;
- publishing a semi-annual Newsletter;
- providing, upon request, articles, books and other information;
- supporting formulations of project proposals;
- systematically involving alumni in international research and teaching networks.

Each master programme has its own alumni association, but since 2006 the MDC alumni and ICHD alumni networks work closely together. A merging of the two networks is under discussion and is likely to take place in 2007.

RIAC/INFI – Réseau International d'Anciens Participants du CIPS / International Network of Former ICHD participants (MPH Programme) and the MCM/MDC alumni network

As alumni from both networks have common interests and are bound to learn from exchange it was decided to join forces in the publication of a single Newsletter, the coordinated support to national networks and the organization of joint regional meetings. The last MDC alumni Newsletter was dedicated exclusively to the Regional Meeting in Siem Reap, Cambodia. The first joint Newsletter appeared in November 2006 on the occasion of ITM's Centennial and was dedicated to "Training". In 2005 RIAC/INFI started to support our alumni at the Lubumbashi School of Public Health (DR Congo) to develop a local MPH curriculum. In 2006 the first cohort of 12 MPH student finished their training and a second cohort of 12 started. Newly trained ICHD and MDC Congolese alumni have joined the teaching staff and are involved in the development and improvement of the master programme.
In December 2006 the fourth regional meeting of former ICHD participants of English-speaking Africa took place. The meeting was held in Kampala and was co-organized by the Makerere University - Institute of Public Health (MU-IPH). Twenty one ICHD alumni from 12 different countries gathered during a four day meeting. Five MDC Alumni from Uganda also attended and we could also count on the active participation of six MU-IPH alumni, all from Uganda. Objectives were:

- to debate with alumni on their needs of scientific exchange and support;
- to discuss the issue of human resources in the health sector;
- to discuss the reform of ITM master training courses;
- to present and discuss training offered by MU-IPH and exchange alumni network experiences.

Participants shared their post training experiences and contributed to the central issue of 'human resources in health' with 12 excellent presentations. Topics were grouped in three sections: a wide national vision on human resources issues, a reflection on the potential roles of the regional levels in human resources policies and experiences of alternative human resources policies in the fight against HIV/AIDS. The ITM team also had the opportunity to present the logic and structure of the planned reforms in the MPH course and to explain an increased collaboration between the MPH (ICHD) and the MDC. In a specific session ICHD alumni shared their vision on the adequacy of the teaching programme and on their suggestions for improvement. MDC alumni did the same.

The alumni network of the Department of Animal Health: RIPROSAT

The local Riprosat (Réseau International de Diplômés en Production et Santé Animale Tropicale) network of Ecuador, organized a "Symposium on emergent diseases in animals and their consequences in public health" in Quito on 23rd November. It was attended by 159 participants. Riprosat – Ecuador designed a web page (http://www.riprosat.com/).
To evaluate and improve the teaching at the department and in preparation of a self-assessment of the Master in Tropical Animal Health programme, a survey was organized among RIPROSAT members who attended the renewed training programme since 2003.
The Alumni Newsletters can be found on www.itg.be (news/contacts)

ACADEMIC COORDINATION

Institutional reflection on course content, learning methods, professional demand and scientific evolutions is one of the key tasks of the academic coordinators. In 2006 a workshop, coached by a staff member of the University of Maastricht, dealt with the formulation of integrated assignments. We also organized peer-review sessions on interactive lecturing, coached by an educational expert of the Catholic University of Leuven. We plan to institutionalize the interactive lecturing workshops, followed by peer-reviewed lectures.
During 2006, the internal academic regulations were translated and the follow-up of "sandwich" PhD scholarships was consolidated. Three ITM course modules were accredited in the tropEd network. A new short course on Clinical Research and Evidence Based Medicine is a first step towards a modular Masters in International Health. The reformed postgraduate course will also be part of this new Master, with a focus on clinical sciences. Institutional capacity for e-learning is developing steadily and the discussions on relevance, efficiency and flexibility of our existing Master programmes are being translated into reforms. The reform of the Master in Public Health and the tighter collaboration with the Master in Disease Control are the first concrete consequences. The preparation of an external evaluation and accreditation of ITM Masters started with an encounter with a Flemish Interuniversity Council (VLIR) in February. We made suggestions for an Evaluating Committee and started writing self-assessments reports during the second semester. The external audit and site visit are planned for May 2007. ITM furthermore participated in Flemish initiatives for the promotion of science as the "2006 Vlaamse Wetenschapsweek" (Flemish Scienceweek) and the creation of a science website called "Stel Je Vraag" (Ask your question) for the general public.

Postgraduates in Tropical Medicine

The reform process of the postgraduate in Tropical Medicine and International Health (PTM&IH) became a laboratory for innovation in education. Integrated exam questions and MCQ's reviewed by a quality assurance committee, development of block-guides and block-assignments, aiming at better integration of course content, as well as structuring continuous formative feedback to lecturers, are examples of such innovations.
In May the first module of the PTM&IH was re-accredited as core course for the tropEd Master in International Health (MIH) and collaboration between ITM and the Swiss Tropical Institute (STI) in Basel allowed a first jointly trained Master student to graduate.
The low course fee (75-125 Euro per credit) of ITM postgraduate courses led to heated discussions in the tropEd network. In some European institutions close to full-cost recovery leads to tuition fees between 200 and 300 Euro per credit whereas other countries still provide "free" education, even at postgraduate level.
The second module focused on biomedical and clinical sciences of tropical diseases. Separate tracks for medical professionals and biomedical scientists were further structured. Strengthening clinical reasoning skills became the main focus for the first group. The content has now become relevant also for European specialists in internal medicine, interested in diagnostic and clinical skills for tropical and travel medicine. This broadening of the target population has been beneficial for the academic level and group dynamics of the course. For the biomedical and pharmaceutical scientists 16 Problem-Based Learning (PBL) cases were developed as guiding principle of their programme.
The postgraduate course for nurses and midwives keeps running according to the former format of a 4-months subject-based course in Dutch and French.

Master of Science in Tropical Animal Health (MSTAH)

In 2006 MSTAH organized three surveys. A first one questioned the departmental teaching staff on the content and design of the current training programme and on measures to be taken in order to guarantee the sustainability and quality in the future.
A second survey was carried out in 2006 among students attending the first two training sessions of the renewed master course (MSTAH 2003-04 and MSSAT 2004-05). Students could give their opinion on the relevance and quality of the course.
A third survey among the members of the thesis jury provided valuable suggestions to improve the thesis evaluation in the next years.
In September a meeting was organized to discuss the future of the Institutional Collaboration between ITM and the Department of Veterinary Tropical Diseases (University of Pretoria). Although both partners agree on the development of an integrated master course and the principle of a joint diploma much more work remains to be done to achieve this. A working group is going to deal with those issues.

Master in Public Health (MPH): International Course in Health Development

During the academic year 2005-2006, the MPH steering group proceeded with the planned reform of the ICHD. In 2004, a working group "Future of the ICHD" assessed the strengths and weaknesses of the current course. In a second phase, the general objectives, the target group, and the professional profile were (re)defined. The third phase included the drafting of a competency matrix and of the general structure of the new course. This year,

Students relaxing in the ITM garden on a sunny day.

working groups developed the content and assignments of two optional modules ("Health policy" and "Strategic management of health services") and new pedagogical approaches to training and teaching. Improvements were initiated based on the quality assurance process (the student handbook, assignment instructions, etc.). The working procedure of the examination committee was revised.

Master of Science in Disease Control (MDC) and Master in Public Health (MPH)

As both the ICHD (MPH) and MDC were planning developments in 2006, this was considered the ideal time to explore a possible synergy between the two courses. All students are health professionals working in the same health system and should share a common framework of values and principles underlying a health system: it would help future horizontal and vertical managers to reach a common understanding of the framework and would also prepare them to interact constructively after graduation from ITM.

While the primary focus of both courses is different (MPH/ICHD = Management of Health Services and MDC = Management of Disease Control Programmes), the distinction has become more artificial in professional life. Dealing with Health Services Organization and Disease Control Programmes requires different skills. However, the ICHD student did not get enough "exposure" to Disease/Health Programmes (including an update on technical aspects and policy issues of some specific disease or health problems), and the MDC student was not sufficiently equipped to reflect about the integration impact of Programmes on Health Services and the potential of strengthened health services for the programmes.

Up to recently the interactions between the 2 courses were limited to a "vertical analysis exercise" and ad hoc debates or seminars. The content of the core part of both courses was nevertheless similar, with some parts almost identical (EPISTAT 1, introduction basic concepts of Public Health and Health Services Organisation, tools for decision making, vertical analysis, health policy, IT, communication).

Different options for collaboration have been explored and it became clear it was essential to:

- safeguard the identity of both courses. The 2 courses have been conceived for a specific health professional profile, ICHD has established a reputation through many years and MDC is probably unique and attracts students with a specific background or aspirations. This would be (partially) lost when merging the courses.
- maintain interactive teaching, building on the experience of both participants and teaching staff by working mainly in small groups. Nevertheless, we would like to explore different teaching methods adapted to specific needs of both participants and teaching staff (self study, teaching in larger groups without loosing quality, coached self-learning …).
- keep the internal coherence of our course programmes: flexibility and modularisation should be carefully balanced with internal coherence.

As from 2007/2008 we would organize two MPH Courses with their own orientation: MPH - Health Systems Management and Policy (former ICHD) and MPH Disease Control (former MDC).

To make collaboration possible both courses will start at the same time and have a similar structure with a core course and options. For the transition year 2006-2007, we decided on a new format for some joint assignments, on joint case studies and common sessions for demography and applied epidemiology.

Doctoral studies at the ITM

Eleven doctoral students supervised by ITM defended their dissertations in 2006, among whom 8 from developing countries. Most doctorates have already led to several publications in respected international journals. With the financial support from DGDC, each year the ITM offers up to three competitive PhD scholarships to recent alumni from its institutional Masters programmes. These fellowships (including sustenance, travel and research costs for a period of four years) are awarded to the best students and PhD proposals, in 2006 to young scientists from Bangladesh, Niger and Kenya. Doctoral fellowships can also be obtained within the institutional capacity strengthening programmes of the ITM/DGDC Framework Agreement, as well as in a number of other externally funded projects. Finally, the ITM also offers a limited number of partial PhD fellowships thanks to generous support from private sponsors.

Since 2003, all these doctoral and fellowship schemes have been brought together in one common, institutional programme applying the same rules and conditions for all doctoral students regardless of the funding source or nationality (as far as possible with regards to fiscal and social security regulations). A multidisciplinary doctoral committee, led by Prof. U. D'Alessandro, evaluates and ranks all the PhD projects and fellowship applications. The ITM sandwich scholarship programme was benchmarked against other Flemish and International fellowship programmes which fund individual PhD projects. ITM conditions and results measure up to other Flemish programmes.

Dr Wilber Quispe Tintaya, received the Development Cooperation Price for the year 2005 from Mr A. De Decker, Minister for Cooperation and Development and Dr. Guido Gryseels, Director of the Museum for Central Africa (and brother of our own director).

THESES AND DISSERTATIONS 2006

ITM PhD Theses

Department of Microbiology

Martin A. Rapid and inexpensive tools for the detection of drug resistance in tuberculosis: applicability in the field [dissertation]. Gent: Universiteit Gent, Vakgroep Biochemie, Fysiologie en Microbiologie; Antwerp: Institute of Tropical Medicine, 2006: 141 pp. UGhent promotor P. Van Damme; ITM promotor F. Portaels

Shamputa IC. Molecular epidemiology of tuberculosis focusing on heterogeneity and mixed infection [dissertation]. Brussel: Vrije Universiteit Brussel, Faculteit Geneeskunde en Farmacie; Antwerp: Institute of Tropical Medicine, 2006: 138 pp. VUB promotor F. Portaels ; ITM promotor L. Rigouts

Department of Public Health

Orach CG. Reproductive health services for refugee and host populations in Uganda: policy implications [dissertation]. Brussel: Vrije Universiteit Brussel, Faculteit Geneeskunde en Farmacie, 2006: 166 pp. VUB promotor A.M. Depoorter; ITM promotor V. De Brouwere

Lambert M. Operational research for effective and integrated tuberculosis control [dissertation]. Gent: Universiteit Gent, Faculteit Geneeskunde en Gezondheidswetenschappen, 2006: 129 pp. UGhent and ITM promotor P. Van der Stuyft

Rijal S. Kala-azar in Nepal: from clinical evidence to control [dissertation]. Gent: Universiteit Gent, Faculteit Geneeskunde en Gezondheidswetenschappen, 2006: 138 pp. UGhent and ITM promotor P. Van der Stuyft; ITM co-promotor M. Boelaert

Saizonou JZ. La prise en charge des "échappé belle" dans les maternités de référence au Bénin: évaluation de la qualité des soins obstétricaux d'urgence et des apports de l'audit médical [dissertation]. Bruxelles: Université Libre de Bruxelles, Faculté de Médecine, Ecole de Santé Publique, 2006: 311 pp. ULB promotor B. Dujardin ; ITM promotor V. De Brouwere

Sánchez Valdés L. Proceso y resultados de la prevención comunitaria del dengue. [Dissertation]. Instituto de Medicina Tropical «Pedro Kourí», Subdirección de Vigilancia Epidemiológica, Ciudad de Habana, Cuba, 2006. ITM promotor P. Van der Stuyft

Department of Animal Health

Masumu Mulumbu J. Study of the Trypanosoma congolense population in cattle in trypanosomosis endemic area of Eastern Zambia [dissertation]. Gent: Universiteit Gent, Faculteit Diergeneeskunde, Vakgroep Virologie, Parasitologie en Immunologie, Laboratorium voor Parasitologie, 2006: 118 pp. UGhent promotor J. Vercruysse; ITM promotor P. Van den Bossche

Soumaré B. Towards a sustainable Rift Valley fever certification system for livestock export in Somaliland: socio-economic and epidemiologic risk analysis [dissertation]. Gent: Universiteit Gent, Faculteit Bio-Ingenieurswetenschappen, 2006: 196 pp. UGhent promotor G. Van Huylenbroeck; ITM promotor D. Berkvens

Department of Parasitology

Erhart A. Malaria control in Vietnam: successes and challenges [dissertation]. Antwerpen: Universiteit Antwerpen, Faculteit Wetenschappen; Antwerpen: Prins Leopold Instituut voor Tropische Geneeskunde, Departement Parasitologie, 2006: 173 pp. UA promotor M. Coosemans; ITM promotor U. d'Alessandro

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MSTAH 2005-2006

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Noho Konteh F. Characterization of HAART-induced reconstitution of TB-reactive T cells in HIV patients. Interuniversity Program Molecular Biology (IPMB), 2006; ITM Promotors L. Kestens, P. Ondoa, W. Jennes

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Department of Animal Health

Gauvin N. Optimalisatie en validatie van de cysticercose sandwich ELISA. Plantijn Hogeschool Antwerpen, 2006; ITM promoters P. Dorny, N. Praet

THE LIBRARY

The main aspirations of the library remain collection development, document delivery, and user education. In 2006 much time and energy was invested in the collections and linking the resultant PDFs with the bibliographic databases. Thousands of recent tropical medicine related journal articles, all dissertations of the ITM master courses and 35 years of the 'Annales de la Société Belge de Médecine Tropicale' (1960-1995) are now available online.

The printed book collection grew by 595 new titles: of which 369 purchased and 226 donated - 135 of the latter came from the private collection of the late Honorary Director Prof. Dr. P. G. Janssens. The total number of registered books now stands at 19,926. Book catalogue records are now also being supplemented with electronic contents pages and cover pictures. In the course of 2006 the library's bibliographic databases were consulted 19,407 times in 6,219 separate sessions.

In 2006, we received 1,426 incoming requests and we sent out 1,489 requests for documents and articles. Almost 100% of incoming and outgoing requests are now handled as electronic PDF-versions. Yet, the three library photocopiers still produced some 225,000 hand copies.

After the exceptional 600% increase in 2005, the DocDel programme for electronic document delivery to overseas partners decreased 23% to 994 requests. Mrs. Luong Thi Phuong Mai, librarian of the National Institute of Malariology Parasitology and Entomology (NIMPE) of Hanoi, Vietnam, was trained for two months in library management and information retrieval techniques. Mrs. Birgit Reynders of the Antwerp library school was a trainee for 6 weeks.

The move of the Master classes and the Public Health Department to the Rochus campus was a good starting point for the start of a central ITM document archive. The task to develop strategies and practices has been assigned to the Library.

The librarians made the usual bibliometric analysis of the ITM scientific output of the previous year. While the excellent results of 2004 were not repeated, the long-term trend remains on the rise.

The Centre for Science and Technology Studies (CWTS) of the Leiden University updated our benchmark 2003 study until 2005. Between 1991 and 2005 ITM staff published 1,700 articles that are included in the Thomson ISI Web of Knowledge databases. By the end of 2006 these had received 22,462 citations. The number of articles and citations within the 3 consecutive 5-year periods increase consistently. The HIV research of the early 1990's created a marked peak. In the recent years the indicators are on the rise again.

The Library remains also responsible for the ITM's website. During 2006 it was consulted 619,079 times, an increase of over 50% when compared to 2005. October and November were the top months, with over 70,000 visitors during our centennial celebrations. Apart from the homepage (367,975 hits) the travel health pages (over 280,000 hits) were once again the most popular pages, followed by the job vacancies (37,495 hits). 55% of the pages consulted were in English, 25% in Dutch, 14% in French and 7% in Spanish. Remarkably, Spanish and French are gaining on English, which still accounted for 66% of the hits in 2005.

The library staff.

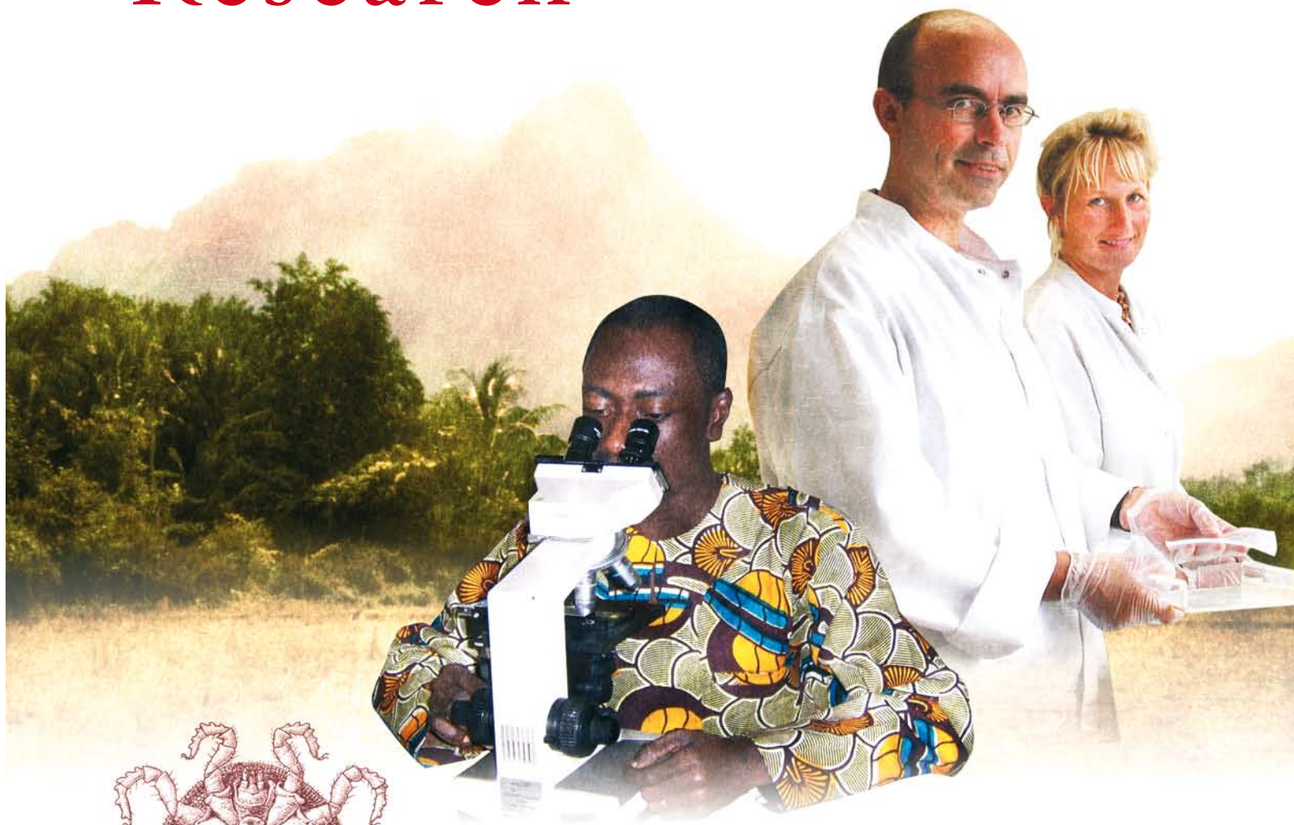
15 years of ITM publications as registered in the Science Citation Index (1991-2005)

ITM	P	C+sc	CPP+sc	CPP/ JCSm	CPP/ FCSm	JCSm/ FCSm	Self Citations
1991-1995	433	2,229	5.15	1.38	1.60	1.16	27%
1996-2000	610	2,775	4.55	1.01	1.15	1.15	33%
2001-2005	657	3,018	4.59	0.84	0.91	1.08	31%
1996-2005	1,267	11,103	8.76	0.86	0.95	1.11	27%
1991-2005	1,700	22,462	13.00	1.05	1.17	1.11	23%

Legend:
P: output: number of ITM publications registered
C+sc: raw impact: total number of citations received (including C+self-citations)
CPP+sc: impact (average number of citations) per publication (including CPP+self-citations)
CPP/JCSm: measure of relative impact of ITM's output compared to the average of its journal set
CPP/FCSm: measure of relative impact of ITM's output compared to the average of its subfield(s)
JCSm/FCSm: measure of relative impact of ITM's journal set in its subfield(s)

Students can work and study in silence in the library.

Research



Animal Health

Clinical Sciences

Microbiology

Parasitology

Public Health

Animal Health

The mission of the Department of Animal Health (DAH) is to improve the health and well-being of the human populations in the tropics by developing, disseminating and applying scientific knowledge of tropical livestock diseases. The department pursues this objective through innovative and applied research, post-graduate training and education, and support for research and control of tropical animal and zoonotic diseases.

Our current research concentrates on biological, epidemiological and preventive aspects of vector-borne diseases, particularly trypanosomosis and theileriosis, on zoonoses such as taeniasis-cysticercosis and brucellosis and on chemo-resistance against anthelmintics and trypanocides.

The department was instrumental to the launch of the Belgian platform 'Tropical Animal Health and Production' (be-troplive)(www.itg.be/betroplive). In November 2006 we organized a symposium 'Strengthening livestock services in the tropics', attended by about 120 participants. The building of the department of animal health was inaugurated and dedicated to its founding father, Prof. J. Mortelmans (1924-2005).

Because of its expertise in the field of bluetongue, an arthropod-borne viral disease of ruminants, the department was requested by the Belgian Food Safety Agency for support in the control of the outbreak of this exotic disease in Belgium.

As a reward for its longstanding research activities in the field of trypanosomosis the department was recognized by FAO as the reference centre for parasite management and diagnosis of livestock trypanosomosis. It is the department's intention to further intensify its activities in this field.

Determination of the infection rates and age of tsetse flies captured at the game/livestock interface in KwaZulu Natal, South Africa.

Opening of the be-troplive founding Symposium 2006 "Strengthening the livestock services in the Tropics"

Public defense of Dr. Huong (Vietnam) to obtain the degree of Master of Science in Tropical Animal Health.

Unit of Veterinary Protozoology

The research of the Unit of Veterinary Protozoology aims at the development and validation of molecular techniques for the detection of drug-resistant trypanosomes, the study of the animal reservoir of *Trypanosoma brucei gambiense,* the molecular epidemiology and control of trypanosomosis and theileriosis and the study of cellular immunity of *Theileria parva* and the development of improved vaccines against East Coast fever. One of the highlights of 2006 was a workshop closing off the project 'Epidemiology and control of bovine trypanosomosis and theileriosis at the game/livestock interface in KwaZulu-Natal Province (South Africa)'.

Unit of Veterinary Helminthology

The research at the Unit of Veterinary Helminthology focuses on helminth zoonoses, including cysticercosis, trichinellosis and fascioliasis. The projects on *Taenia solium* cysticercosis continued in Ecuador, Zambia and Vietnam, and new ones started in India, Nepal, Burkina Faso and Cameroon. They focus on the improvement and assessment of diagnostic tests, understanding transmission dynamics in different epidemiological situations, assessing the disease burden and socio-economic impacts, and measuring the effects of intervention programmes. We also work on protozoan infections in non-human primates and on nematode control in ruminants. This unit currently supervises seven PhD students.

Unit of Animal Disease Control

The Unit of Animal Disease Control was established in 2005. It aims at contributing to the improved control or prevention of livestock diseases, which endanger food security and trade, neglected zoonotic diseases affecting the poor and livestock trypanosomosis. Studies were initiated to determine the impact of certain zoonotic infections in various livestock production systems.

Unit of Epidemiology and Biostatistics

The Unit of Epidemiology and Biostatistics focuses on the evaluation of diagnostic tests and on spatial epidemiology. A method to evaluate diagnostic tests in a multi-testing Bayesian framework was applied in partnership with Ecuador (brucellosis), the European Food Security Agency (EFSA) (salmonellosis), the Veterinary and Agrochemical Research Centre (VAR) (food-and-mouth-disease) and Ghent University (giardiasis, cryptosporidiosis). New models are being developed in collaboration with Leuven University (spatial models applied to rabies data) and the ITM Department of Parasitology. Competitive grants were obtained from FWO (Fund for scientific research) and FOD (Federal Public Service Public Health and Food Security) .

Culicoides obsoletus s.l.: vector of the Bluetongue virus captured during the autumn outbreaks of Bluetongue in Belgium.

PROJECTS

Institutional collaboration with the Department of Veterinary Tropical Diseases (DVTD) of the University of Pretoria, South Africa

To make the transfer of expertise in Southern Africa in the research and control of major parasitic diseases of livestock to other African countries easier, the DAH entered into an institutional collaboration with the DVTD, Faculty of Veterinary Sciences of the University of Pretoria. This collaboration aims at increasing the DVTD's capacity to deal with trypanosomosis, theileriosis and helminthosis The fourth year of this collaboration enabled the support of research in tsetse and trypanosomosis in Malawi and South Africa. Within the framework of the collaboration 7 PhD students and one MSc student are currently conducting their research in the fields of trypanosomosis and tsetse control, Corridor disease and *Theileria* identification, modelling in ovine haemonchosis, canine babesiosis, and tuberculosis. We also supported the development and delivery of the modules on trypanosomosis, tick-borne diseases and helminthology of the web-based MSc course in Tropical Veterinary Medicine that was launched in 2005.

Institutional University Collaboration (IUC-VLIR) with the University of Zambia (UNZA)

The department contributes to the institutional collaboration between the Flemish Inter-University Council (VLIR) and UNZA, in particular the project between the University of Ghent and the UNZA Veterinary school The main objective of this project is to enhance the research capacity of the Veterinary School about relevant veterinary issues in Zambia. In 2006 we participated in capacity strengthening and research on cysticercosis and trypanosomosis. After having demonstrated very high prevalences of taeniasis and cysticercosis in humans in the Southern Province and of cysticercosis in pigs in three provinces, we are now focussing on the human health impact of this zoonosis. Contacts were established with hospitals and health services to set up a case control study on neurocysticercosis and epilepsy in the Eastern Province

Improved diagnosis of drug resistant trypanosomes

Resistance against diminazene aceturate is caused by the loss of activity of a P2-type transporter in *Trypanosoma brucei* due to a set of six point mutations. It was found that in *T. congolense* a single point mutation (G to A) is conferring resistance and appears as a Val 306 Ile amino acid permutation. A PCR-RFLP test was developed as a quick and sensitive tool for the diagnosis of existing or emerging drug resistance to diminazene. This test was further validated with strains originating from Cameroon sharing an excellent correlation with the single dose mouse test (85,7%), the molecular method was more sensitive than the in vivo test.
Investigations were continued to elucidate alternative mechanisms of resistance against isometamidium

Diagnosis and control of animal trypanosomosis in Cameroon

In order to assess the prevalence of trypanocidal drug resistance in the Adamaoua region 48 trypanosome isolates were randomly collected from infected cattle. They were examined using the single dose mouse test and/or molecular tests (PCR-RFLP) for the detection of resistance to isometamidium or diminazene. Resistance to isometamidium and diminazene was detected in 58.7% and 92.9% of the examined *T. brucei* and *T. congolense* isolates, respectively. Since the PCR-RFLP test does not detect all isometamidium resistant strains (more than one mechanism of resistance is involved), the figures underestimate the real prevalence of resistance to isometamidium. The surprisingly high resistance rates are probably due to the large scale mass treatment campaigns using isometamidium and diminazene in the seventies. Action is currently being undertaken to inform the livestock owners about measures to delay the development of resistance and how to maintain the efficacy of the few currently available drugs.

Animal trypanosomosis in Kinshasa

In 2006 the Veterinary Laboratory of Kinshasa (Labovet) pursued the trapping of tsetse flies in the neighbourhood of pig farms around Kinshasa. 1,398 tsetse flies were captured and 678 dissected. All infected flies (6) showed an infection with *Trypanosoma simiae* in PCR-restriction fragment length polymorphism (PCR-RFLP). At the Institute of Medical Research in Yaounde a modified heteroduplex PCR was used to identify *the bl*ood meal of 159 of these flies. Most meals (8,2%) were from pigs.
The department supported the start of the PCR activities in Kinshasa by transfer of biological material and protocols. In 48 pig farms 100 blood samples were analyzed using a nested PCR for the presence of *Trypanosoma spp*. Five samples were positive and will be further characterized.
A survey, carried out to clarify the paradox of the presence of antibodies in pigs at Selembao District where there are no tsetse flies, revealed that the pigs had been purchased in tsetse infested districts.

The field practical of the Tick module organized in Pretoria, South Africa: students capturing a calf for tick collection.

In Antwerp a novel sensitive PCR assay for differentiating *Trypanosoma b. brucei* from *T. b. rhodesiense* and *T. b. gambiense* was further developed. The assay gave different profiles on single-strand conformation polymorphism. A PCR-RFLP was developed differentiating *T. b. gambiense* from *T. b. brucei* and evaluated on a sample of 35 different *T. brucei spp.* and *T. evansi* isolates.

Genetic diversity of the *Trypanosoma congolense* population in cattle

The study on the genetic diversity of *T. congolense* populations was completed. It highlighted the great genetic diversity in the trypanosome population and its repercussions on disease expression in livestock. The data allowed to better understand the epidemiology of livestock trypanosomiasis in southern Africa and to identify priority areas for control. The findings were summarized in a PhD-thesis "The importance of *Trypanosoma congolense* strain diversity in the epidemiology of bovine trypanosomiasis" in December.

The susceptibility of tsetse flies to infections with *T. brucei* and *T. congolense*

Part of the experiments to determine factors affecting the susceptibility of teneral and adult tsetse flies to infections with trypanosomes were finalized in 2006. Adult flies are believed to contribute little to the overall infection rate of a tsetse population. Starving adult tsetse flies (*G. morsitans morsitans*) for a number of days resulted in a significant increase in their susceptibility to infection with *Trypanosoma b. brucei* or *T. congolense, however to* clarify this observation, immunopeptide expression was determined in starved and non-starved flies. Preliminary results suggest that differential expression of immunopeptides in teneral and non-teneral starved or non-starved tsetse flies could form the basis for differences in susceptibility
Experiments with blood meals containing isometamidium continued and showed that starvation decreased the prophylactic effect of this treatment for infection with *T. congolense*.

The ecology of *Glossina austeni* and *Glossina brevipalpis* in KwaZulu-Natal Province, South Africa

Collaborative studies on the distribution and control of Glossina austeni and G. brevipalpis in KwaZulu-Natal Province of South Africa were continued. Special attention was paid to determining the speed of reinvasion by G. austeni and G. brevipalpis after removal of target barriers. Results showed clear differences between the two species with G. brevipalpis reinvading at a much higher speed than G. austeni. Those results are not surprising considering the differences in the behaviour of the two tsetse species but indicate the need for more stringent control measures in areas where G. brevipalpis is present.

Environmental changes in Africa and tsetse habitat fragmentation: epidemiological consequences and perspectives for control

The impact of human expansion and subsequent changes in the vegetation on the density of tsetse and the epidemiology of trypanosomiasis was investigated in the Eastern Province of Zambia. A highly cultivated zone was compared to a sparsely populated area. Preliminary results show a decrease in tsetse density with increasing habitat fragmentation. Four permanent monitoring sites were established for a longitudinal study.

Development and evaluation of a heterologous prime-boost vaccination strategy against *Theileria parva* in a mammalian model.

Specific delivery strategies for ruminants need to be developed to initiate cellular immune responses to *Theileria parva*, as results from mice tests cannot be transposed to cattle as such. Insertion of different *T. parva* PIM epitopes into the Hepatitis B core antigen (HBcAg), a self assembling particle that acts as a powerful T-helper inducer and as adjuvant, could increase the immunogenic properties of the construct. Three gene constructs encoding for different but overlapping HBcAg-*T. parva* PIM peptides gave good results but we experienced problems with particle formation. New constructs are currently being developed and tested. In a second approach to promoting high CTL-response different gene constructs were made using the HSP70 gene from mycobacteria, bovine HSP and HSP from *T. parva* fused to the PIM gene. The three HSP genes have been conjugated to the PIM gene and these hybrid genes will be ligated into a pcDNA4 plasmid, containing the CMV promoter for eukaryotic expression and have been tested in COS-7 cells. Expression levels were satisfactory and it is planned to compare HSP constructs for their stimulation of a CTL-response in vaccination challenge trials.

Development of a control strategy for theileriosis in Rwanda

Molecular identification and characterization of *Theileiria parva* parasites showed the presence of two dominant *T. parva* parasite population groups throughout the country. Molecular analysis of tick samples collected from the vegetation in the various districts showed an infection rate of 1-4% for *T. taurotragi* and of 0.3-7% for *T. parva* depending on the localities. Tick stabilates from the two main *T. parva* genotypes were produced and tested. Preparations for the final cross-immunity testing are under way. This project is also about training the staff of the Central Veterinary Laboratory (CVL, Kigali) in serological, ecological and molecular diagnostic techniques.

Epidemiology and control of bovine trypanosomosis and theilerioses at the game/livestock interface in KwaZulu-Natal Province, South Africa.

Throughout 2006, sentinel herds in the Hluhluwe-iMfolozi Game Reserve were sampled monthly to determine the incidence of trypanosome infections. To determine the intensity of tsetse movement a mark/release/recapture experiment was conducted. Results indicate that *G. austeni* is probably the most important vector, Incidence of infection varied widely between herds.
For theileriosis PIM and p104 markers were used to differentiate *T. lawrencei* from classical *T. parva*. Most of the buffalo samples contained *T. lawrencei* parasites, but sequencing data revealed extensive recombination between viral *T. parva* PIMs. Further characterization using a mitochondrial marker showed the existence of two major *Theileria* lineages corresponding with the *T. lawrencei* and *T. parva* populations. Most *T. lawrencei* recombinants were derived from the classical *T. parva* lineage. This observation suggests that classical *T. parva* has been circulating in South Africa after it was assumedly eradicated in the 1950's, with potential implications for the control of Corridor disease.
Other studies on the distribution and control of *Glossina austeni* and *G. brevipalpis* in KwaZulu-Natal Province of South Africa showed clear differences between the two species.

Protozoan infections in non-human primates in zoological gardens

Gastro-intestinal parasites are important causes of diarrhoea in captive non-human primates (NHP). Data on the prevalence, risk factors and clinical importance of these gastro-intestinal parasites in zoological gardens are scarce. We conducted a cross sectional survey to estimate the occurrence of gastro-intestinal parasites in NHP at 4 zoological gardens in Belgium and collected 917 faecal samples from 259 animals housed in 39 groups. The 30 species involved were representatives of prosimians, New World (NW) monkeys, Old World (OW) monkeys and apes. All samples were microscopically examined after an acetic acid-ether concentration. *Entamoeba coli*, *Entamoeba histolytica/dispar/moshkovskii* and *Giardia* spp. were the most prevalent species. Other species detected were *Endolimax nana*, *Chilomastix mesnili, Iodamoeba bütschlii, Balantidium coli, Entamoeba polecki*-like, *Trichuris* spp. and *Strongyloides* spp. Samples infected with *E. coli* were more prevalent in OW monkeys than in both prosimians and NW monkeys, but did not differ significantly in apes. *E. histolytica* was the most prevalent in OW monkeys. Samples collected from OW monkeys contained the highest number of parasite species.

Vector monitoring during a Bluetongue outbreak in Belgium

Bluetongue, a viral disease of ruminants generally occurring in tropical and subtropical countries, was reported at the Belgian-Dutch border mid-August. The virus, of which 24 different serotypes have been identified, is transmitted by small midges of the genus *Culicoides*. The outbreak in north-western Europe was caused by serotype 8, usually found only in sub-Saharan Africa or South America. The disease rapidly spread to cattle and sheep holdings in Belgium, Germany, Luxembourg and the north of France. The department was asked to organize the monitoring of the vector. We carried out a cross-sectional study in 32 sites where bluetongue clinical cases had been diagnosed. In 28 of these, midges of the *Culicoides obsoletus* complex were captured. Studies by colleagues from the Gembloux Agricultural University, Liege Veterinary Medicine Faculty and the Walloon Agricultural Research Centre, demonstrated that the vector density was correlated to climatological factors and that at low temperatures the vector sought shelter in stables. The vector monitoring programme will be pursued in 2007.

Setting out insect traps for entomological monitoring of *Culicoides* species near Bluetongue outbreaks in Belgium.

Support to the training programme of the OAU/IBAR Centre for Ticks and Tick-borne diseases (CTTBD), Lilongwe

The Centre for Ticks and Tick-borne Diseases (CTTBD) is a Southern African Development Community (SADC) and African Union (AU/IBAR) centre of excellence for training in veterinary epidemiology, vaccine production and backstopping service. CTTBD continued to produce, titrate and test East Coast fever vaccines for Zambia, Kenya, Uganda and Tanzania. In 2006 courses were organized in epidemiology and laboratory diagnostics. The alumni support network continued to function and the CTTBD website was maintained.

The use of DNA immunizations for the identification of candidate CTL antigens using a *Theileria parva* bovine model

This project aims at identifying protective antigens for *Theileria parva* in order to develop a subunit vaccine. The screening method is based on DNA vaccination with candidate antigen constructs and analysis of the resulting immune response. Cattle were vaccinated with the GFP-antigen fusion construct and showed both a GFP and a *Theileria*-antigen specific B- and T-cell response. A homologous challenge with a live sporozoite stabilate showed that one of the two animals was successfully protected. A larger experiment will be set up in order to confirm these findings. The topical structure of the EGFP-PIM protein was also analyzed in COS7 cells using different approaches. It was found that the N-terminal and the central parts of the protein are expressed on the surface.

Improved diagnosis of *Taenia saginata* cysticercosis

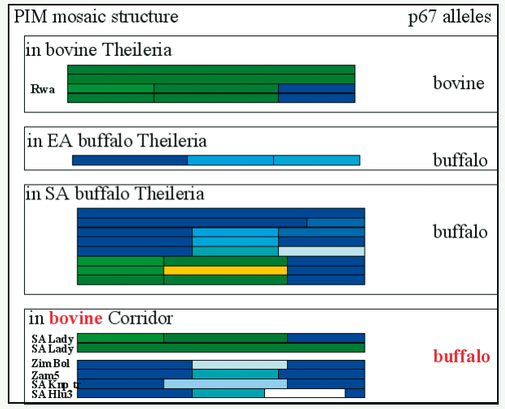
Current techniques for the diagnosis of bovine cysticercosis lack sensitivity. We work on *post-mortem* diagnostic tools aiming at more sensitive methods to support classical meat inspection, especially antigen detection in serum and meat extracts, PCR on suspected lesions and immunohistological and immunofluorescent techniques. We collected samples from infected and control cattle in abattoirs. In addition, we experimentally infected a calf for collection of parasite antigens and reference serum. Monoclonal antibodies are now being produced and screened for use in immunological diagnostic tests.

Vaccination against porcine cysticercosis

In this project we evaluate the protective antibody response induced by a recombinant *Taenia solium* vaccine, comprizing a host-protective protein from the oncosphere. It was cloned from mRNA and expressed in *Escherichia coli* as a fusion protein with glutathione S-transferase (GST) or maltose binding protein (MBP). An inhibition ELISA was used to characterize the protective epitopes of this TSOL 18 antigen. Antiserum from pig immunised with TSOL18-GST was pre-incubated with TSOL18-GST, TSOL18-MBP or the truncated TSOL18 antigens (TSOL18-1 and TSOL18-2). Both antigens TSOL18-GST and TSOL18-MBP can inhibit to 100% the binding of pig antibodies to TSOL18. The truncated TSOL18 antigens did not inhibit antibody binding on their own or combined together. This result indicates that all, or the great majority, of the serum antibody response induced by TSOL18 is directed against antigenic epitopes that are associated with the conformation of the TSOL18 protein and not linear peptide epitopes.

Use of recombinant camelid single domain antibodies for the diagnosis of *Taenia solium* cysticercosis

Antigen detection assays, using monoclonal antibodies raised against excretion secretion antigens from *Taenia saginata,* can be used to detect active cysticercosis in humans. In pigs the use of this test is hampered by the occurrence of cross-reactions with *Taenia hydatigena*. The objective of this project is to produce recombinant single domain antibodies (VHH's) derived from camelid heavy chain antibodies specific for *T. solium* cysticercosis. So far 3 recombinant immune libraries were constructed after immunization of dromedaries. Two animals were immunized with *T. solium* cyst fluid and one animal with *T. solium* excretion secretion antigens. Using phage display technique and biopanning, the first two libraries were screened for specific VHH antibody fragments. This resulted in 7 *T. solium* specific VHH antibodies. These VHH's were sequenced, produced in large quantity in *E. coli* WK6 cells and partially characterized by BIAcore affinity measurement, ELISA and Western blot. These VHH's, together with the VHH's from the third immune library, will be further characterized and adapted for use in a sandwich ELISA to detect active cysticercosis in pigs.



PIM sequence comparison between classical bovine ECf, East African buffalo and South African Theileria and bovine Theileriosis in South Africa. Assignment of corresponding p67 alleles to buffalo or bovine alleles is also shown. Green are sequences found exclusively in bovines, blue are buffalo-derived sequences and differences in darkness represent the level of homology. Brown is a mixed sequence between bovine and buffalo.

Impact assessment and control of cysticercosis in the Indian subcontinent

Taenia solium cysticercosis is a major preventable cause of epilepsy in developing countries. Neurocysticercosis is regularly diagnosed in India and Nepal but data on transmission patterns and the burden of disease are spare. In a first phase, the project aims to provide the evidence base on the presence and impact of *T. solium* infection. Surveys conducted simultaneously in humans and animals from the same environment will enable a comprehensive and accurate approach to study the transmission and the burden. For this purpose, highly sensitive and specific, affordable diagnostic tests will be made available and staff will be trained on these, through north-south and south-south collaboration. In the second phase of the project intervention strategies that are based on data generated in the surveys and on socio-economic considerations, will be implemented in selected areas and monitored.

Zoonoses in Vietnam

Community-based surveys on the transmission dynamics of endemic *Taenia solium* in mountainous areas of North Vietnam confirmed the clustered distribution of human cysticercosis in and around houses of tapeworm carriers. A case-control study on neurocysticercosis and epilepsy has now been initiated. In another study on lesions and cysts in pig's livers we demonstrated that these are mainly due to infections with *T. hydatigena*, a non-zoonotic species..We also studied the prevalence, epidemiology and impact of zoonotic *Fasciola* spp. by using improved diagnostic tools, including serology and molecular-based techniques. We described two cases of ectopic fascioliasis in humans that were caused by *Fasciola gigantica.*

Zoonoses in Ecuador

We have set up a close collaboration with the International Centre of Zoonosis (CIZ) on major zoonoses occurring in the country and the region. The research concentrates on epidemiological surveys and control studies on cysticercosis and brucellosis.In Loja province, preliminary results indicated that between 13 to 17% of the cases of epilepsy are caused by neurocysticercosis. Mapping of bovine brucellosis in Ecuador showed considerable variations and strategies the need for zoning in order to optimize control. The impossibility to distinguish vaccinated from naturally infected animals complicates the interpretation of the test results. The laboratory infrastructure was further strengthened, a serum bank was set up and quality initial mechanics established

A framework for the improved control of zoonoses in developing countries

Zoonoses are diseases that are transmitted from animals to humans. Some zoonotic agents cross the species only occasionally, but spread in humans while other require the constant presence of an animal reservoir. They may be transmitted directly through the environment, vectors or food. As a result of this diversity, control of zoonoses requires disease-specific approaches. We try to develop a framework for the control of two zoonoses of the poor (brucellosis and tuberculosis). These threaten mainly rural populations that are in close contact with livestock or fresh livestock-derived products. In collaboration with the departments of public health and microbiology and local partners, studies were initiated in four different farming systems: a pastoralist system in southern Ethiopia, a subsistence mixed farming system in Eastern Zambia, small commercial settings in Kenya and a subsistence mixed farming system adjacent to a game park in KwaZulu-Natal, South Africa.

Epidemiology and control of zoonotic infections in the Gambia and Senegal

This project started with a kick-off meeting. The aim is to carry out epidemiological studies on brucellosis in cattle, cysticercosis in pigs and salmonellosis in poultry in Western Division of The Gambia and in the Casamance (Senegal), and to design packages for prevention and control under local conditions. Three PhD-students will be trained.

PROMOTERS & SUPPORT

Institutional collaboration with University of Pretoria, South Africa
ITM promoters: P. Dorny, P. Van den Bossche
External promoter: J.A.W. Coetzer (UP)
Support: DGDC, University of Pretoria

Institutional University Collaboration (IUC-VLIR) with the University of Zambia
ITM promoters: P. Dorny, P. Van den Bossche
External promoters: I.K. Phiri (UNZA), J. Vercruysse (UG)
Support: DGDC, VLIR

Improved diagnosis of drug resistant trypanosomes
ITM promoters: V. Delespaux, S. Geerts
Support: ITM

Diagnosis and control of animal trypanosomosis in Cameroon
ITM promoter: S. Geerts
External promoters: A. Zoli (University of Dschang, Cameroon), E. Van Marck (UA)
Support: VLIR

Animal trypanosomosis in Kinshasa
ITM promoters: R. De Deken (ITMA), M. Boelaert
External promoters: J. Sumbu (Labovet)
Support: DGCD

Genetic diversity of the *Trypanosoma congolense* population in cattle
ITM promoters: P. Van den Bossche, D. Geysen
External promoter: A. Bechin (VUB)
Support: FWO; PhD grant (DGDC)

The susceptibility of tsetse flies to infections with *T. brucei* and *T. congolense*
ITM promoter: P. Van den Bossche
Support: FWO; IAEA; PhD grant (DGDC)

The ecology of *Glossina austeni* and *Glossina brevipalpis* in KwaZulu-Natal Province, South Africa
ITM promoter: P. Van den Bossche
External promoters: G. Vale (NRI, Zimbabwe)
Support: DGCD, OVI (South Africa), PhD grant

Environmental changes in Africa and tsetse habitat fragmentation
ITM promoter: P. Van den Bossche
External promoters: Avia-GIS (Belgium), CIRAD (France), Oxford University (UK), B. Calvin (ULB)
Support: Wellcome Trust

Development and evaluation of a heterologous prime-boost vaccination strategy
ITM promoter: D. Geysen
External promoters: Y. Guisez, I. Degoeyse (UA), B. Goddeeris (KUL).
Support: FWO, BOF (UA).

Development of a control strategy for theileriosis in Rwanda
ITM promoter: D. Geysen
External promoters: J. Vercruysse (UG), I. Gafarasi and T. Bazarusanga (CVL, Kigali)
Support: VLIR

Epidemiology and control of bovine trypanosomosis and theilerioses
ITM promoters: S. Geerts, P. Van den Bossche, D. Geysen
External promoter: K. Coetzer (University Pretoria)
Support: BWS

Protozoan infections in non-human primates in zoological gardens
ITM promoter: P. Dorny
External promoters: F. Vercammen (Royal Zoological Society of Antwerp)(RZSA), J. Vercruysse (UG)
Support: Flemish community, RZSA

Vector monitoring during a Bluetongue outbreak in Belgium
ITM promoters: P. Dorny, R. De Deken, M. Madder
Support: FOD, FAVV

Support to the training programme of the OAU/IBAR
ITM promoter: D. Berkvens
Partner promoter: Misheck Mulumba (CTTBD)
Support: DGDC, DANIDA, Dutch Development Cooperation, PACE

DNA immunizations for the identification of candidate CTL antigens using a *Theileria parva* bovine model
ITM promoter: D. Geysen
External promoter: B. Goddeeris (KUL)
Support: FWO

Improved diagnosis of *Taenia saginata* cysticercosis
ITM promoter: P. Dorny
External promoter: G. Caethoven (Plantijn Hogeschool)
Support: PWO (Thematic Scientific Research)

Vaccination against porcine cysticercosis
ITM promoters: S. Geerts, P. Dorny
External promoters: M. Lightowlers (University of Melbourne); A. Zoli (University of Dschang, Cameroon)
Support: Wellcome Trust (UK)

Use of recombinant camelid single domain antibodies for the diagnosis of *Taenia solium* cysticercosis
ITM promoter: P. Dorny
External promoters: S. Muyldermans (VUB), J. Vercruysse (UG)
Support: IWT, FWO

Impact assessment and control of cysticercosis in the Indian subcontinent
ITM promoter: P. Dorny
External promoters: V. Rajshekhar (CMC India); D.D. Joshi (NZFHRC Nepal); J. Vercruysse (UG)
Support: VLIR

Zoonoses in Vietnam
ITM promoter: P. Dorny
External promoters: D.C. Thach (NIMPE), N. T. G. Thanh (NIVR), L.T. Hoa (NIB)
Support: DGDC, VLIR

Zoonoses in Ecuador
ITM promoter: D. Berkvens
External promoters: W. Benitéz-Ortíz, C. Saegerman (ULg), C. Walravens (VAR).
Support: DGDC, Universidad Central del Ecuador, BTC

A framework for the improved control of zoonoses
ITM promoters: P. Van den Bossche, P. Van der Stuyft
Support: DGDC

Epidemiology and control of zoonotic infections in the Gambia and Senegal
ITM promoter: S. Geerts
External promoters: C. Ly, A. Schönefeld (ITC, The Gambia), E. Van Marck (UA)
Support: VLIR

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Clinical Sciences

The Department of Clinical Sciences consists of the Unit of Tropical Medicine and Clinical Biology (including the subunit Medical Mycology), the Unit of Travel Medicine (with focus on travellers and migrants in Europe) and the Unit of HIV/Sexually-Transmitted Diseases (clinical research in Europe and in developing countries). Its aim is to provide training, conduct research and offer services in clinical tropical medicine and HIV/AIDS. Most of the staff is also active in the ITM's Medical Services. The Department was strengthened by Jan Jacobs, who takes up the leadership of the clinical biology subunit.

Research in Europe

The Unit of Tropical Medicine and Clinical Biology finalized the lengthy study of fever among travellers, resulting in nine publications. The database with 2,000 patients was used to set up a novel interactive expert system, functioning with the Kabisa logic. An internal validation was concluded. The TropNetEurop collaboration focused on severe malaria and schistosomiasis and our unit particularly handled criteria for ambulatory treatment of malaria cases.

The clinical biology subunit studied the pathogenicity of intestinal parasites, the development of PCR diagnosis for malaria and the transmission of the infection by identifying fingerprints.

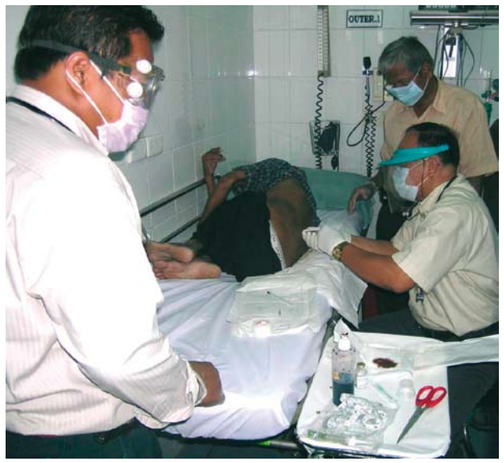
The Unit of Travel Medicine finalized studies on conditions that interfere with vaccination and prevention prescription, the effect of travel counselling on knowledge and behaviour, and on sexual risk behaviour during travel.

The STD/HIV Unit participated in nine multi-centre clinical trials of investigational drugs, four expanded access programmes of anti-retroviral drugs, and two treatment protocols on chronic hepatitis-C/HIV co-infection. The unit closely monitors a large cohort of HIV-infected patients and participates in the EuroSIDA network.

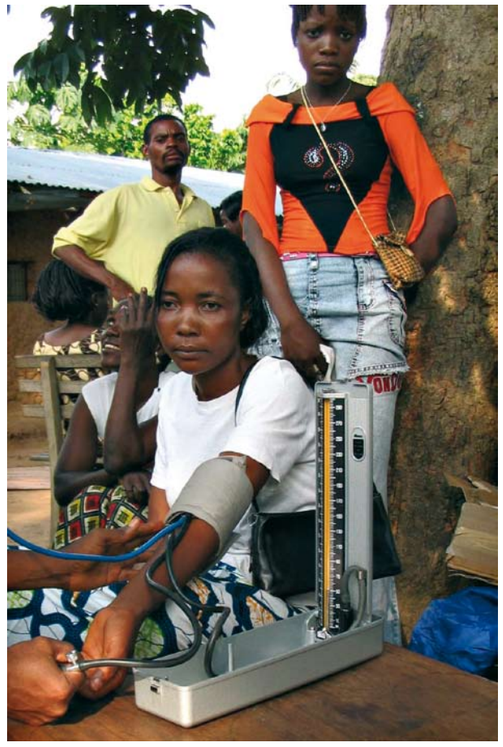
Since 2006 a sub-unit of health promotion was established, overseeing three projects. The Eurosupport project, coordinated by the ITM since 1996, focuses on the changing needs of HIV/AIDS patients in various European countries. The HIV-SAM project, promotes sexual health and prevention of STIs among African migrants living in Flanders. The Helpcenter project conducts operational and policy research on primary and secondary prevention within urban riskgroups.

Research in the South

In the South we concentrate our efforts on institutional collaborations with clinical or diagnostic centres in Lima, Peru (Institute of Tropical Medicine of the Universidad Peruana Cayetano Heredia); Phnom Penh, Cambodia (Sihanouk Hospital Centre of HOPE); Kigali, Rwanda (Centre Hospitalier Universitaire); Kampala, Uganda (Makerere University); Kinshasa and Mozambique (Tete Regional Hospital). The main themes are AIDS, malaria, tuberculosis, sleeping sickness and typical parasitic diseases.



Dr. Un Phally, Sihanouk Centre of HOPE, Cambodia, teaches a trainee from a provincial hospital how to perform a lumbar puncture.


Bloodcollection in open air in Kikwit Bandundu DR Congo.

In the Sihanouk Hospital Centre of HOPE in Phnom Penh, Cambodia, the number of patients under HAART (Highly Active Anti-Retroviral Treatment) steadily increases (now at 1,100). 37 Cambodian doctors have received advanced training and several research projects are ongoing. The capacity of the laboratory was further strengthened and formal quality management was started up.

In Peru, our support focuses on management of the cohort database and research on sporotrichosis, PCP *(Pneumocystis carinii pneumonie)* and cryptococcosis.

At the Centre Hospitalier Universitaire de Kigali, Rwanda, three important research projects were concluded in 2006: diagnosis of TB in children, HIV diagnosis in infants less than 18 months old and validation of algorithms in immunocompromised patients. New protocols were written on the outcome and adverse reactions of TB treatment in adults, diagnostic markers in cerebral malaria and malarial splenomegaly. Several training sessions in clinical research were organized, and general support to the "cellule de recherche" provided.

In Burkina Faso we collaborate in a research project on the diagnostic and economic effects of introducing Rapid Diagnostic Tests for malaria at the health centre level. More than 6,000 patients are included; the data of the dry season are being analyzed.

In Mozambique we take part in a multi-facetted integrated project to fight HIV/AIDS and STI in the Province of Tete, in collaboration with the Provincial Health Department, Médecins Sans Frontières and the University of Ghent. Our contribution focuses on strengthening the clinical and technical capacity for HIV/AIDS diagnosis and treatment, and developing epidemiologic and operational research.

In Uganda, we closely collaborate with the Infectious Diseases Institute (IDI) in Kampala. A new model of scaling up anti-retroviral treatment in urban settings is being developed, establishing a referral system, upgrading the responsibilities of nursing staff, group and individual therapy counselling and custom built databases for patient information.


The ITM's clinical laboratory.

PROJECTS

Febrile illnesses after a stay in the tropics

In this prospective observational study at the ITM and the University Hospital Antwerp, we investigate the aetiology and outcome of imported fever. By December 2006, 2,252 returning travellers or migrants had been included. Several papers have been published this year, describing the epidemiology and prognosis of imported fever in this cohort, investigating the confirming and excluding power of diagnostic predictors for the main tropical conditions, and documenting the features of several neglected imported diseases. The safety of our (rather unique) selective ambulatory management of *Plasmodium falciparum* malaria has also been evaluated. The data during this long study allowed us to upgrade our Kabisa learning programme into an evidence-based expert system dedicated to usual pathologies seen in travel medicine.

Training for Kabisa in Vientiane, Laos.

Diagnosis of intestinal parasites

This prospective study aims to determine whether examination of fixed stool samples, detection of antigen, and PCR have an added value to the conventional diagnostic method (direct examination and ether sedimentation of fresh stool samples). We also analyze the pathogenicity of various intestinal parasites. Around 2,700 samples have been collected and analysis is ongoing.

European Network on Imported Infectious Disease Surveillance (TropNetEurop)

The European Network on Imported Infectious Disease Surveillance (TropNetEurop) (www.tropnet.net), founded in 1999, is a collaborative association of 45 European tropical clinical centres in 16 countries, with a total post-travel patient turnover of approximately 57,000 per year. The main focus is currently on imported malaria, schistosomiasis, dengue and leishmaniasis studied by means of a web based questionnaire.

Telemedicine

In 2003, the ITM set up a hybrid web/e-mail discussion forum, accessible on a medical website (http://telemedicine.itg.be), to support and guide physicians working in resource-limited settings in the medical decision-making and management of difficult HIV/AIDS cases. Between April 2003 and December 2006 we received 619 second opinion requests, from more than 30 resource-constrained countries: 75% of the tele-consultations directly supported management of complex medical problems in a specific patient and 25% were questions in the field of organization of health services for HIV prevention, treatment and care, vaccination programs and guidelines delivery.
Interesting clinical cases and recurring questions are elaborated as case rounds or frequently asked questions.. Physicians get policy documents, guidelines and continuous medical education material in the field of HIV/AIDS care on the website, with an emphasis on low resource settings.
A formal survey was conducted in 2006 to evaluate the clinicians' perception of the ITM's Telemedicine service. 53% of the "active users" responded. 78% of responders claim that the service was beneficial for the establishment of the diagnosis, 55% judge that the advice given is instructional for the referring physician, and 39% consider the advice as a reassuring confirmation of their own medical practice.

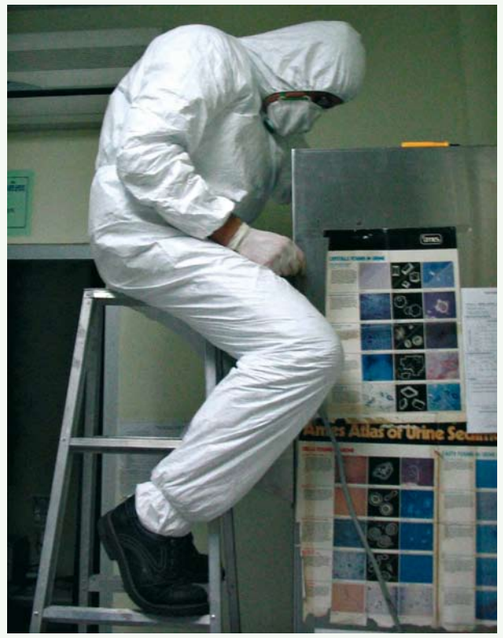
In September 2006, following the SCART, we organized a one-week workshop on the practical use of the Telemedicine website and ITM library document delivery for 4 participants from Cambodia, Mozambique and Uganda. Topics like "How to access free literature online" and "How to manage the database of references by using Reference Manager" were also included in this workshop.

Mycology Research

In collaboration with the Scientific Institute of Public Health (IPH), Brussels, the unit organizes an annual survey on cryptococcosis in Belgium. We have a close working relationship with the Mycology Laboratory at the Institute of Tropical Medicine in Lima (Peru) on the molecular epidemiology of sporotrichosis.

Eurosupport V: improving sexual and reproductive health of persons living with HIV/Aids (PLWHA) in Europe

ES V is a 3 year (2005-2008) research project on assessing sexual and reproductive health (SRH)-related problems and needs of PLWHA, such as positive prevention (i.e. prevention with and for PLWHA), sexual problems, and fertility regulation.
An expert network of 17 HIV-treatment centres in both Western and Central/Eastern Europe carries out the research. We adopt a multi-method approach. The project consists of three research phases: 1) Formative research: qualitative data assessment using grounded theory and focus group methodology to assess SRH-related problems and needs among PLWHA and service providers. 2) Cross-sectional study with the objective to assess factors influencing sexual risk taking among PLWHA; and 3) Policy-oriented research: assessing evidence-based models of service provision in European clinical care settings.
Phase 1 has been completed. On the basis of its results (and further empirical evidence) a self-reported questionnaire has been developed in 2006 to assess factors influencing sexual risk taking. The instrument has been piloted and translated (including back translation) in the respective languages of all participating countries. Data collection is currently ongoing across Europe, and the policy research is being prepared.
Project results are continually disseminated through an electronic newsletter (two editions in 2006), a web-forum (www.sensoa.be/eurosupport) and regular electronic circulars.



Jan Jacobs providing technical assistance to the laboratory of the Sihanouk Hospital Centre of Hope (Phnom Penh, Cambodia): replacing the HEPA filter of a biosafety cabinet.

HIV-SAM: Promotion of sexual health and prevention of STIs among African migrants living in Flanders

The objective of the programme is to improve sexual health and HIV/STI prevention among Sub-Saharan African migrants (SAM), the second largest group affected by HIV in Belgium. Training intermediaries is an important strategy, which enables the regular health care and social welfare sector to address the target group of African migrants.
The current project builds on previous results and continues working with the HIV prevention networks that have been established in 3 Flemish provinces. These networks consist of social leaders and volunteers carrying out prevention activities such as free condom distribution and awareness raising; the project's efforts in 2006 were targeted towards a "train the trainers" approach to assure the quality of the prevention interventions. Prevention for PLWHA from the African migrant population includes a professionally facilitated patient support group (Muungano) as well as culturally sensitive face-to-face counselling.
The project also carries out research to further develop culturally adequate prevention strategies: in 2006, a qualitative study on assessing barriers to VCT among African migrants was conducted, as well as a study on the needs of health care staff of HIV outpatient clinics.

Assessing sexual risk reduction needs of adolescents living with HIV in a clinical care setting

Both clinical and scientific evidence show that young people living with HIV need tailored support in reducing sexual risk behaviour, but few interventions have been developed in a cultural sensitive context.
This cross sectional qualitative study determines the needs of HIV-positive adolescents in terms of sexual risk reduction and dual protection needs (i.e. STI and unwanted pregnancy), as well as their own perception on factors that influence their sexual risk taking. The study is carried out at the Paediatric Infectious Disease Clinic at Mulago Hospital (Kampala, Uganda), and targets adolescents aged 10 to 19 years. Data were acquired through focus group (FG) research on information on health risks, motivation to reduce risk taking, and behavioural skills. In September 2006, a workshop with clinic staff was organized to train them in formative research techniques. A total of 9 focus groups were carried out (with about 90 adolescents). A service providers' FG assessed the perceptions of reduction counseling**.**
Data will be analyzed emphasising a gender-specific dimension; the outcome forms evidence to develop a tailored intervention to promote sexual and reproductive health of youth living with HIV. In 2007, a workshop will be organized to start conceptualizing such an intervention with the participation of all stakeholders.

EuroSIDA cohort study

The EuroSIDA study is a prospective observational cohort study of more than 9,700 patients, followed up in 72 hospitals in 26 European countries. The main objective of the study is to assess the impact of anti-retroviral drugs on the outcome of HIV-infected patients in Europe. In 2006, the Unit of HIV/AIDS care took part in the cohort II-VI and DAD studies.

ITM HIV cohort database

Our unit had developed a custom-made electronic database, generating clinical, scientific and policy oriented data. We are still converting different databases to a central SQL database and restructuring validation procedures.. At the end of 2006 long-term data of 1,429 HIV-positive adults had been entered, making up the largest cohort of HIV positive adults in Flanders. It enables us to develop clinical research projects, especially on side-effects of anti-retroviral treatments, and provide clinical and epidemiologic data for virological, immunological and pharmalogical studies. Data have been extracted and sent to the Scientific Institute for Public Health (WIV) for the clinical monitoring of HIV infection at national level. We use the database to improve the quality of care, e.g. for the early detection of patients who are lost-to-follow-up and of treatment failure. Our data were used in a pharmaco-economic study ("Medical resource utilisation and cost of HIV-related care in the highly active anti-retroviral therapy-era in Belgium").

SMS study

A prospective, multi-centre randomized controlled trial determined the Short Message Services (SMS) as an extra tool to support patients' adherence to Anti-retroviral Treatment. The study had to be stopped early for logistic reasons, even though important conclusions could be drawn. Based on the visual analogue scales, we could see that the SMS group (p=0.005) took their drugs on the exact time. This was confirmed in a closed question: patients in the SMS group mentioned significantly more pill intakes within the stipulated time interval compared to the patients in the control group (p=0.002).) Almost 14% of all participants were concerned about the confidentiality of the system. This did not diminish significantly after three months (p=0.76) but they all agreed to start or continue the system after the study period. It was concluded that short standard messages may improve self reported adherence levels in a well defined group of patients.

Collaboration with the CHUK, Rwanda

The "Centre Hospitalier Universitaire de Kigali" (CHUK) is the main reference and training hospital of Rwanda. We support the set-up of a clinical research unit focusing on infectious diseases and aiming at the improvement of diagnostic and therapeutic strategies for clinical practice. In 2006 research projects on TB in children, HIV diagnosis in infants and validation of several algorithms in immune-compromised patients were concluded and presented at national level. Ongoing research concentrates on outcome and adverse reactions of TB treatment in adults, on diagnostic markers in cerebral malaria in children and adults, and on diagnostic markers in children with (malarial) splenomegaly. The laboratory was enriched with a fluorescence microscope for he diagnosis of TB and for parasitological serology.

Cambodia clinical AIDS care

The Sihanouk Hospital Center of HOPE (SHCH) in Phnom Penh is a privately funded NGO-hospital that combines high accessibility with quality care, and provides post-graduate training to Cambodian health professionals. It plays a national role as a referral and training hospital for HIV/AIDS. The ITM coaches the infectious diseases department and the laboratory. In order to reinforce the diagnostic, clinical and research capacity, and thus its role as a national and regional training centre for HIV

Dr Sopheak gives post-graduate training to health professionals.

TB culture techniques were started up at the SHCH in Cambodia.

clinical care. By the end of 2006, 1,647 HIV patients were in active follow-up, of which 1,115 were on ART. An additional 13 doctors from other public hospitals and NGOs were trained in HIV medicine, bringing the total to 37. We introduced new TB diagnosis techniques, based on fluorescence microscopy and mycobacterial cultures. The electronic database, established in 2003, was monitored in 2006 with an excellent match between patient's file and the database. ArtJournal has been finalized as a freeware database for HIV programmes, and can be freely downloaded from the telemedicine website (www..telemedicine.be). Guidelines for the monitoring of the HIV database are available. The doctors of the Infectious Diseases Unit are actively involved in the national AIDS programme (monitoring and evaluation and training of medical staff). A working group on research meets on a regular basis. In 2006 the hospital staff presented 4 abstracts at international conferences. Three EC/DGDC/ITM funded research protocols were implemented, and three more protocols on TB/HIV co-infection were developed and submitted to the WHO-TDR's Capacity Strengthening Programme for funding. A joint collaborative research project on diagnosis of smear-negative TB was started with US-CDC.

Institutional collaboration with the Instituto de Medicina Tropical of the Universidad Peruana and hospital Cayetano Heredia in Lima, Peru

The institutional collaboration with this institution in Peru involves several departments. The clinical component focuses for the moment on HIV care. In 2006, the number of HIV/AIDS cases in Peru was estimated at 93,000 and 52% of the target population was receiving free ARV therapy through the National HAART Programme. Our support concentrates on the management of the cohort database and data-analyses and write-up. In December 2006 Dr David Iglesias attended the TB-IRIS workshop in Kampala Uganda.

Collaboration with the Infectious Diseases Institute (IDI) in Kampala, Uganda

The IDI is a centre of excellence for HIV/AIDS at the Makerere University (Mulago Hospital) in Kampala. Professor Colebunders helped to set up this institute and is currently participating in a Professor in residence-programme. The IDI provides free care for 17,000 adults and 3,000 children with HIV. More than 4,000 are under HAART, and 1,000 of them are followed at regular intervals with routine CD4 and viral load testing. A new model of scaling up anti-retroviral treatment in urban settings is being developed, establishing a referral system, upgrading the responsibilities of nursing staff, group and individual therapy counselling and custom built databases for patient information. The training programme of the IDI focuses on anti-retroviral therapy and comprehensive care for HIV/AIDS. The IDI participates in clinical, operational and laboratory research. Recently the IDI hosted the first international workshop on Tuberculosis Immune Reactivation Inflammatory Syndrome (TB IRIS), with funding from the EDCTP and the ITM/DGDC framework agreement and it also obtained an EDCTP grant to build capacity in Uganda for phase III trials of TB vaccines and to establish a trial site Demographic Surveillance Site (DSS) in Iganga/Mayuge. The IDI will coordinate a study on adherence and retention rates in anti-retroviral roll out programmes in 5 Ugandan HIV treatment centres. Other projects include the effect of anti-retroviral treatment on HIV related symptoms and signs, methods to predict anti-retroviral treatment failure, side effects of anti-retroviral treatment, the efficacy of second line anti-retroviral treatment and HIV TB co-infection.

AIDS care project in Tete, Mozambique

Since February 2004, the ITM takes part in a multi-facetted integrated project financed by the Flemish government to fight HIV/AIDS and STI in the Province of Tete, Mozambique, in collaboration with the Provincial Health Department, Médecins Sans Frontières and the University of Ghent.
The ITM concentrates on strengthening the clinical and technical capacity for HIV/AIDS diagnosis and treatment, and developing epidemiologic and operational research in the Provincial Hospital of Tete. The main components are: (1) training medical professionals in the area of opportunistic infections and anti-retroviral treatment; (2) increasing access to diagnosis and treatment of HIV-related conditions for hospitalized patients (3) increasing the capacity of the laboratory to diagnose opportunistic infections, especially tuberculosis; and (4) investigating the cost-efficiency of alternative laboratory tests (CD4 testing) to monitor the response to ART.
Since August 2005, Dr. Mieke Ponnet is the medical coordinator for ITM in Tete. Until June 2006 Solon Kindane, an ITM laboratory technician, was in charge of the laboratory and the blood bank of the HPT. Internal cross-sectional surveys conducted in 2006 showed a significant improvement of the quality of HIV/AIDS care in the medical departments of the Provincial Hospital of Tete. In September 2006, external consultants positively evaluated the 3-year achievements of the global integrated project and backed further support to the Mozambican Provincial Health Direction. The project will extend until 2009.

Malaria rapid diagnostic test project in Burkina Faso

This research project aims at evaluating the effects of introducing Rapid Diagnostic Tests for malaria at the health centre level. More than 6,000 patients are included; the data of the dry season are being analyzed. The first results show an impressive neglect of the diagnostic value of RTD's by the clinical officers, and moreover, a decrease in other diagnoses. Once malaria has been diagnosed, the clinicians stop to consider other possible diseases.

Staff of the Sihanouk Hospital Center of HOPE in front of the main building, at the occasion of its 10th anniversary in November 2006.

PROMOTERS & SUPPORT

Febrile illnesses after a stay in the tropics
ITM promoters: E. Bottieau; J. Van den Ende
ITM collaborators: J. Clerinx, A. Van Gompel, E. Van den Enden, R. Wouters
Support: ITM

Diagnosis of intestinal parasites
ITM promoter: M. Van Esbroeck
External collaborators: R. ten Hove, J. Verweij, L. Van Lieshout, A. Polderman (Leiden University, The Netherlands)
Support: ITM

TropNetEurop
ITM collaborators: All clinicians and clinical biologists
External collaborators: T. Jelinek (Berlin University, network co-ordinator); 45 European clinical infectious disease units
Support: ITM

Telemedicine
ITM promoters: L. Lynen and M. Zolfo
External collaborators: S. An (Sihanouk Centre of Hope, Phnom Penh, Cambodia), MSF B projects, K. Brauchli (Switzerland), M. Batenganya (Guyana), Tove Sorensen (WHO collaborating centre on telemedicine, Norway)
Support: ITM; DGDC

Mycology research
ITM promoter: D. Swinne
External collaborators: I. Surmont (Roeselare); Scientific Institute of Public Health, Brussels
Support: ITM

Eurosupport V: Improving sexual and reproductive health of persones living with HIV/Aids in Europe
ITM promoter: R. Colebunders, C. Nöstlinger
External collaborators: 17 HIV-treatment centres in 14 European countries (Austria, Belgium, Czech Republic, Germany, Greece, Hungary, Italy, Latvia, Poland, Portugal, Slovak Republic, Spain, Switzerland, United Kingdom)
Support: European Commission; ITM; private sponsors

HIV-SAM: Promotion of sexual health and prevention of STIs among Africans living in Flanders
ITM promoter: C. Nöstlinger
Support: Flemish Government (Ministry of Welfare); Provinces of East Flanders and Antwerp; ITM

Assessing sexual risk reduction needs in Uganda
ITM promoter: C. Nöstlinger
External collaborators: S. Bakeera-Kitaka, Paediatric Infectious Disease Clinic, Mulago Hospital
Support: ITM; private sponsors

EuroSIDA cohort study
ITM promoter: R. Colebunders
External collaborators: 72 European hospitals
Coordinating institute: Copenhagen

ITM HIV cohort database
ITM promoters: E. Florence, A. De Roo
External collaborators: E. Rubbrecht, All Direction®
Support: ITM; private sponsors

SMS study
ITM promoters: P. Desmet, L. Apers
External collaborators: KUL, Stuivenberg, Brugmann, Iris Sud Ixelles, UCL and St-Pierre Bruxelles.
Support: ITM, unrestricted grant of a pharmaceutical company.

Institutional collaboration with CHUK, Rwanda
ITM promoters: J. Van den Ende, J. Clerinx
External collaborators: P. Munyarugamba, J. Mugabekazi, J. Vyankandondera, E. Kayibanda (CHUK, Rwanda)
Support: DGCD

Cambodia clinical AIDS care
ITM promoter: L. Lynen
External collaborators: T. Sopheak, SHCH staff (Phnom Penh, Cambodia), Brown University; MSF-B in Cambodia
Support: ITM; DGDC; European Commission

Institutional collaboration with IMT, Peru
ITM promoter: J.C. Dujardin, L. Lynen for HIV component
External collaborators: E. Gotuzzo, D. Iglesias, C. Seas (IMT Lima, Peru)
Support: DGDC

Collaborative project with IDI, Uganda
ITM promoter: R. Colebunders
Support: The Academic Alliance Foundation; ITM; Fund for Scientific Research – Flanders (FWO, Brussels, Belgium), EDCTP, CDC, private funds

AIDS care project in Tete, Mozambique
ITM promoters: V. Huyst, E. Bottieau
ITM collaborators: M. Ponnet, S. Kindane
External collaborators: DPS of Tete, MSF-L in Mozambique, University of Gent
Support: Flemish Government (VLAIS)

Malaria rapid diagnostic test project in Burkina Faso
ITM promoter: J. Van den Ende
ITM collaborator: C. Lodesani
External collaborators: A. Angheben, T. Halidou, S.B. Sirima, K. Van den Ende, F. Gobbi, G.Baracca, Z.Bisoffi.
Support: MLAL, IMTA

PUBLICATIONS

Publications in international peer-reviewed journals

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Cambodian researchers present their research results on the International Aids congress in Toronto.

Microbiology

The main goal of the Department of Microbiology is to improve the knowledge and the control of the Human Immune Deficiency Virus (HIV), Tuberculosis (TB) and Sexually Transmitted Infections (STI), especially in developing countries. The Department has four scientific units: Virology, Immunology, Mycobacteriology and STD/HIV Research & Intervention. It also houses the service-oriented AIDS Reference Laboratory.

The main research areas are molecular variability and fitness of HIV and implications for vaccine development, diagnosis and treatment; epidemiological and immunological studies of HIV and interactions of HIV with other infections; prevention, diagnosis, treatment and control of HIV and STI in developing countries; development and epidemiological application of diagnostic techniques for tuberculosis, drug resistance and other mycobacterial diseases.
Our educational objectives focus on advanced, post-graduate professional and scientific training programmes at the ITM as well as at universities and in international programmes.
Our service provision consists mainly of national and international diagnostic reference tasks, and support to partner institutions and control programmes in developing countries.

Unit of Virology

Our various HIV-related projects continued in 2006: (1) prevention: neutralizing antibodies and evaluation of candidate microbicides, (2) pathogenesis: viral transmission, fitness and interaction with the interferon system and (3), therapy: preparation of immunotherapy, using autologous dendritic cells and monitoring HIV drug resistance. Our collaboration on Human T lymphotropic Virus-1 (HTLV-1) in Peru was prolonged as a VLIR project. We obtained one major grant from the Bill and Melinda Gates foundation (BMGF) on vaccine development. A new grant from ANRS will enable us to test our immunotherapy strategy in SIV-Infected macaques. Ms. Tine Vermoesen left our Unit after five productive years of developing pseudovirus particles and joined the AIDS Reference Laboratory at our Institute. Ms. Liesbeth Heyndrickx joined our Unit to work in the BMGF project.

Unit of Immunology

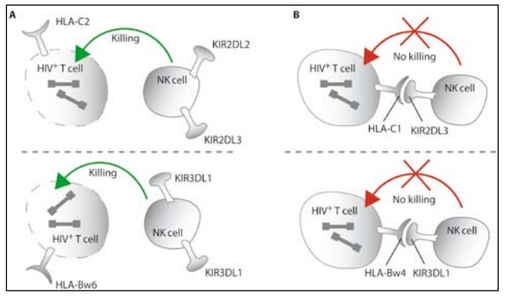
The Unit of Immunology continued its research on cellular immunology of HIV with projects on correlates of protection from HIV infection, the use of pseudoviral particles in the monitoring of cellular immune responses and capacity strengthening of immunology projects in the South. The study of qualitative defects of ART-induced immune reconstitution and their impact on HIV-disease progression has become an important research theme of our laboratory. Preliminary laboratory experiments support our field research activities on immune restoration in Senegal. The implementation of a new EC FP 6 research project on the pathogenesis of the tuberculosis-associated Immune Reconstitution Inflammatory Syndrome (IRIS), an important complication of anti-retroviral treatment in developing countries, started in Kampala, Uganda. Wim Jennes supervized the study of resistance to HIV in persistently HIV-exposed seronegative (ESN) subjects in Dakar, Senegal.

Pascale Ondoa (middle) and Luc Kestens (left) attend a meeting in Kampala, Uganda in December 2006 on the immune reconstitution inflammatory syndrome in HIV patients co-infected with tuberculosis. On the right, Maarten Schim van der Loef from the Academic Medical Centre (AMC) of Amsterdam.

Wim Jennes presenting at AIDS Vaccine conference in Amsterdam, 29 August – 1 September 2006.

STD/HIV Research and Intervention Unit

The STD/HIV Research and Intervention Unit is mainly focused on the development and evaluation of tools and strategies for the prevention and control of HIV infection and other sexually transmitted infections (STIs). The activities of the unit in this area range from trials of candidate microbicides to the development of behaviour change interventions and research on the integration of reproductive health services. Over the past 5 years the unit has also become involved in policy research on access to anti-retroviral treatment in low resource settings.
The unit plays an important role in several initiatives to develop vaginal microbicides for the prevention of sexual transmission of HIV. Our unit is part of the European Microbicides Programme (EMPRO) and a newly established consortium, the European Vaccines and Microbicides Enterprise (EUROPRISE). Our STD laboratory, together with the AIDS Reference Laboratory of the Department of Microbiology, is collaborating with CONRAD and Family Health International, on phase III trials of cellulose sulphate, a candidate microbicide. In 2006 the unit joined the Academic Medical Centre of Amsterdam (The Netherlands) and the University of Ghent, in response to an EDCTP call for proposals for capacity building for the conduct of vaginal microbicides. In December 2006 we were notified that our bid was successful. The International Partnership on Microbicides (IPM) also invited the unit to submit a grant application for capacity building to EuropeAid. The STD laboratory of the unit plays a crucial role in these microbicides projects and its expertise is highly valued by our international partners. In October 2005 the STD laboratory has been nominated as Belgian reference centre for *Neisseria gonorrhoea*, but semi-officially, it also plays a reference role for various other STIs.
The unit, and in particular Marie Laga, has been working on HIV prevention interventions targeting female commercial sex workers for over 20 years, first in Kinshasa (DR Congo), later in Abidjan (Ivory Coast) and Cambodia. Our involvement in Abidjan and Cambodia goes on for more than 10 years. The expertise of the unit in sex worker interventions is internationally recognized and Marie Laga has been appointed member of the technical panel that guides the AVAHAN programme, a large scale programme that targets sex workers in 5 states in India and that is funded by the Bill and Melinda Gates Foundation. In 2006 the unit was awarded a grant from the US President's Emergency Plan for AIDS Relief (PEPFAR) to develop a sex worker intervention in Kisumu (western Kenya). In collaboration with the NGO Family Health Options Kenya (FHOK) we set up specialized services for sex workers in Abidjan.
In western Kenya the unit has set up a multi-



Resistance to HIV-1 Infection among African female sex workers is associated with inhibitory KIR in the absence of their HLA ligands. A. Model in ESN female sex workers, B. Model in HIV-infected female sex workers.

component programme to improve the reproductive health of young people. The programme addresses young people's individual behaviour as well as the context in which they live. The unit also co-ordinates a major EuropeAid supported project on "Increasing the relevance and effectiveness of HIV/AIDS prevention and care among youths through a Cambodia-Thailand partnership".

A study on the effects of programmes for the prevention of mother-to-child transmission of HIV on the quality of obstetric care in Ivory Coast was completed in 2006. Also in 2006, the unit collaborated with Columbia University and the Rwandese Ministry of Health on an evaluation of access to and utilization of prevention of mother-to-child transmission services in Rwanda.

Several staff members of the unit are involved in the development and evaluation of prevention interventions. Evaluation of the effects of some of these interventions is complex and difficult, especially if there is pressure to roll out promising, innovative interventions. In December the unit held a two day brain storming about methods to evaluate interventions. Guy Kegels and Vincent De Brouwere of the Department of Public Health graciously shared their thoughts with us.

The unit continued to invest time in international HIV/AIDS policy support, especially in HIV prevention. Marie Laga, as member of the UNAIDS Prevention Reference Group, International Working Group on HIV Prevention, and the WHO-Technical panel, has provided technical support to the themes of "Intensifying HIV Prevention", "Scaling up Prevention Interventions", "Evidence for HIV Prevention Interventions" and "New Appraoches to HIV prevention". In Belgium, Marie Laga plays an active role in pushing the agenda of intensifying HIV prevention among men having sex with men, as member of the board of SENSOA.

Inhabitants of Tandji (Benin) showing the rats captured to investigate their role as a reservoir for *Mycobacterium ulcerans*.

Françoise Portaels (second from left) with two of her PhD students, Anatole Kibadi from DRC (left), Dissou Affolabi from Benin (second from right), at the "Cours International M2U" on the microbiology of *Mycobacterium ulcerans* (Centre Pasteur du Cameroun, Yaounde, 23-30 January 2006). With Gladys Anyo (Mycobacteriology Unit, right) they actively participated in the teaching.

Unit of Mycobacteriology

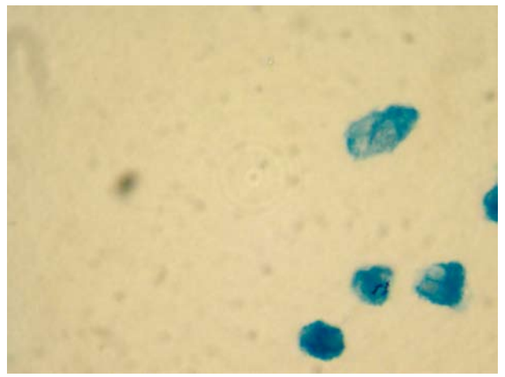
As the reference centre of an international network, the Unit of Mycobacteriology continued its contribution to the world-wide monitoring of resistant tuberculosis (TB), against first- and second-line drugs. The unit also continued its work on the simplification, standardization and field-evaluation of techniques for the determination of drug sensitivity, with emphasis on low-cost methods. In the field of TB treatment our unit contributed to the evaluation of standardized (re)treatment schedules for multidrug-resistant (MDR) TB with gatifloxacin. They have produced very promising results so far. A long-term study on the development of drug-resistance following the use of various standard treatment regimens continued in DR Congo and Bangladesh. We also participate in two multi-centre clinical trials: a gatifloxacin-containing drug regimen for shortening the duration of treatment of pulmonary TB and the evaluation of a four-drug fixed dose combined (FDC) tablet daily in the initial intensive phase of chemotherapy for the treatment of pulmonary TB.

Capacity strengthening of local laboratories through training and quality control remained one of the goals in 2006.

In collaboration with the World Health Organization (WHO) and the Special program for research and training in Tropical Diseases (TDR) we established a TB strain bank representing the major drug resistance patterns. This bank will be publicly available in 2007. In the field of bovine TB we continued our collaboration with Ecuador to estimate the prevalence of the disease among cattle and humans.

Buruli ulcer (BU) remained the second most important research subject in 2006. The strong cooperation with the National Reference Laboratory of Mycobacteria (LRM) of Benin has continued. In the search for the reservoir of *Mycobacterium ulcerans*, the role of various animal species (rodents, fish, amphibians, and molluscs) as well as the possible interaction of the mycobacterium with protozoa was further investigated. Our search for new molecular markers for DNA-typing of BU strains is ongoing.

As part of the Belgian Co-ordinated Collections of Micro-organisms (BCCM) we are setting up a public *Mycobacterium* strain bank comprising a broad variety of mycobacterial species from a wide range of sources (human, animal, environmental) and of world-wide geographical origin.



Mycobacterium ulcerans is phagocytised by *Acanthamoeba polyphaga* when a suspension of a biopsy from a Buruli ulcer lesion is brought into co-culture with the amoebae.

REFERENCE TASKS OF THE DEPARTMENT OF MICROBIOLOGY

National AIDS reference laboratory

The AIDS Reference Laboratory (ARL) is certified and funded by the Federal Ministry of Public Health and Social Affairs. Its mission is reference diagnosis of HIV, assessment, development and quality control of existing and new tests, data collection and surveillance. In 2006, the following tests were executed: HIV screening: 2 466; HIV confirmation: 976; BTC: 410; DNA PCR: 134; Resistance testing (sequencing): 136; Viral load testing (RNA-PCR): 4 980. 285 newly HIV (three HIV-2) infected persons have been identified. Four simple/rapid tests were evaluated for the private sector. Service contracts have been signed for laboratory work for several clinical trials.

National Reference Centre for Mycobacteria

As National Reference Centre for Mycobacteria, the Mycobacteriology Unit (contact Leen Rigouts) of the Microbiology Department, performs drug-susceptibility testing (DST) and identification of mycobacteria from peripheral Belgian laboratories, assists in organizing quality control programs for DST and performs DNA-fingerprinting analyses to document possible laboratory cross-contaminations or mini-epidemics. In 2005, we received 143 isolates for identification and DST, 382 human specimens for detection of mycobacteria and 44 isolates for quality control of DST.

WHO Collaborating Centre for HIV/AIDS Diagnostic and Laboratory support

This reference centre is hosted by the department since 01 Oct 1986. The current contract runs from May 2004 to May 2008. The terms of reference include expert advice, reference services, quality control, research and training on the diagnosis and surveillance of retroviral diseases and blood-transmissible diseases, particularly HIV and HTLV-I/II. In 2006, the accreditation according to ISO 17025 has been obtained (2006-2011). We participated in the WHO/CDC informal consultation meeting on technologies for the early detection of HIV infection in infants in Entebbe, Uganda (10-12 May) and in the 4th WHO/Afro-CDC joint meeting of the regional network of HIV/AIDS Public Health laboratories in Addis Ababa, Ethiopia (6-10 November).

WHO Collaborating Centre for the Diagnosis and Surveillance of *Mycobacterium Ulcerans*

The Unit of Mycobacteriology has been designated as a WHO reference centre in 2002. The terms of reference include country support, epidemiological surveillance, creation and management of *M. ulcerans* strain and tissue banks, expert training and the production of training and educational material. In 2006, the Unit performed the reference diagnosis for patients from various countries world-wide, mainly West-Africa, and assisted in capacity strengthening of laboratories in endemic regions. The joint ITM/MOH colloquium on Buruli ulcer in Cotonou, Benin in 2005 led to a considerable extension of the network.

Supranational Reference Laboratory (SRL) of the World Health Organisation (WHO) and the International Union Against Tuberculosis and Lung Disease (IUATLD) for drug-resistant tuberculosis.

The Unit of Mycobacteriology performed Drug Sensitivity Tests (DST) for various National Tuberculosis Programs, trained local staff to perform DST and perform quality control. A drug-resistance survey was completed in Rwanda and support was given to a survey in Georgia. We continue the supervision of the surveillance of drug-resistance in re-treated cases in Bangladesh. The Mycobacteriology Unit coordinated the 12th round of quality assessment of DST for the SRLs. In the "WHO-DOTS-plus working group" we are responsible for coordinating the activities of the subgroups on DST for second-line drugs and on Laboratory Capacity Strengthening (SLCS).

National *Neisseria gonorrhoeae* reference laboratory

The STD laboratory acts as Belgian reference centre for Neisseria gonorrhoeae since October 2005. In 2006 we received 332 gonococcal isolates from 44 different peripheral Belgian laboratories. After confirmation, isolates were stored frozen for later supplemental batch testing. Antimicrobial susceptibility testing, identification of plasmids, and detection of fluoroquinolone resistance DNA mutations was performed on 203 gonococcal isolates received in 2005.

PROJECTS

Unit of Virology

UCL VDC Vaccine-Induced Protective Cross-Neutralization of HIV-1

Virtually all licensed vaccines for other diseases are believed to work by inducing neutralizing antibodies that combine with vulnerable regions of the infectious agent. The UCL VDC research consortium will isolate a large number of antibodies from humans and animals, screen them for the ability to neutralize HIV, and "work backwards" from the best antibodies to design new vaccine candidates. The task of the ITM is to select HIV-1 seropositive individuals infected with pandemic HIV-1 subtype C and A/CRFO2_AG viruses and having broadly cross-reactive plasma antibodies, capable to neutralize a spectrum of virus variants of different HIV-1 clades.

Identification of HIV vaccine peptides and human broad neutralising monoclonal antibodies using M13 phage libraries

Using phage display peptide libraries, mimotopes of the HIV envelope epitopes to which antibodies are raised, can be identified. We investigated to what extend antibody reactivity to these mimotopes can be predictive of broad cross-neutralizing capacity. HIV-1 peptide phages have been selected by screening plasma of an individual with broad cross-neutralising antibodies. Plasma of 220 randomly selected HIV-1 positive individuals was evaluated for binding the selected peptide phage. One HIV-1 seropositive individual had a unique and broad reactivity to selected V3 peptide phage. V3 peptide phage reactivity was conserved for follow up samples. A concordance between reactivity with V3 peptide phage, BCN capacity, and long-term survivor characteristics, was apparent. Our studies suggest that broadly cross-neutralizing plasma share unique properties in terms of recognition of conserved conformational epitopes. The selected M13 phage displayed V3 mimotope reactivity can be considered as a marker for identification of HIV-1 positive individuals with BCN capacity.

Study of the human immune response to envelope proteins of HIV in an intrasplenic human PBL-SCID model

Passive immunization with IgG from HIV-infected persons could inhibit replication of primary virus isolates in severe combined immunodeficiency mice, reconstituted with human peripheral blood lymphocytes (accepted for publication in Antiviral Research).
Furthermore, immune deficient NOD/SCID mice were also used to study human B cell expansion. We observed the presence of HIV-specific circulating memory B cells in untreated patients and natural suppressors and the nearly complete absence of circulating memory B cells in patients receiving highly active anti-retroviral therapy.

Relative HIV viral fitness and transmission

Samples from recently seroconverted HIV patients from the Amsterdam cohort were evaluated for evolution of replicative fitness. Viruses from the late nineties are more fit than those from the mid eighties. Apparently, the bottleneck, occurring with each transmission, does not completely reset the fitness increase acquired during the disease progression.
In order to better understand the mechanisms of sexual transmission, we set up in vitro models, based on a combination of epithelial cell lines, representing the various parts of the female genital tract and mononuclear target cells. We thus want to understand the role of cell-free versus cell-associated HIV and of inflammatory mediators. This knowledge will be used to design preventive strategies, including microbicides.

Development screening assay based on single-round infectious pseudoviral HIV-1 particles

We developed a pseudovirus based assay which can be used to screen drugs for their anti-retroviral activity, without the use of a fully replicative primary virus. We selected 5 HIV-1 primary isolates, using CCR5 or CXCR4 as co-receptor and representing different subtypes/Circulating Recombinant Forms, and prepared the corresponding pseudovirus (PV) constructs. Using a set of reference compounds, the EC50 values (the concentration of compound inhibiting viral replication by 50%) were determined for both PV and original isolates. From this evaluation we learned that the PV assay is a fast and sensitive screening tool, but EC50 values in the assay with the primary isolate are usually higher.
As an extension of the developed and evaluated single-round infectious pseudoviral HIV-1 screening assay more pseudoviruses from different primary isolates representing the most common subtypes and Circulating Recombinant Forms, and using CCR5/CXCR4 or both as co-receptor, were generated. Using these pseudoviral HIV-1 particles an evaluation was done of 5 new (under development) compounds all interfering with the CD4 binding pocket. The obtained results showed a subtype dependent activity of these compounds stressing the difficulties associated with the development of entry inhibitors.

In vitro evaluation of microbicides

We further implemented the use of the single-cycle pseudovirus assay for the screening of the antiviral activity of candidate microbicides. Additionally, we started to evaluate combinations of compounds in this assay to determine synergism, antagonism or additive effects. A mathematical model for the evaluation of combinations of compounds was adapted from the statistics department of Janssen Pharmaceutica. Further enhancement of this method was done in collaboration with Dr. P. Lewi, former president of the Centre for Molecular Design of Janssen Pharmaceutica. This new method was used to analyse potential synergism between various compounds, from ANRS multi-micro project and collaboration with IPM/Tibotec.
Several molecules were also received from EMPRO collaborators for testing in our co-culture model of monocyte-derived dendritic cells (MO-DC) and autologous CD4+ T cells, as representative target cells in sexual HIV transmission. Most promising compounds included a series of CD4 mimicking miniproteins, which target the CD4 binding site on the viral gp120 envelope protein. The most potent representatives of this class prevented infection at non-toxic concentrations and will be further investigated in additional models, including our elaborated dual chamber model.

Dendritic cell-mediated immunotherapy

We showed that HIV gag sequences from treatment-naïve patients could be used as mRNA to efficiently load autologous dentritic cells (DC). These DC triggered both CD4 and CD8 T cells ex vivo to produce interferon gamma (IFN-γ), interleukin-2 (IL-2) and crucial cytokines in defence against HIV. In view of the development of a true immunotherapy, we then concentrated on patients who have gone trough a period of severe immune deficiency and are treated with highly active anti-retroviral therapy. We already showed that their DC, ex vivo loaded with mRNA encoding gag, can be used to significantly expand IFN-γ, IL-2 and perforin producing T cells in vitro. We showed by epitope mapping of p24 that it is possible, with this strategy, to boost and broaden the immune response. This mRNA approach with consensus gag will be tested in human clinical trials in the near future. The mRNA approach with the autologous gag mRNA will be further evaluated in macaque studies, in collaboration with Dr Roger Legrand, head of the Parisian primate centre.

Interaction between viral and interferon-induced proteins by functional proteomics

Promyelocytic Leukaemia Nuclear Bodies (PML-NBs) are nuclear multi-protein complexes that are involved in numerous cellular processes such as transcription, translation, regulation of cell growth and apoptosis. Using proteomics we investigate the role of PML-NBs on viral infections, analyze which proteins associate with the PML-NB complex, before and after virus infection. Using the Tandem Affinity Purification (TAP) methodology, the gene encoding the PML-NB component ISG-20 has been cloned and transfected to HeLaCD4+ cells. Stable cell-lines were selected, and expression of the correct fusion product was demonstrated by Western blot analysis. The TAP procedure was optimized, and a first identification of ISG20 partners was determined.

Assays for monitoring drug resistance in HIV-2 infected patients on anti-retroviral therapy

HIV-2 is naturally resistant and has reduced susceptibility to some currently available anti-retroviral drugs. This makes treatment of HIV-2 patients difficult with very limited treatment options. Thus, early detection of resistance mutations is important to explain treatment failures and guide therapy decisions. With the Global Fund and other initiatives, a substantial number of HIV-2 patients will receive ART, and developing cheaper and more sustainable resistance assays, such as the oligonucleotide ligation assay (OLA) is an important priority. Oligonucleotides were designed to detect the Q151M mutation associated with phenotypic resistance to Zidovudine, Didanosine, Zalcitabine (ddC), and Stavudine and the M184V mutation associated with phenotypic resistance to Lamivudine in HIV-2. The assay was successfully developed and evaluated on samples from The Gambia, Guinea Bissau, the Netherlands and Sweden to give a sensitivity of 99.2% (Q151M) and 98.3% (M184V). OLA results were compared with sequencing to give a high concordance of 98.4% (Q151M) and 97.5% (M184V). We have developed a simple, easy-to-use and economical assay to genotype drug resistance in HIV-2 that is more sustainable for use in developing countries than sequencing.

Human T Lymphotropic Virus 1 (HTLV-1) in Peru

This is a joint collaborative capacity strengthening and research program between the ITM and the Instituto de Medicina Tropical (IMTL), Lima, Peru. The collaboration was extended through VLIR by including Prof. Van Camp and Dr. Van Laer from the University of Antwerp for host genetic studies and Prof Van Damme and Dr. Van Dooren from the REGA Institute for viral evolution studies. A cohort study was initiated with the objective to include at least 300 asymptomatic and 300 symptomatic HTLV-1 infected subjects as well as their family members to improve diagnostics, to document early signs of the disease and to investigate the host genetic, immunological and viral determinants of disease expression. Two papers with the first results were already published during the first year and a comprehensive review was accepted in Lancet Infectious Diseases. The study will continue for three years.

Diagnosis and follow-up of HIV in resource poor settings

An in-house real-time PCR was developed in our Aids Reference Laboratory for cheap follow-up of patients in resource poor settings. In collaboration with the University of North Carolina and the National Reference Laboratory in DR Congo an evaluation has started on "alternative diagnosis with a heat dissociated signal amplified p24 Agen test on filter paper".

Unit of Immunology

Correlates of protection against HIV-infection among African HIV-exposed but seronegative subjects

Some individuals remain persistently HIV-seronegative despite frequent and unprotected exposure to the virus (HIV-exposed seronegative or ESN). ESN subjects can be found among female sex workers and in HIV-discordant couples (one partner HIV-seropositive, one partner HIV-seronegative). We previously found that ESN female sex workers in Abidjan, Ivory Coast show gene combinations potentially resulting in increased natural killer cell activation. We are currently investigating whether similar gene combinations protect against infection among ESN partners in HIV-discordant couples, and whether they also influence the

progression of the disease in HIV-infected subjects.
Other objectives of the study include the analysis of HIV-specific T cell responses and intrinsic immune factors like APOBEC3G and TRIM5alpha. Eva Lion, a Master student from the University of Antwerp, tested the capacity of CD8 antibody clones to block antigen-specific CTL responses ex vivo. This was done as part of our efforts to improve the specificity of the currently available assays for the detection of antigen-specific T cell responses.

Capacity strengthening of the Immunology Laboratory of CHU in Dakar

This projects aims to strengthen the capacity of the Immunology Laboratory of the Faculty of Medicine and Pharmacy at the University 'Cheikh Anta Diop' in Dakar (Senegal) and to evaluate new, mobile and affordable methods for the immunological follow-up of HIV/AIDS patients under treatment. In 2006, two other instruments, the Cyflow green (2-colours) and the Sysmex, have been assessed for their capacity to enumerate CD4 cell count in HIV patients in Dakar. The ultimate goal of these evaluations is to define criteria for selecting affordable flow cytometers to support the decentralisation of ART in Senegal. Procedures of maintenance and calibration of the new Facscalibur have been implemented in Dakar in order to further control the quality of the CD4 count for the follow-up of ART.
Preliminary investigations on the possible defects of immune reconstitution in HIV patients receiving ART have been undertaken. We want to know whether initiation of HIV therapy with low CD4 count and in the context of high exposure to opportunistic infections (e.g. in sub-Saharan Africa) has a negative impact on the quality of immune restoration as opposed to the situation in industrialized countries. Fatou Noho Konté, a Master student from the IPMB (VUB) studied the reconstitution of antigen-specific immune response diversity in a small cohort of HIV-infected patients starting on ART at the ITM clinic. In the frame of this study a protocol for in vitro antigen-specific T cell expansion was developed, allowing the generation of up to 50% of CMV- or PPD- specific T cells within a population of unsorted PBMCs. Concomitant increase of antigen specific T cell absolute number still needs further adjustment of the procedure. The data have been presented in Fatou's Master thesis at the VUB and the results will be used to set up a larger study on immune reconstitution in Senegalese patients receiving ART in Dakar.
CHU de Dakar and the Hôpital de Fann have continued their efforts in following a cohort of HIV-discordant couples in Dakar, Senegal. 28 HIV-discordant couples have been identified and enrolled for follow-up. As controls, HIV-concordant couples are included for whom intra-couple virus transmission can be confirmed by comparing variable virus sequences from both partners. This work is part of the research program of Jordan Kyongo, a Master student from IPBM (VUB).

Development and evaluation of affordable alternative methods for counting CD4 cells and HIV viral load measurement

The development of a quantitative detection method of heat-denatured (HD) HIV p24 antigen in the plasma of HIV patients by flow cytometry has been finalized. The adaptation of the HD amplified HIV p24 antigen assay for flow cytometry appeared to be more complicated than originally expected. It has been observed that the plasma kinetics of HIVp24 antigen are different from the plasma kinetics of HIV RNA in HIV-infected subjects. Therefore, there is a general tendency to abandon HIV p24 antigen detection as an alternative method for viral load, although it is still useful for HIV diagnosis in paediatric patients. We are now looking into another flow-based assay which is based on the detection of HIV mRNA in infected cells.
In 2006, a field evaluation of a new CD4 instrument (Aurica) was planned but the manufacturer applied significant modifications to its instruments. We therefore decided to postpone the evaluation until the new instrument (Aurica Now) is released (expected in spring of 2007).
In 2006 we also evaluated a new affordable light-emitting diode (LED)-based fluorescence microscope for manual CD4 counting, based on the Dynabeads method. One disadvantage of this manual method is that it is very labour-intensive and requires a light microscope and preferably a fluorescence microscope. The microscope can be equipped with a digital camera which makes it possible to produce permanent digital records of CD4 counts per patient to improve quality control. Preliminary evaluation of this microscope looks promising.

The use of HIV-1 pseudoviruses to monitor HIV-specific immune responses

We are developing a new tool to stimulate HIV-specific cellular immune responses against a maximum of HIV epitopes, using HIV-1 pseudoviruses or genetically inactivated HIV particles. Our hypothesis is that, in contrast to other ex vivo stimulation methods, the pseudoviruses will be processed through the 'natural antigen processing' pathway and stimulate HIV specific cellular immune responses against a maximum of HIV-1 antigens, without the need for biosafety laboratories. We were able to monitor HIV-specific cellular immune responses with the HIV-1 pseudovirus in IFN-γ ELISPOT. In order to obtain sufficient quantities of HIV pseudoviruses that meet all the requirements for this new application, we are currently upscaling the production and optimizing the purification.

Unit of STD/HIV Research & Intervention

Research on microbicides: phase III trials of cellulose sulphate

We provide laboratory support (training, quality control and evaluation) to phase III trials of Cellulose Sulphate (CS). The trials in Benin, India, South Africa and Uganda are conducted by CONRAD; the trial in Nigeria by Family Health International. Laboratory staff from each collaborating site was trained at the ITM in the molecular amplification technique (SDA) used for the detection of Neisseria gonorrhoeae and Chlamydia trachomatis. The ITM laboratory staff provided on-site training in HIV rapid testing on fingerprick blood and assisted with the start-up of the SDA technique. The STD laboratory was also responsible for the external quality control on the laboratory tests in the different sites.

Research on microbicides: EMPRO

The European Microbicides Programme (EMPRO) entered its third year. The furthest advanced molecules were tested in macaques. The ITM Unit of Virology studies these products in an i*n vitro* model and at the cellular level. Planning started for a safety study focusing on the effect of TMC120 in a vaginal ring in the normal vaginal flora.

Capacity building for the conduct of trials of candidate microbicides

In December 2006 we were notified that we were successful in our application for a grant from the EDCTP. The objective of the grant is to build the capacity of Projet Ubuzima in Kigali (Rwanda) and ICRH-Kenya in Mombasa to conduct clinical trials of candidate vaginal microbicides. Our unit will build capacity of laboratories, train in GCP/GLP and help to set up quality systems.
Our unit was also invited by the International Partnership on Microbicides to join them for a grant application that was submitted to EuropeAid. This project is also about capacity building, in South Africa, Kenya, Rwanda and Zimbabwe. Results of this application are expected early 2007.

Quality and coverage of sex worker interventions in Ivory Coast

In 2006, HIV prevention and care activities for sex workers were further strengthened in Abidjan and San Pedro. Two new sites were set up, in Gagnoa and in Yamoussoukro. A total of 10,706 clinic visits was recorded, with 3,584 female and 85 male sex workers attending for the first time, and 3,365 STI episodes treated. Rapid HIV testing was performed on 1,946 attendants. Outreach activities include group education condom promotion. In 2006, 19,630 female and 841 male sex workers were reached.
A national standardized curriculum for the training of community workers including peer health educators (PHE) was developed in collaboration with the ministry of AIDS and other partners. A guide describing a standardized minimum package of care for interventions for sex workers was elaborated and will be distributed in the country.

Care and Prevention of Sexually Transmitted Diseases in Cambodia

This project provides technical assistance to the National Centre for HIV/AIDS, Dermatology and STD (NCHADS), primarily to the STI and reproductive Health Unit, in matters of STI care and programme management. Since September 2006, the STI component of the National Strategy has been undergoing a major overhaul. Firstly, at policy level, NCHADS revised and updated its policies and strategies on STI management. The new policy document is called "National Policy and Strategies for Prevention and care of Sexually Transmitted and Reproductive Tract Infections 2006-2010". NCHADS and the National Mother-and-Child-Health Centre (NMCHC) also finalized a "Joint Statement of NCHADS and the NMCHC on strengthening the management of sexually transmitted and reproductive tract infections", which formalized both national programmes' goal to work closer together in the field of reproductive health. Secondly, NCHADS and Ministry of Health/NGO partners have started discussions on the "Reproductive Health linked response", with the aim to strengthen interactions between the various components of reproductive health, including STI care, and HIV prevention, mainly VCT and PMTCT. Thirdly, NCHADS has started internal discussions about adapting the 100% condom use strategy to a changing environment in Cambodia, where the number of brothel-based sex workers has gradually declined over the past 10 years, but the number of women working in entertainment venues and occasionally selling sex services has risen dramatically.
Technical support also included a thorough review of the latest guidelines for monitoring and supervision of the STI clinics (of which there are now 33) by staff from the STI Unit and the National STI Clinic. This work is going on. Finally, F. Crabbé assisted NCHADS in the preparation of materials presented by the Director at the Joint Partners' meeting in November.

Operational research in STI and related services for women in high-risk situations in Cambodia and Thailand (ORISS Project)

The project aims to provide the National Health Authorities in Cambodia and Thailand with improved understanding of high-risk situations among vulnerable women, and of reproductive health needs, in order to help them develop appropriate policies and strategies. The project consists of three studies, including a study on the validity of the algorithm for the syndromic management of STIs in sex workers in Cambodia, on the working conditions and mobility of sex workers in Cambodia and on the working conditions and reproductive health needs of vulnerable women in Thailand. The qualitative components of the latter two studies have been completed in 2003. Data collection of the quantitative component in Thailand and in Cambodia was completed in 2004 and in 2006 respectively. The study on the validity of the algorithms for the syndromic management of STIs was approved in January 2006 by the ethics committees in Cambodia and Belgium. Field work and testing of samples was completed in the latter half of

2006. Data have been analyzed and preliminary results have been presented at a workshop in Phnom Penh. The ORISS project ended on 31st October 2006.

A comprehensive sexual and reproductive health programme for adolescents in rural Western Kenya

The programme consists of interventions at 3 levels: the adolescent, his/her family and the community.
At the adolescent level, two evidence based curricula (Making A Difference and Making Proud Choices) that were developed in the United States, were adapted to the Kenyan setting for use in small groups of mixed gender (12-18 participants). One curriculum is based on abstinence and targets 10-14 year olds in in-school settings. The other curriculum uses a safer sex approach and targets older adolescents aged 13-17 years. The two adapted curricula, named "Healthy Choices for a better future", will be implemented and formally evaluated in 2007.
At the family level, we adapted and implemented a community-based intervention developed in the US that promotes positive parenting and effective parent-child communication about sexuality and sexual risk reduction. "Families Matter!" targets primary caregivers of 9-12 year olds during 5 sessions of 3 hours. We followed up 321 parent-child pairs 15 months after the intervention. Parenting and communication almost always improved significantly. The level of satisfaction among parents about the intervention was high. However, while these results are encouraging, we do not know to which extent the intervention has an effect on adolescent sexual risk taking and we are planning more evaluations that will assess the effects of the intervention on behaviour.
At community level, youth friendly services are offered, both at the youth centres and through mobile services. Community participation is enhanced by creating local youth committees and advisory boards. The vocational training and micro-credit program for out-of-school youth, a small component of the program, continued to have its own challenges, i.e. low uptake of the services, low repayment of loans, low coverage and minimal impact on livelihood opportunities. After it became clear that the micro-credit organization which implemented the savings- and loans programme, was not performing well, we decided to hand over the management of the micro-credit groups to another project (Rotary Safe Water Project). The fieldwork of an ethnographic study on the relationship between livelihood and sexual behaviour among out-of-school youth was concluded. Data analysis is ongoing and preliminary results are expected in 2007.

Study on sexual behaviour and livelihood among out-of-school youth in rural Western Kenya

As part of the above mentioned youth intervention programme, an ethnographic study is conducted on sexual behaviour and livelihood among out-of-school youth in rural Western Kenya. This study is set up by an anthropologist from ITM in collaboration with the Kenyan Medical Research Institute (Kisumu, Kenya), the Centers for Disease Control and Prevention (Atlanta, USA) and the Amsterdam School for Social Science Research (ASSR) in the Netherlands. Extensive fieldwork based on participant observation, in-depth interviews and focus group discussions was carried out in 2006 and preliminary results are expected in 2007.

Prevention intervention targeting highly vulnerable women in Kisumu (Western Kenya)

In April 2006, the above project's mandate expanded to include the development, implementation and evaluation of an intervention targeting young vulnerable women in Kisumu town, in particular female sex workers. The general objective of this intervention is to reduce the transmission of HIV between women engaged in sex work and their partners/clients in the Kisumu district.
A contract has been signed with Family Health Options in June 2006 for the provision of specialized prevention and care services for female sex workers at the clinic and during outreach services. Staff has been trained, the services have been established and are free of charge. Provision of care and ART to HIV-positive clients is also offered through a collaborative effort with FACES in Kisumu (KEMRI/UCSF). Peer educators have been elected and a network of organizations that target vulnerable women has been established. More than 1,000 sex workers have been approached directly by the outreach workers and have received information about the services offered. 438 clients have received free HIV prevention and care services.
The Highly Vulnerable Women project has been named Pambazuko, or the start of a new day.
A protocol for a baseline assessment which is part of a targeted evaluation has been submitted to KEMRI, CDC and ITM for ethical clearance. It is still awaiting clearance from CDC.

Increasing the relevance and effectiveness of HIV/AIDS prevention and care among youths through a Cambodia-Thailand partnership

This project aims to set up innovative STI/HIV/AIDS control interventions, combined with other reproductive health services among specific population groups, in geographical areas in Cambodia where little has been undertaken so far, and in the Upper North region of Thailand. The project has four major components:

1) Prevention interventions will target secondary school students, 'indirect sex workers', and out-of-school youth in Cambodia; mainly youth groups and PLHAs (people living with HIV/AIDS) in Thailand.
2) Care interventions in Cambodia will reach PLHAs in the selected districts, offering comprehensive services through a continuum of care including VCT, outpatient/inpatient care and follow-up in the community. In Thailand, AIDSNet will contribute to the strengthening of existing organizations by providing grants to build capacity and monitor.
3) Research will assess baseline situations and monitor achievements using measurable indicators.
4) Finally, the project will identify best management practices for partnerships between the government and non-governmental organisations/community based organizations.

The Cambodian and Thai partners work together on training, capacity building, monitoring and evaluation.
In 2006 NCHADS continued to strengthen the Continuum of Care (CoC) throughout the country. Up to the end of 2006, a total of 36 ODs (out of 76) had had the CoC fully or nearly fully implemented. During the whole year of 2006 the total number of patients on OI treatment was 12,172, of which 2,503 were eligible for ART. Since ART became available in the public sector the total number of patients on ART has reached 20,131, including 1,787 children. Care interventions in the three project ODs were in line with the implementation of the CoC strategy nationwide.
Interventions for youth consisted primarily of peer education for adolescents in-school and out-of-school in a selection of secondary schools and villages of the three rural ODs, and the set-up of a Youth-Friendly Centre (YFC) in Pursat town. Interventions began early 2005, as planned, the NGO World Education being in charge of peer education activities, and the national NGO KNKS being responsible for the YFC.
Plans to reach out to youth out-of-school (following a recommendation of the 4th Steering Committee meeting in January 2006) began in July, when KNKS set up outreach for out-of-school youth in 36 remote villages of the OD. Two young people from each village (i.e. 72 in total) received a basic training in HIV/AIDS and related issues before starting their work as peer educators in their own village. During the 3rd and 4th quarters, they made contact with nearly 3,000 young people. As a consequence, the number of youth reached by KNKS interventions (centre + outreach) climbed dramatically during the same period. While the vast majority of visitors to the centre attended the group education sessions and spent time at the library, the number of youths seeking individual counselling and being referred to health services increased regularly in 2006, with 341 youngsters seeking counselling during the 4th quarter, against 186 in the 1st quarter.
Under a 5-year project with the MoEYS supported by DFID a curriculum has been developed by the Interdepartmental Committee for HIV/AIDS (ICHA) of the MoEYS for HIV prevention among youth in- and out-of-school. The new curriculum, called "Life Skills for HIV/AIDS" (LSHE) was field-tested extensively during 2006, and is now ready for use on a large scale. It targets children of grades 5 and 6 in primary schools, and students of grades 8 and 11 in secondary schools. Out-of-school youngsters of 13 to 19 years are also targeted. The NGO World Education, which took an active role in the development and testing of the curriculum, will use it in the three ODs of the project.
Following a recommendation of the 4th Steering Committee meeting to develop an extra-curricular booklet on gender and violence as a complement to the LSHE, HNI obtained the formal approval of the MoEYS in March 2006. Under a contract with HNI signed in December 2006 World Education is due to proceed with the development of the booklet.
A literature review indicated that sexual activity of young, unmarried Cambodian people is low, but attitudes towards sexual violence are worrying. In 2006 a draft outline was written for qualitative research on young people's attitudes towards gender based violence. A suitable anthropologist has been identified and data collection and analysis will take place early 2007.

Policy research on prevention of HIV transmission from mother to child and on care of HIV-infected persons in developing countries

In this policy project we document the minimal requirements to implement programmes of prevention of mother to child HIV transmission (PMTCT) and the effect of PMTCT implementation on the quality of maternity care services. We also explore how health care services can meet sexual and reproductive needs of women and men living with HIV.
A survey has been conducted in five health facilities in San Pedro and Abidjan, Ivory Coast, on the quality of antenatal and obstetric care, before (2002) and after (2005) the implementation of prevention of mother-to-child transmission services. In Rwanda, a study on access to and utilization of prevention of mother-to-child transmission of HIV was conducted in 12 nationally representative PMTCT sites, between March and May 2006. 162 HIV-negative women and 246 HIV-positive women completed an interview, on antenatal and delivery care; HIV testing; knowledge about family planning and practices. HIV-positive women were also asked about their experience with PMTCT prophylaxis and infant feeding. In-depth interviews were conducted with 26 HIV-positive women and 11 of their partners, at two sites. The study revealed unmet needs for family planning both among HIV positive and negative women in Rwanda.
A background paper on "Reproductive choices for women and men living with HIV-Policy and programmatic guidance: Contraception, abortion and fertility" was written for a WHO co-sponsored "Global consultation on the rights of people living with HIV to Sexual and Reproductive health". The meeting was held in Addis Ababa from 27th to 30th March 2006.

Epidemiology of Trichomonas in Zambia

This study on Trichomonas vaginalis in young women in Ndola, Zambia started in February 2002. Three study groups were identified: commercial sex workers, pregnant women attending antenatal clinic and adolescent girls (age 13-16 years). All participants provided a vaginal, a mouth and a rectal swab sample. Questionnaires about socio-demographic characteristics, hygiene and sexual behaviour were administered by trained interviewers. The most striking finding was the high prevalence (23%) of Trichomonas vaginalis infection in young girls with no reported sexual intercourse. In 2006 data analysis has been completed and the first drafts of manuscripts have been written.

Activities of the STD laboratory

- The STD laboratory performs, on behalf of the ITM Medical Laboratory, DNA amplification tests for the diagnosis of STIs pathogens. In 2006 2,075 samples were received for *Chlamydia trachomatis* testing; 17 for confirmation of a diagnosis of lymphogranuloma venereum; 150 for a diagnosis of herpes simplex virus type 1/2 Infection.

- In its capacity of Belgian reference centre for *Neisseria gonorrhoea*, the laboratory processed 332 gonococcal isolates from 44 different laboratories. This meant an increase of 64% and over 100% compared to 2005 and 2004, respectively. After immediate definitive confirmation of identification, isolates were stored frozen for later supplemental batch testing. Antimicrobial susceptibility testing, identification of plasmids, and detection of fluoroquinolone resistance DNA mutations was performed on 203 gonococcal isolates received in 2005.

Collaboration in international studies

The STD laboratory collaborates with the London School of Hygiene and Tropical Medicine in Mwanza, Tanzania. The laboratory tested genital specimens with DNA amplification assays for the detection of *Haemophilus ducreyi*, *Treponema pallidum*, and herpes simplex virus types 1 and 2.
A. Buvé collaborates with the London School of Hygiene and Tropical Medicine, on a Wellcome Trust funded project of modelling HIV transmission dynamics in four African cities with contrasting HIV/STI epidemiology. The modelling work is finished and several abstracts were presented at the International AIDS Conference in Toronto, August 2006. Furthermore she was invited by M. Alary of the University of Laval, Canada, to collaborate on a population based survey of HIV and risk behaviour in Cotonou, Benin, using the same data collection tools as were used in the multicentre study 10 years ago. This is a unique opportunity where population based data on HIV, STIs and risk behaviours, collected 10 years apart, will be compared.

Unit of Mycobacteriology

TUBERCULOSIS (TB)

Drug resistance surveillance and multidrug-resistant TB (MDRTB) treatment

The general aim of this project is to document the prevalence of drug resistant TB in various continents and regions, in order to provide relevant information for treatment regimens and to evaluate TB control programmes. Focus lies on first-line drugs, but if possible, and if appropriate in the settings, second-line drugs are included as well. In Bangladesh, where resistance profiles have been determined in defaulters, relapse and failure cases since 1995, resistance levels have remained more or less stable during the last several years. However, from 2004 onwards both MDRTB rates and non-MDR rifampicin-resistant TB rates increased. An unfavourable trend that might be linked to the introduction of the new treatment with the administration during 6 months of rifampicin (R) since the end of 2003.
The first national survey conducted in Rwanda showed relatively high levels of MDRTB. Of 616 strains from new cases, 6.2% were resistant to isoniazid (H), 3.9% to rifampicin (R) and 3.9% were MDRTB. Among 85 strains from previously-treated cases, the same values were respectively 10.6%, 10.6% and 9.4%. The main reasons of this emergence of MDRTB can be attributed to the disorganization of the health system and migration of the population during the 1994 civil war. This resulted in poor success rates, since a large number of patients were transferred out and/or lost to follow-up. On the other hand, the use of treatment regimens administered twice weekly during the continuation phase could be another important factor and warrants further investigations. Fluoroquinolone resistance was moderate (0.6% among all cases) and more frequent among MDR (3/52) than non-MDR (1/565) patients.
Preliminary results of a drug resistance survey in the general population of Georgia, have shown high levels of drug-resistance to first-line drugs: up to
6.4% of MDRTB among new cases and 23.8% among previously treated patients. Second-line drug resistance testing on a convenience sample revealed relatively high levels of resistance but no extensively drug resistant strains (XDRTB), defined as MDRTB resistant to at least fluoroquinolones and an injectable second-line drug. With the support of the Green Light Committee and the Global Fund to fight AIDS, Malaria and TB, management of MDRTB patients will be integrated in the National TB Program in May 2007. Our unit will provide laboratory support to the National Reference Laboratory in Tbilisi.
Evaluation of various standardized MDRTB regimens on 314 laboratory-confirmed MDRTB cases in Bangladesh showed an overall cure rate of 72% at the end of the ofloxacin-based treatment regimens, with 12% defaulters, 11% deaths and only 5% failures. One bacteriologically confirmed relapse has been recognized so far. Inclusion of clofazimine in the second phase seemed to protect against failure by acquisition of resistance to ofloxacin. Preliminary results of the new gatifloxacin-based regimens are extremely promising: 95% of 38 patients that completed treatment were cured, whereas only 1 patient defaulted and 1 patient died. However, the real test will be an evaluation of the relapses. These preliminary results are in favour of a standardized approach as a reasonable alternative to individual treatment of MDRTB in resource-poor settings.
Besides resistance surveillance, operational research is included to improve direct microscopy, optimize specimen transport for culture, and optimize low-cost, rapid and easy alternatives for the classical drug-susceptibility tests. In this way, the microscopy-based techniques for rapid drug-susceptibility testing (slide culture DST) and detection of viable bacilli (the fluoresceine diacetate assay, FDA) proved to be good, simple and inexpensive tools for rapid screening of MDRTB.

Investigations on the development of drug resistance in TB

The general aim of this project is to gain a better understanding of the creation and amplification of resistance to first-line drugs by TB bacilli during the treatment. Important types of resistance are man-made, due to therapeutic errors, and are especially frequent where serious economic and management problems occur. Original short-course treatment regimens were based on daily dosing and R was used exclusively in a quadruple combination in the intensive phase. The replacement daily by intermittent, twice or thrice weekly dosing, and the use of R in combination with H in the second phase, are two recent trends meant to make DOT (Directly Observed Treatment) more feasible. In strictly controlled trials this yields equally good results as daily dosing, but it is far from clear to what extent these regimens may also cause resistance under field conditions.
Therefore, two large cohorts of newly registered pulmonary TB patients in Bangladesh and DRC are sampled before, during and after Category I treatment with at least 2 years of follow-up. By mid 2006, 1,042 paired sputum samples were obtained. By now, sequencing of the rpoB gene for the detection of R-resistance was completed for 101 patients. Ten of them showed mutations after treatment that were not present before. In 6 cases this proved to be acquired R-resistance as evidenced by identical DNA-fingerprints whereas in the remaining cases R-resistance resulted from re-infection with a new strain.

A multicentre randomized control trial of a gatifloxacin-containing short-course regimen for the treatment of pulmonary TB

The overall objective of the project is to evaluate the efficacy of a gatifloxacin-containing drug regimen for shortening the duration of treatment of pulmonary TB to 4 months in developing countries. This objective will be measured using the randomised-control method, comparing the efficacy of this regimen with the standard recommended 6-month regimen, using clinical and bacteriological end-points.
Despite some logistic problems that were encountered, the Mycobacterial Growth Indicator Tube (MGIT) culture method to directly detect MDRTB in sputa is operational in all 5 countries (Benin, Senegal, Guinea, Kenya and South Africa). The direct MGIT test gave excellent results. No false R-resistant results were observed and only 3 out of 1006 patients (0.3%) gave false R-susceptible results.
Important conclusions can be drawn from the fingerprinting analyses of the isolates. The numbers of clinical relapse cases from Benin (2.0%) were considerably smaller than those from South Africa (56.5%). While both cases from Benin were characterized as true relapses, the higher number of true relapse cases from South Africa could be related to the high level of HIV-AIDS infection in the region. There was no case of re-infection in Benin, while 43.5% of re-infection cases were observed in South Africa. These high levels of re-infection in South Africa are in agreement with the previous findings of Van Rie, who observed that exogenous re-infection, was the major cause of post-primary tuberculosis in the same country (Van Rie et al., 1999).

An international multi-centre trial for the evaluation of fixed dose combined tablets for the treatment of pulmonary TB

The use of Fixed-Dose Combined (FDC) drugs in the treatment of TB has been internationally recommended to help preventing the emergence of drug resistance due to monotherapy, reducing the risk of incorrect dosage, simplifying procurement and prescribing practices, aiding compliance and facilitating Directly Observed Treatment (DOT). Two and three-drug FDCs, containing H and R, have been in use for a number of years. Their bioavailability levels have been evaluated as acceptable when compared to those given in separate drug formulations, they are well tolerated and the rate of side-effects is similar to that of the separate formulations. The recommended treatments for newly diagnosed TB always contain an initial intensive phase of four drugs, most generally R, H, pyrazinamide and ethambutol. It would be appropriate, therefore, if a four-drug combined tablet were available for use in the initial intensive phase. Several pharmaceutical companies have recently manufactured such a four-drug FDC tablet, and the one manufactured by the pharmaceutical company Aventis, has recently shown satisfying results in bioavailability studies.

The primary objective of this clinical trial is to compare the effectiveness, acceptability and toxicity of the four-drug FDC when given in the initial intensive phase to patients with newly diagnosed, smear-positive pulmonary TB, followed by four months of a two-drug FDC (R and H), to a regimen which consists of the same drugs, but given in separate formulations, in the initial intensive phase.
One or two sputum specimens should be collected for microscopy, culture examination and drug-susceptibility testing before, during and after treatment. Treatment failure and acquisition of resistance will be investigated by means of classical molecular biological tools.
In our laboratory we have analyzed a total of 968 *M. tuberculosis* cultures from the various sites. Further follow up of patients is required to draw any conclusions.

Improved diagnosis, drug resistance detection and control of TB in Latin America

An important issue for the improvement of TB control is the development of inexpensive, reliable and rapid diagnostic techniques that can replace the slow and laborious conventional methods for diagnosing TB and detecting drug resistance. The main objective of this concerted action project is the development, standardization and evaluation of new and improved diagnostic methods for TB, including serological markers, and rapid molecular identification methods. In 2006, the project focused on rapid detection of drug resistance against first- and second-line drugs. The Colorimetric Resazurin Microtiter Assay (REMA) and the nitrate reductase assay were further evaluated in small pre-clinical trials in several countries in Latin America. The accuracy and performance of the two tests were very high as compared to the conventional proportion method; with a sensitivity of 93.5% and 100% and specificity of 98.1% and 99.7% for H and R respectively compared to the reference standard method on Löwenstein-Jensen medium, when implemented as a routine test in several countries in Latin America.
We have also developed a new colorimetric method for detecting resistance to pyrazinamide (PZA), another important first-line anti-TB drug that is active at a low pH making *in vitro* testing very difficult and less reliable. In our assay we used nicotinamide as a surrogate for PZA and the same REMA format. The REMA-nicotinamide assay showed a sensitivity of 100% and a specificity of 98% as compared to the currently available testing methods. It will be further evaluated in other settings in collaboration with partners of this network.

Development of a molecular platform for the simultaneous detection of *M. tuberculosis* resistance to rifampicin and fluoroquinolones (OLIGOCOLOR)

This project addresses the problem of MDRTB through the development of a versatile and user-friendly molecular platform for the identification of *M. tuberculosis* and the simultaneous detection of resistance to key anti-TB agents in clinical specimens and/or liquid cultures. A molecular platform has been initially developed for the detection of resistance to rifampicin since the associated mutations are well-defined and circumscribed to a small DNA region. In a second phase, the OLIGOCOLOR platform will incorporate oligonucleotides for the detection of resistance to fluoroquinolones based on information generated by sequencing the *gyrA* gene that determines resistance to this drug. Small, single-stranded oligonucleotides, covalently-linked to an activated solid surface in a microplate-strip format, are used to capture the amplified product of the specific target sequences. The OLIGOCOLOR platform is being validated for reproducibility and proof-of-principle in laboratories in Sweden, Holland, Argentina and Colombia. During 2006, the basic design of the OLIGOCOLOR platform for quinolone-resistance detection has been completed and it will enter into evaluation in three European laboratories. A small prospective trial on clinical samples is being planned for 2007.

Biofitness of the *M. tuberculosis* Beijing genotype

MDRTB continues to be a serious problem in many countries, especially in Eastern Europe. New areas with a high prevalence of MDRTB include China and Iran. In this context, a genetically-related group of *M. tuberculosis* strains that is distinguished by specific molecular markers and referred to as the "Beijing" family has been described. By molecular epidemiological studies it has been shown that these strains are highly prevalent throughout Asia and regions of the former Soviet Union, but have also been reported in other geographical areas including North America and Western Europe. However, the underlying host-pathogen and epidemiological factors responsible for their dissemination and burden of disease have not been clearly determined. A strong association of this Beijing genotype with drug resistance has raised the question of whether these strains have an enhanced ability to acquire drug resistance and that their predominance results from their reduced susceptibility to antibiotics. On the other hand, it is frequently assumed that organisms pay a physiological cost for the acquisition of drug resistance, as has been demonstrated in other bacteria. If the mutations leading to MDR in *M. tuberculosis* exert a cost on the reproductive effectiveness or fitness of the bacteria, we may expect that these strains are widely less transmitted than drug susceptible organisms. Therefore, the relative fitness of drug resistant strains is an important issue for investigation and could provide crucial information relevant for the prevention and management of MDRTB. This study is investigating the physiological cost expressed as the biological fitness in relation to the resistance profile of different strains within the Beijing genotype.

M. tuberculosis of the Beijing genotype showing different degrees of resistance to R and H are being evaluated by three different approaches: metabolic activity as assessed in the REMA format measured quantitatively with a spectrophotometer, growth curves set-up in the BACTEC MGIT960 system, and competitive growth studies performed by microbiological techniques. The results will be compared to the different resistance profiles to assess a possible fitness cost in relation to drug resistance. Similar studies are being conducted with non-Beijing strains of *M. tuberculosis*.

Evaluation of serodiagnostic tests for TB

The cornerstone of pulmonary TB diagnosis worldwide is sputum smear microscopy, a simple and relatively inexpensive method. Specificity is >95% in high-prevalence settings, however, sensitivity ranges between 40-80%. Mycobacterial culture methods partially overcome the problem of low sensitivity but this advantage is offset by the number of weeks required to yield results. Over 40 simple and rapid serological tests based on antibody detection in serum, using native or recombinant antigens including 38kDa, 16KDa, 6kDa, LAM, ESAT-6, CFP-10, are commercially available. They may be suitable for use in primary health care settings for the diagnosis of TB, but there are limited data on their performance characteristics in both HIV-infected and non-infected patient populations.

The objective of this study was to compare the performance and reliability of these tests using serum samples from the WHO/TDR TB Specimen Bank and to assess the operational characteristics, including the ease of use, technical complexity and inter-reader variability. 19 companies agreed to participate. TDR has selected tests that are rapid (result available in less than 30 min.), simple (can be performed in 1 or 2 steps requiring minimal training and no special equipment) and easy to interpret (card or strip format with visual readout). The sera were collected from patients at collaborating health clinics, showing symptoms of pulmonary TB, which was diagnosed or excluded on the basis of smear microscopy, culture, radiography and clinical follow-up. Whole blood was collected from the patients before start of treatment. Serum was prepared from the blood samples and frozen on site at -70°C. The samples were then shipped in liquid nitrogen to a central repository in the USA and the samples were transferred to the ITM, without thawing, to be stored at -70°C. We evaluated 19 kits using a panel of 400 serum samples. Data are being analyzed in collaboration with WHO/TDR for a joint-publication.

Development and maintenance of a bank of highly characterized isolates of *M. tuberculosis*

In response to recommendations of a WHO/TDR Expert Working Group, our Unit is developing, in collaboration with the Product Research and Development (PDR) team of TDR, a bank of pedigreed *M. tuberculosis* isolates collected around the world that exhibit a variety of drug-resistance profiles. The project aims at characterizing these strains phenotypically and genotypically. The objectives of collecting, maintaining and distributing these isolates are to promote the development of novel technologies for drug-susceptibility testing (DST) appropriate for use in disease endemic countries, make the laboratory evaluation of new (and existing) DST methods easier and provide reference materials to support quality control and proficiency testing programs in endemic countries. Access to materials in the TB-bank will only be possible through WHO/TDR.

In 2006, classical microbiological and molecular biological characterization of 216 *M. tuberculosis* isolates has been completed: minimal inhibitory concentrations have been determined for H, R, S and E; seven gene loci involved in resistance to the four drugs have been sequenced; and DNA-fingerprinting has been performed. The first batches of strains were sent to the National Collection of Type Cultures (NCTC, London) for freeze-drying. The bank was presented at the 37th Union World Conference on Lung Health in Paris (November 2006) and will be available to the public in 2007. Strains can be requested through WHO/TDR.

Characterization of rifampicin-resistant *M. tuberculosis* isolates from Peru

As part of a prospective study on the rapid detection of rifampicin-resistant TB, conducted at the Institute of Tropical Medicine Alexander von Humbold in Lima, Peru, our laboratory was asked to phenotypically and genotypically characterize 200 *M. tuberculosis* isolates resulting from that study. We performed drug-susceptibility testing by the proportion method on solid medium (7H11 agar) and sequenced the rpoB gene to identify mutations responsible for resistance to rifampicin in order to confirm obtained results. Typing of *M. tuberculosis* isolates by MIRU-VNTR allows for detection of transmission in the studied population. So far we received 197 isolates of which only 131 gave a pure, full grown M. tuberculosis subculture. Sixty-two of them were found to be resistant to R by culture, which was confirmed by a mutation in the rpoB gene in 58 cases so far. These results still need to be compared with the results obtained in Peru. MIRU-VNTR typing was performed on 125 isolates so far. Thirty-three and 51% of non-MDR and MDRTB isolates respectively were clustered. Whether this observation of a higher transmission rate of MDRTB compared to non-MDRTB is representative for the Lima population requires further investigation on a population-based non-selected sample.

BURULI ULCER (BU)

Laboratory diagnosis of Buruli Ulcer

Although the experienced health worker in endemic areas usually can make an accurate clinical diagnosis of BU, microbiological confirmation is essential for several reasons:

1) to determine the precise prevalence and incidence of BU in a given area;
2) to confirm new foci, especially where health workers lack experience with BU;
3) to confirm and differentiate relapse and reinfection after treatment;
4) to help manage the disease by surgical and/or antimycobacterial treatment.

This aspect is becoming particularly important now that an increasingly number of health professionals are using antimycobacterial drugs to cure BU.

The clinical diagnosis of BU is usually easy when a child from a known endemic area presents with a typical painless ulcer characterized by undermined edges.

It has been demonstrated that in regions where health professionals are not highly experienced, very few clinically diagnosed cases are confirmed by laboratory tests. Consequently, the number of declared BU cases may be overestimated, and worse, management of patients with diseases other than BU can be totally inadequate.

As a WHO Collaborating Centre for the diagnosis and surveillance of BU we have received clinical specimens from known endemic countries and from so-called "new foci" for bacteriological confirmation.

The presence of the disease could be confirmed in Gabon, Uganda, Sudan, Togo and Papua New Guinea but not in Zambia and Guinea. These results indicate that health professionals of some countries have difficulties to clinically recognize BU.

In Peru, the Democratic Republic of Congo (DRC) and Benin, BU activities are partially supported by the DGDC. Very few cases are reported in Peru each year, and no new case was reported in 2006.

In DR Congo our collaboration with the "Programme National de Lutte contre l'Ulcère de Buruli" (PNLUB) and the Evangelical Hospital in Kimpese (IME) were reinforced in 2006. Collaboration with IME is supported by a project of the European Union entitled: "Buruli ulcer: multidisciplinary research for improvement of control in Africa" (BURULICO). Dr. A. Kibadi was enrolled in 2006 as a PhD student in our laboratory with financial support from the DGDC. The title of his PhD project is: "Contribution to the improvement of BU treatment in DR Congo".

Our collaboration with the five BU diagnostic and treatment centres of Benin continued with more than 1,000 cases diagnosed and treated in 2006. Clinical specimens were analyzed by the "Laboratoire de Référence des Mycobactéries" (LRM) of Cotonou and in Antwerp.

In 2006, we have performed a retrospective study on a large number of patient data to estimate the value of three laboratory tests (ZN staining, culture and IS2404 PCR) for the confirmation of BU. Analysis of data on laboratory tests conducted on 1,024 specimens from 793 clinically suspected cases of BU allowed us to draw important conclusions:

1) ZN "scanty" positive results (1-3 AFB per 100 fields) should be considered as ZN positive results.
2) Among the three laboratory tests used in the present study, culture gave the lowest positivity rates while PCR gave the highest positivity rates.
3) At least two specimens from the same patient should be analyzed to confirm a BU case.
4) ZN staining on two specimens followed by PCR analysis in case of ZN negative results should be recommended as routine practice to confirm a BU case in endemic areas.

Role of protozoa in the environmental reservoir of *Mycobacterium ulcerans* and in the transmission of Buruli ulcer

Because it seems unlikely that *M. ulcerans* exists primarily as a free saprophytic organism in the environment and following findings that *M. ulcerans* cells were present in higher concentrations in detritus than in water, we hypothesized that one of the actual hosts of *M. ulcerans* could be a planktonic or benthic organism such as *Daphnia* or a protozoon. A study on the role of free-living amoebae in the environmental reservoir of *M. ulcerans* was started in 2005. The possibility for *M. ulcerans* to be ingested by *Acanthamoeba polyphaga* as well as its survival and multiplication within this host was investigated. Both light and transmission electron microscopy demonstrated intracellular *M. ulcerans* bacilli within phagocytic vacuoles of the amoebae. Moreover, the *M. ulcerans* bacilli were not digested after ingestion and thus not killed by the amoebae providing an environment for survival and growth. Instead, *M. ulcerans* was noted to have actually multiplied during the first days of the intracellular stage. These results support the hypothesis that free-living amoebae might be environmental hosts to *M. ulcerans*.

Water and biofilm samples from a BU endemic region in Benin showed that both safe and unsafe sources of water are heavily contaminated with free-living amoebae. Using PCR and in vitro culture, *M. ulcerans* was however not detected. A variety of environmental specimens (fish, insects, snails, amphibians, leeches, mud, …) from BU endemic countries have been tested in the past for *M. ulcerans* using PCR and *in vitro* culture with very low levels of positivity for PCR (2-10%) and no growth in culture. The difficulty in detecting *M. ulcerans* from these environmental sources might be due to its residence within protozoa such as free-living amoebae.

Molecular epidemiology of Buruli ulcer

Extensive molecular typing of *M. ulcerans* isolates recovered from patients in many endemic foci has been undertaken to further understand the epidemiology of BU. A set of robust genotyping methods has already been applied to *M. ulcerans*: IS*2404* RFLP, AFLP, multi-locus sequence typing, VNTR, MIRU-VNTR, IS*2426* PCR, IS*2404*-Mtb2 PCR, and PCR amplification between IS*2404* and GC-rich regions.
In 2006, we have identified for the first time a microsatellite locus containing variable numbers of ACC trinucleotide repeats in a geographically diverse collection of *M. ulcerans* isolates. The analysis identified five *M. ulcerans* alleles in this locus including a unique allele in an isolate from Angola, allowing discrimination of this isolate which has hitherto been clustered among the conserved African genotype. This work represents an important promising step towards the utility of microsatellites for VNTR-based typing approach for intraspecies discrimination in this highly clonal species.
Since the discovery of IS*2404*-positive *M. ulcerans*-like mycobacteria, molecular research on *M. ulcerans* has broadened to all IS*2404*-positive, mycolactone-producing mycobacteria, i.e. *M. liflandii*, *M. pseudoshottsii*, and a subspecies of *M. marinum*. The four species were typed, based on the sequence of three genes probably involved in antibiotic resistance mechanisms. Analysis of the *rpoB*, *rpsL*, and *gyrB-gyrA* genes revealed they are stable enough to be used for fingerprinting and phylogenetic analysis. Twenty seven mutation sites were found in the 2787-bp concatenated nucleotide sequence. Alignment and clustering analysis resulted in 18 sequence types among *M. ulcerans* isolates of geographically diverse origins.

Intramacrophagic growth of *M. ulcerans*

In collaboration with scientists from Prof. J. Pedrosa's group (Braga, Portugal), M.T. Silva (Porto, Portugal) and Dr. W.M. Meyers (USA) we have undertaken a thorough study to attempt unraveling the controversy surrounding the intracellular location of *M. ulcerans*. Contrary to what is reported in literature we have demonstrated that there is an intracellular stage during the infectious cycle of *M. ulcerans* in mice and in humans.
Analyses of specimens from Buruli ulcer patients and from experimentally infected mouse footpads revealed that extracellular acid-fast bacilli are concentrated in the central acellular areas; we found intramacrophagic bacilli in the inflammatory infiltrates at the periphery of these areas. We demonstrated that mycolactone-producing *M. ulcerans* isolates are efficiently phagocytosed by murine macrophages indicating that the extracellular location of *M. ulcerans* is not a result of inhibition of phagocytosis. We found that *M. ulcerans* multiplies inside cultured mouse macrophages when low MOI (Multiplicity Of Infection) are used to prevent early mycolactone-associated cytotoxicity. Our data show that *M. ulcerans* is an intracellular parasite with an intramacrophagic growth phase like other mycobacteria, in accordance with the occurrence of cell-mediated and delayed-type hypersensitivity responses.

Risk factors for Buruli ulcer in Benin

Control options against BU are limited due to the lack of knowledge on potential risk factors and the absence of a specific vaccine. Epidemiologic observations concentrate on descriptive information or identification of new foci; however, few case-control studies have been published.
In Benin, we conducted 3 case-control studies in order to identify risk factors for BU but also to analyze the association between BCG vaccine or hemoglobin variants and BU. The 3 studies differ in their design and statistical approach. The two last studies were performed in collaboration with Prof. R. Tonglet (UCL), who sadly passed away in June 2005.
For the first time large case-control studies were performed including hospital controls and neighbourhood controls. These studies allowed us to confirm previous findings and to analyze possible risk factors that were never studied before. We conclude that (1) children < 15 years of age are at the highest risk for developing BU, (2) in BU-endemic areas exposure to unprotected water is a risk factor, (3) BU in older people may be related to reactivation of latent infections, (4) there is no evidence of a protective effect against BU by BCG vaccination at birth, (5) there is no evidence of increased risk of BU in patients with sickle cell anaemia and (6) absence of BCG vaccination at birth and HBSS/SC disorders could be risk factors for BU osteomyelitis.

PROMOTERS & SUPPORT

Unit of Virology

UCL VDC Vaccine-Induced Protective Cross-Neutralization of HIV-1
ITM promoter: W. Janssens
Collaborators: The UCL VDC research consortium (Lead Investigator: R.A. Weiss)
Support: Bill & Melinda Gates Foundation

Identification of Human Immunodeficiency Virus vaccine peptides and human broad neutralising monoclonal antibodies using M13 phage libraries
ITM promoter: W. Janssens
Support: Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT)

Study of the human immune response towards envelope proteins of HIV in an intrasplenic human PBL-SCID model
ITM promoters: L. Heyndrickx, G. Vanham
Collaborators: S. Steyaert, P. Vanlandschoot, G. Leroux-Roels (University of Ghent, Belgium)
Support: Fund for Scientific Research – Flanders (FWO, Brussels, Belgium)

Sunset over the Mekong near Phnom Penh, Cambodia.

Relative HIV viral fitness and transmission
ITM promoters: Y. van Herrewege, G. Vanham
Collaborators: B. Berkhout; Laboratory of Experimental Virology, Department of Medical Microbiology, Academic Medical Centre, University of Amsterdam, Amsterdam, the Netherlands and K Ariën, Department of Clinical Chemistry, Microbiology and Immunology, Faculty of Medicine and Health Sciences, University, of Ghent, Belgium.
Support: Fund for Scientific Research-Flanders (FWO, Brussels, Belgium); Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT, Brussels, Belgium)

Development screening assay based on single-round infectious pseudoviral HIV-1 particles
ITM promoter: L. Heyndrickx
Collaborators: Tibotec (Mechelen, Belgium)
Support: Tibotec (Mechelen, Belgium)

In vitro evaluation of HIV Microbicides
ITM promoters: Y. Van Herrewege, G. Vanham
Support: European Commission (EMPRO Project); Agence Nationale de Recherche sur le Sida (ANRS, Paris, France), International Partnership for Microbicides (IPM) - Tibotec (Mechelen, Belgium)

Dendritic cell-mediated immunotherapy
ITM promoters: E Van Gulck, G. Vanham
Collaborators: Z. Berneman, V. Van Tendeloo (University of Antwerp, Belgium); A. Hosmalin (Cochin Institute); R. Legrand (Primate Centre, Paris)
Support: Fund for Scientific Research-Flanders (FWO, Brussels, Belgium); Common Research Fund Antwerp (GOA); Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT, Brussels, Belgium), Agence Nationale de Recherche sur le Sida (ANRS, Paris, France)

Analysis of interactions between viral and interferon-induced proteins by functional proteomics
ITM promoter: W. Janssens
Collaborator: X. Van Ostade (Department of Biomedical Sciences, University of Antwerp, Belgium)
Support: Fund for scientific research – Flanders (FWO, Brussels, Belgium)

Development and application of assays for monitoring drug resistance in HIV-2 infected patients on antiretroviral therapy
ITM promoters: W. Janssens, G. Vanham
Collaborators: S. Jallow, S. Kaye, S. McConkey, S. Rowland-Jones (Medical Research Council, Banjul, The Gambia)
Support: ITM; DGDC

Human T Lymphotropic Virus 1 (HTLV-1) in Peru
ITM promoter: G. Vanham
ITMAvH promoter: E. Gotuzzo
Collaborators: G. Van Camp, L. Van Laer (University of Antwerp); A. Vandamme, S. Van Dooren (Catholic University of Leuven)
Support: DGDC; Flemish Interuniversity Council (VLIR, Brussels, Belgium)

Alternatives in diagnosis and follow-up of HIV in resource poor settings

ITM promoter: K. Fransen
ITMAvH promoter: University of North Carolina (USA); CDC (Kinshasa, RD Congo)

Unit of Immunology

Correlates of protection against HIV-infection among African HIV-exposed but seronegative subjects

ITM promoter: L. Kestens
Collaborators: J.N. Nkengasong (CDC, Dakar, Senegal); S. Mboup, T. Dieye (CHU, Dakar, Senegal); C. Demanet (Free University of Brussels, Belgium); X. Van Ostade (University of Antwerp, Belgium)
Support: Fund for Scientific Research – Flanders (FWO); DGDC

Capacity strengthening of the Immunology Laboratory of CHU in Dakar

ITM promoter: L. Kestens
Collaborators: S. Mboup, S. Sow, T. Ndieye (CHU, Dakar, Senegal)
Support: DGDC

Development and evaluation of affordable alternative methods for counting CD4 cells and HIV viral load measurement

ITM promoter: L. Kestens
Collaborator: R. Ryder (University of North Carolina, USA), M. Angelini (Fraen, Italy)
Support: Doris Duke Innovation in Clinical Research Award 2003, USA; Fraen; WHO

The use of HIV-1 pseudoviruses to monitor HIV-specific immune responses

ITM promoter: L. Kestens
Support: Institute for the Promotion of Innovation through Science and Technology in Flanders (IWT-Flandes, Belgium)

Unit of STD/HIV Research & Intervention

Research on microbicides: phase III trials of cellulose sulphate

ITM promoter: A. Buvé
Unit staff: T. Crucitti and the team of the STD laboratory (S. Abdellati, V. Cuylaerts, B. Dedeken, W. Thys)
Collaborators: L. Van Damme, M. Callahan (CONRAD, Washington, USA); David Grimes (Family Health International, North Carolina, USA)
Support: CONRAD; Family Health International

Research on microbicides: EMPRO

ITM promoter: A. Buvé
Collaborators: C. Kelly, King's College London; IPM, Washington.
Support: European Commission

Capacity building for the conduct of trials of candidate microbicides

ITM promoter: A. Buvé
Collaborators: J. van de Wijgert (AMC-CPCD, Amsterdam, The Netherlands); M. Temmerman (University of Ghent); J. Vyankandondera (Projet Ubuzima, Rwanda); K. Mandaliya (ICRH, Kenya), Z. Roosenberg (IPM, Silver Springs, USA)
Support: EDCTP (European & Developing Countries Clinical Trials Partnership), EuropeAid

Quality and coverage of sex worker interventions in Ivory Coast

ITM promoter: M. Laga
Collaborators: ASAPSU; Family Health International (Abidjan, Ivory Coast)
Support: DGDC; Family Health International

Care and Prevention of Sexually Transmitted Diseases in Cambodia

ITM promoter: A. Buvé
Collaborator: C.V. Mean (NCHADS, Phom Penh, Cambodia)
Support: DGDC; European Commission

Operational research in STI and related services for women in high-risk situations in Cambodia and Thailand (ORISS Project)

ITM promoter: A. Buvé
Collaborators: R. Coutinho (Municipal Health Service, Amsterdam, The Netherlands); S. Hean (Centre for Advanced Study, Phnom Penh, Cambodia); B. Pattanaik (Alliance against Traffic in Women Foundation, Bangkok, Thailand)
Support: European Commission

A comprehensive sexual and reproductive health programme for adolescents in rural Western Kenya

ITM promoter: A. Buvé
Collaborators: K. Miller, L. Gavin, E. Marum (CDC); A.O. Misore (Provincial Medical Officer, Kisumu, Nyanza Province, Kenya)
Support: DGDC; PEPFAR through Centers for Disease Control and Prevention (Atlanta, USA);

Study on sexual behaviour and livelihood among out-of-school youth in rural Western Kenya

ITM promoter: A. Buvé
Collaborators: A. Hardon (ASSR, Amsterdam, the Netherlands); M. de Bruijn (African Study Centre, Leiden, the Netherlands)
Support: PEPFAR through Centers for Disease Control and Prevention (Atlanta, USA)

Prevention intervention targeting highly vulnerable women in Kisumu (western Kenya)

ITM promoter: A. Buvé
Collaborators: Dr J Osur (Family Health Options Kenya); S. Onditi (Provincial clinical officer, Kisumu, Ministry of Health, Kenya)
Support: PEPFAR through Centers for Disease Control and Prevention (Atlanta, USA);

Increasing the relevance and effectiveness of HIV/AIDS prevention and care among youths through a Cambodia-Thailand partnership

ITM promoter: A. Buvé
Collaborators: C.V. Mean (NCHAD, Phnom Penh, Cambodia); Sav Chanty (HNI, Cambodia); G. Suwanarrat (AIDSNet, Thailand)
Support: EuropeAid

Policy research on prevention of HIV transmission from mother to child and on care of HIV-infected persons in developing countries

ITM promoters: A. Buvé
Support: DGDC; USAID, Columbia University, WHO

Epidemiology of Trichomonas in Zambia

ITM promoters: A. Buvé, E. Van Dyck
Collaborator: R. Musonda (Tropical Diseases Research Centre, Ndola, Zambia)
Support: ITM

Activities of the STD laboratory

ITM promoters: E. Van Dyck, T. Crucitti, A.Buvé
Collaborator: N/A
Support: RIZIV; own resources

Collaboration in international studies

ITM promoters: A. Buvé, E. Van Dyck, T. Crucitti, M. Laga
Collaborator: R. Hayes (LSHTM)
Support: CONRAD; Family Health International; UNAIDS; WHO

Unit of Mycobacteriology

TUBERCULOSIS (TB)

Drug resistance surveillance and multidrug-resistant TB (MDRTB) treatment

ITM promoter: F. Portaels
External Institutes/collaborators: Damien Foundation TB Control Projects of Bangladesh, Rwanda, Burundi, Philippines, India and DRC, National TB Programmes of Georgia, Burundi, Rwanda and the Philippines.
Support: Damien Foundation (Belgium); WHO (Geneva, Switzerland)

Investigations on the development of drug resistance

ITM promoter: F. Portaels
External collaborators: Damien Foundation TB Control Projects and National TB Programmes of Bangladesh and DR Congo
Support: Damien Foundation (Belgium)

A multicentre randomised control trial of a gatifloxacin-containing short-course regimen for the treatment of pulmonary TB

ITM promoter: F. Portaels
Project promoter: C. Lienhardt (Institut de Recherche pour le Développement, Paris, France)
External collaborators: C. Perronne (Hopital Raymond Poincare, Garches, France), D.A. Mitchisson (St George's Hospital Medical School, London, UK), K. Fielding and C. Merle (London School of Hygiene and Tropical Medicine, London, UK), M. Ndir, A.H. Diop, F. Ba (Programme National Tuberculose, Dakar, Senegal), M. Gninafon (Programme National Tuberculose, Cotonou, Benin), B. Fourie (Medical Research Council, South Africa), J. Odhiambo (Kenya Medical Research Institute, Nairobi, Kenya), and O. Sow (Programme National Tuberculose, Conakry Guinea)
Support: European Commission

Multi-centre trial for the evaluation of fixed dose combined tablets daily for the treatment of pulmonary TB

ITM promoter: A Van Deun
Project promoter:: IUATLD, France.
Collaborators: A. Jindani, N. Zidouni (CHU Algiers, Algeria), H. Piñeros (CIDEIM Cali, Colombia), B. Bah (CHU Conakry, Guinea), N.Thuy Ha (NHTRD Hanoi, Vietnam), (PNT Hospital Ho Chi Min, Vietnam), B. Shrestha (GENETUP Kathmandu, Nepal), Dr. K. Sharma (INF Nepalganj, Nepal), E. Ticona (NTP Lima, Peru), C. David (HRC Manhica, Mozambique), J. Changulucha (NIMR Mwanza, Tanzania), I. Patino (NTP Santa Cruz, Bolivia)
Support: European Commission

Improved diagnosis, drug resistance detection and control of TB in Latin America

ITM promoters: F. Portaels, J. Palomino
Collaborators: An extensive network of European and Latin American researchers
Support: European Commission

Development of a molecular platform for the simultaneous detection of *M. tuberculosis* resistance to rifampicin and fluoroquinolones (OLIGOCOLOR)

ITM promoter: F. Portaels
Collaborators: National Institute for Public Health & the Environment (Bilthoven, the Netherlands); Swedish Institute for Infectious Disease Control (Solna, Sweden); Corporación CorpoGen (Bogotá, Colombia); INEI-ANLIS Institute Malbrán (Buenos Aires, Argentina); Hospital Dr. Cetrángolo (Buenos Aires, Argentina).
Support: European Commission

Biofitness of the *M. tuberculosis* Beijing genotype

ITM promoter: F. Portaels
Collaborators: Fundación Universidade do Rio Grande, Brazil.
Support: Fund for Scientific Research-Flanders (FWO)

Evaluation of serodiagnostic tests for TB

ITM promoter: F. Portaels
Support: WHO/TDR

Development and maintenance of a bank of highly characterized isolates of *M. tuberculosis*

ITM promoter: F. Portaels
Support: WHO/TDR

Characterization of rifampicin-resistant *M. tuberculosis* isolates from Peru

ITM promoter: F. Portaels
Collaborators: E. Gotuzzo (IMTAvH, Lima, Peru)
Support: Foundation for Innovative New Diagnostics (FIND)

BURULI ULCER (BU)

Laboratory diagnosis of Buruli ulcer

ITM promotor: F. Portaels
Collaborators: BU National Programs of Togo, Gabon, Guinea, Uganda, Sudan, Papua New Guinea, DRC and Benin. H. Guerra (IMTAvH, Lima, Peru), T. Muyembe and K. Kibadi (INRB, Kinshasa, DRC), S. Anagonou (LRM, Cotonou), R.C. Johnson (PNLUB, Cotonou)
Support: DGDC, Damien Foundation (Belgium), EU (Burulico project)

Role of protozoa in the environmental reservoir of Mycobacterium ulcerans and in the transmission of Buruli ulcer and eventually other mycobacterial diseases

ITM promoter: F. Portaels
Collaborators: J.F. De Jonckheere (Research Unit for Tropical Diseases, Christian de Duve Institute of Cellular Pathology) and M.T. Silva (Institute for Molecular and Cell Biology, Portugal)
Support: Fund for Scientific Research-Flanders (FWO)

Molecular epidemiology of Buruli ulcer

ITM promoter: F. Portaels
Collaborators: P. Supply (Institut Pasteur de Lille, France), M. Hilty (Swiss Tropical Institute, Switzerland)
Support: DGDC, Damien Foundation (Belgium), EU

Intramacrophagic growth of *M. ulcerans*

ITM promoter: F. Portaels
Collaborators: J. Pedrosa and M.T. Silva (University of Minho, Portugal), W.M. Meyers (Armed Forces Institute of Pathology, USA)
Support: Damien Foundation (Belgium)

Risk factors for Buruli ulcer in Benin

ITM promoter: F. Portaels
Collaborators: M. Dramaix (ULB, Brussels), R. Tonglet, J.L. Gala and F. Nackers (UCL, Brussels)
Support: DGDC, Damien Foundation (Belgium)

PUBLICATIONS

Publications in international peer-reviewed journals

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Parasitology

The mission of the Department of Parasitology is to generate, disseminate and apply knowledge of human parasitic diseases as well as to strengthen the capacities to this end in developing countries. Currently, our focus is on malaria, leishmaniasis, sleeping sickness and schistosomiasis. The department pursues these objectives through innovative and applied research, post-graduate training at the ITM and elsewhere and scientific support to research and control programmes.

Collection of a blood sample during a malaria survey in Vietnam.

Unit of Entomology

The Unit of Entomology focuses on the biology and control of malaria vectors in SE Asia and Africa. Fieldwork takes place in Vietnam, Laos, Cambodia, Thailand, Uganda and Burundi. The Unit coordinates a network (MALVECASIA) on monitoring insecticide resistance and mapping malaria vectors in SE Asia, which is considered a model for other regions in the world. New molecular diagnostic methods were developed to detect target insecticide resistance in more than 20 species and metabolic resistance was explored using enzymatic assays. In collaboration with the University of Louvain (UCL), geographical information on vectors and environment in SE Asia were integrated into a simple visualization tool SEAGIS based on Arc View Software.

A study on transmission-dynamics and monitoring insecticide resistance was completed in seven sentinel sites in Uganda.

The project on indoors residual insecticide in the highlands of Burundi was finalized, staff of the Ministry of Health was trained to assure the continuity of the national expertise. Data will now be further analyzed to assess the validity of this strategy in preventing malaria.

The Unit also participated in the entomological evaluation of insecticide treated hammocks to control forest malaria in Vietnam (see below).

In Cambodia, we started a project to understand the dynamics of malaria transmission in fast changing forested settings to strenghten the national capacity and prepare intervention studies.

In collaboration with the Department of Public Health, a new project was started on evaluating long lasting insecticidal nets against sandflies, vectors of leishmaniasis in India.

The Unit is actively involved in the review of reports of testing/evaluation vector control tools (insecticides and long lasting insecticidal nets) in the WHO Pesticide Evaluation Scheme (WHOPES) and contributes to develop guidelines for testing mosquito adulticides.

The second research focus of the unit is the interaction between tsetse flies and trypanosomes, particularly the immunomodulatory activity of proteins in tsetse saliva in vertebrate hosts. The unit participates actively in the WHO/TDR International *Glossina* Genomics Initiative (IGGI).

Mosquito identification in Ninh Thuan province, Vietnam

Unit of Parasite Diagnostics

The Unit of Parasite Diagnostics conducts research on sleeping sickness, visceral leishmaniasis and Chagas' disease. We focus on parasitological, serological, bioclinical and genetic markers and their application in primary diagnosis, stage determination and follow-up after treatment. Special attention is paid to the development of individual tests based on recombinant and synthetic antigens that can also be applied on saliva. Several studies on sleeping sickness and visceral leishmaniasis are conducted in DR Congo, Angola, Uganda, Sudan and Malawi. In Kinshasa, the Unit collaborates with the National Reference Laboratory for Human African Trypanosomiasis at the Institut National de Recherche Biomédicale. In Chile, a small scale study was started up on the development of an innovative molecular test for Chagas' disease. The Unit continues research on animal trypanosomiasis in collaboration with the veterinary department the ITM and universities in Belgium, Ethiopia and Gran Canaria. In 2006, FIND-Diagnostics invited the Unit to assist in the development of a new generation of diagnostic tests for sleeping sickness. The Unit has also become an International Reference Laboratory for *Trypanosoma evansi* of the Office International des Epizooties (OIE).

Unit of Molecular Parasitology

In 2006, the Unit of Molecular Parasitology has continued its activities on leishmaniasis, with special attention for the treatment failure and drug resistance, and molecular epidemiology. We collaborate with the unit of Parasite Diagnostics for the simplification of molecular assays for the diagnosis of Leishmaniasis, Human African Trypanosomiasis and Chagas' disease, the Unit of Parasite Epidemiology for the coaching of all molecular activities related to malaria (parasite fingerprinting in support to clinical trials, search of new markers), and the Unit of Entomology in the project of impregnated bednets for leishmaniasis lead by the Department of Public Health. We coordinate the Institutional strengthening programme in Peru, which involves 4 departments of IMT.

Our Unit coordinates the LEISHMED network of 22 Euro-Mediterranean partners and the LEISHRISK network of 43 worldwide institutions, which will be launched in January 2007. We remain thus active in Latin America, the Indian sub-continent, the Mediterranean basin and East Africa.

Unit of Epidemiology and Control of Parasitic Diseases

Prof. U. D'Alessandro, Drs A. Erhart, J.P. Van geertruyden and Mrs C. Van Overmeir.

The Unit of Epidemiology and Control of Parasitic Diseases further developed its research lines on antimalarial drug resistance, the efficacy of new drugs or drug combinations, malaria in pregnancy, malaria-HIV interactions, malaria epidemiology and the evaluation of new actual interventions.

The new project: "Evaluation of 4 artemisinin-based combinations for treating uncomplicated malaria in African children", was kicked off with an investigators' meeting in Antwerp. The phase III study on the efficacy of dihydroartemisinin-piperaquine against artemether-lumefantrine for the treatment of uncomplicated *P. falciparum* malaria, funded by Medicine for Malaria Venture (MMV), was completed. A new trial on the paediatric formulation of artemether-lumefantrine was started in Benin as part of a multicentre African trial, with the support of MMV.

We continued our collaboration in Rwanda, including a clinical trial on chlorproguanil-dapsone+artesunate versus amodiaquine-sulfadoxine-pyrimethamine, and in Zambia with the trial on the prevention of malaria in HIV infected individuals and the case-control study on HIV infection as risk factor for severe malaria in adults.

The project on the delivery of sulfadoxine-pyrimethamine intermittent preventive treatment to pregnant women in Burkina Faso and in Malawi, in collaboration with national partners and the Liverpool School of Tropical Medicine, is in its fourth year and about to be completed.

In the project on insecticide-treated hammocks in Vietnam, two additional cross-sectional surveys were carried out.

In Peru, the analysis of the trial on dihydroartemisinin-piperaquine against mefloquine-artesunate was finalized. A new study on *P. vivax* epidemiology, in Vietnam and Peru, was formulated and should start in 2007.

Unit of Human Helminthology

The Unit of Human Helminthology continued its research lines on the epidemiology, transmission dynamics and integrated control of schistosomiasis and other helminthiases. Collaborative field research takes place in Senegal, Cuba, DR Congo, Peru. In Senegal, a new INCO-DEV project on innate immune responses and immunoregulation in schistosomiasis was launched. In DR Congo, a research on capacity strengthening is set up with the INRB in Kinshasa, focusing on the re-emergence and control of schistosomiasis in post-conflict areas. In South-America we continue the collaborative projects on the diagnosis and epidemiology of strongyloides in Peru, and the study on the relation between helminth infections and atopic diseases in Cuba. We also collaborate in several projects on cysticercosis of the Unit of Veterinary Helminthology.

The annual two-day meeting "ParadayS" outside the Institute, was devoted to the presentation of new projects and achievements of our PhD students.

PROJECTS

Unit of Entomology

Monitoring of malaria vectors and insecticide resistance in South-east Asia (MALVECASIA)

The standard WHO bioassay was used to assess the resistance status of field collected malaria vectors in Cambodia, Laos, Thailand and Vietnam. Over a three year period, more than 100 sites were prospected, about 65,000 mosquitoes tested (without counting the controls) and 668 bioassays (insecticide/species/study sites) have been carried out.

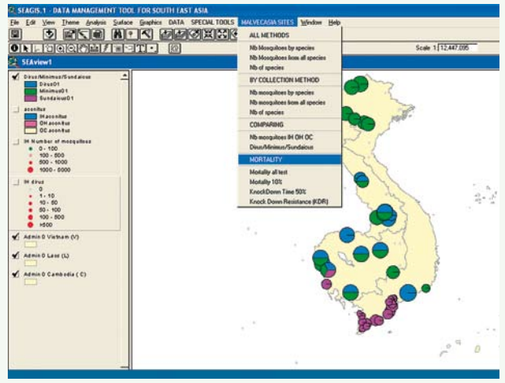
Insecticide resistance was only found in low transmission areas and does not impose changes of the ongoing control strategies. The high levels of insecticide resistance in southern Vietnam demand further study. This large scale field work also provided substantial information on the distribution of *Anopheles* species in the region, which was integrated in a geographical information system (see below).

Final coordination meeting of the MALVECASIA network in Sihanoukville (Cambodia): S. Manguin (IRD France), L.K. Thuan (Nimpe Vietnam) Y. Linton (NHM UK), M. Coosemans (ITM, Belgium), S. Phopida (CMPE Laos).

A Geographical Information System (GIS) for *Anopheles*

A Geographical Information System (GIS) was set up for the spatial analyses of the insecticide resistance and the distribution of *Anopheles* species. Data were collected at 3 levels. Level 1 includes information on mosquitoes, people, environment, administrative boundaries, roads, rivers, villages, altitude, malaria cases, meteorological information, land cover and mosquito collection sites from the literature. Level 2,presents a zoom of 10x10km around each of the collection sites of the insecticide monitoring study, including satellite images, topographic maps (1/50.000) and land cover data. All the information from level 1 and 2 was integrated into a simple visualisation tool SEAGIS, based on the ArcView software. A detailed study on the relationship between vector distribution and environment will be done in the province of Ninh Thuan (Vietnam) and in 3 provinces of Cambodia (level 3). Mosquito collections are ongoing, and Landsat TM satellite images are processed in a referenced field map for land use analysis.

The SEAGIS allows to study spatial distribution of insecticide resistance and to pursue its extension in time. Detailed species distribution maps of the *Anophles dirus* complex, based on more than 600 collection sites, provide a good overview on the geopgraphical extension of the different species.



SEAGIS with results on bioassays.

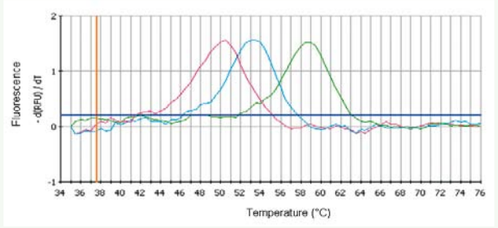
Malaria transmission and insecticide resistance in Uganda

This research is part of the project 'Intensity of malaria transmission and spread of antimalaria drug resistance' of the Unit of Epidemiology and Control of Parasitic Diseases. Insecticide resistance is monitored in the seven sentinel sites. The bioassays show that both DDT and permethrin resistance is present; a low level of deltamethrin resistance was observed in two sentinel sites. Two *kdr* (knockdown resistance) point mutations were found in *An. gambiae* s.s. populations, one of which was observed in high frequency with spatial and seasonal variations. These observations have important implications for the insecticide use in malaria vector control.

Insecticide target resistance in malaria vectors

A pyrethroid and DDT resistance mechanism, known as knockdown resistance (*kdr*), is linked to mutations at codon 1014 in the DIIS6 region of the *para*-type sodium channel gene. The sequence of the DIIS6 region was determined in 25 Southeast Asian and African *Anopheles* species. A phylogenetic analysis is ongoing. The DIIS6 sequences were used to develop PCR based assays for the detection of *kdr*. In Southeast Asia, no *kdr* mutation was observed in the main vectors. Biochemical assays suggest an esterase mediated detoxification in the pyrethroid resistant *Anopheles epiroticus* of the Mekong Delta and an esterases and monooxygenase detoxification in *An. minimus* s.l. A L1014S *kdr* mutation in *An. vagus, An. sinensis* and *An. paraliae* was found in southern Vietnam and in Cambodia. In *An. peditaeniatus*, the L1014S *kdr* allele was found in combination with the L1014F *kdr* allele. In all species, the *kdr*

genotypes were equally distributed among bioassay survivors and non-survivors. At population level, the L1014S frequency correlates to the permethrin survival rate. In the Ugandan *An. gambiae* s.s., the L1014S frequency is high, even in populations with no pyrethroid and low DDT resistance. At individual level, the *kdr* genotypes correlate to the DDT survival status. This suggests that in the African and Southeast Asian *Anopheles* species beside the L1014S *kdr* mutation other subsequent mutations are necessary to survive the bioassay. Posttranscriptional regulation mediated a resistance associated correlation and/or other mechanisms provide insecticide resistance.



Real time PCR to detect kdr mutations in *An. gambiae* and *An. arabiensis*. Cloned sequence variants, from low to high Tm: The L1014S allele (red), the L1014F allele (blue) and the wild type L1014L allele (green).

Prevention of malaria epidemics in the Central African highlands

Training of a Burundese lab technician at ITM.

We evaluate a strategy for sustainable prevention of malaria epidemics in African highlands in the Province of Karuzi, Burundi. Indoor spraying with residual insecticides is investigated in space and time; houses located near the valley floors (25% of the population) are treated once a year just before the hottest month of the year. From 2002 to 2004 the vector population showed a drastic decrease in the treated area and in 2004 malaria prevalence declined with 20%, compared to the control areas. In 2005, however we observed an important increase of the vector population associated with an increase of *knock down* resistance in *An. gambiae*.
In order to sustain national expertise Burundese biologist and technicians were trained and quality systems were set up.
Bioassays were performed in different sites near the Karuzi province. *An. funestus* and *An. gambiae* s.l are sensitive to discriminative doses of DDT and delthametrin, and the resistance against permethrin is suspected in *An. gambiae.*

Vector control for the prevention of visceral leishmaniasis in India

As part of a larger project of the Department of Public Health on the efficacy of Long-Lasting Insecticidal Nets (LLIN) to prevent visceral leishmaniasis in the Bihar focus (Kalanet project), we evaluate the impact of two brands of long lasting impregnated bed nets on the density of phlebotomine sandflies at household level. The protocol was designed assuming that most sandflies breed mainly inside the houses. We use two collecting methods, CDC light traps during the night and aspirator collections in the morning. A first analysis showed no impact of LLINs on sandflies density, suggesting regular invasions from outside.

Evaluation of long-lasting insecticidal nets in India.

Collaboration with the National Institutes of Malaria, Parasitology and Entomology in Vietnam, Cambodia and Laos

The objective of this over-arching programme is to strengthen the managerial, scientific, technical and networking capacities of these national reference institutes and to design scientifically valid strategies for the control and surveillance of malaria and helminths.
In the province of Ninh Thuan (Vietnam) entomological surveys were continued to evaluate long lasting insecticidal hammocks for the control of forest malaria. The density of malaria vectors is low in this area. The annual entomological inoculation rate was 9 infective bites/man/year in the forest and 1 infective bite/man/year on the way to the forest; no transmission was measured inside the villages. Apart from the main vectors, *An. dirus* and *An. minimus*, *An. maculatus* and *An. pampanai* contributed to malaria transmission. In Cambodia transmission was studied in 12 different forest settings in three provinces. Results of this study will be integrated in the GIS level 3 for analyzing the spatial-environmental distribution of vectors (see above). The impact of insecticide-treated hammock nets on the biting behaviour of malaria vectors was assessed in two forest villages. Six experimental huts were built to evaluate the impact of existing vector control tools in terms of mortality, deterrence, blood-feeding inhibition and induced exophily of *An. epiroticus* in Southern Vietnam. In pre-trial over six nights 1,104 *An. epiroticus* were collected. Three other species, *An. nimpe, An. sinensis* and *An. campestri,* were found in very low densities.
Staff members from Vietnam and Cambodia were trained in ELISA techniques for the detection of the sporozoite antigen CSP and in the molecular identification of *Anopheles* species.

One of the six experimental huts built to test the operational implications of insecticide resistance found in *Anopheles epiroticus* populations of southern Vietnam.

Tsetse fly salivary glands and trypanosome development

The main objective of this study is to characterize proteins from the tsetse fly salivary glands that play a role in the blood feeding process of the fly and in the development of the trypanosome in the insect and the vertebrate host. The protein-rich salivary gland environment of the tsetse fly supports the growth and differentiation of specific trypanosome developmental stages up to the infective metacyclic forms. Moreover, these metacyclic forms are injected with the tsetse saliva into a new vertebrate host by the bite of the infected tsetse fly.
To obtain more insight in the tsetse salivary function, general aspects of the tsetse fly saliva and its composition were studied. Direct pH and protein content measurements revealed a moderately alkaline (pH ~ 8.0) salivary environment with approximately 4.3 µg soluble proteins per gland and a constant presence of the major saliva proteins throughout the blood feeding cycle. Although major salivary genes are constitutively expressed, upregulation of salivary protein synthesis within 48 hours after the blood meal ensures complete protein replenishment from day 3 onwards. Screening of a non-normalized *Glossina morsitans morsitans* λgt11 salivary gland expression library with serum

Entomological team studying forest malaria in Cambodia.

from a saliva-immunized rabbit identified three novel full-length cDNAs encoding for secreted salivary proteins with yet unknown functions: a 8.3 kDa glycine/glutamate-rich protein (*Glossina morsitans morsitans* salivary gland protein Gmmsgp1), a 12.0 kDa proline-rich protein (Gmmsgp2), and a 97.4 kDa protein composed of a metallophosphoesterase / 5'nucleotidase region with a glutamate / aspartate / asparagine – rich region (Gmmsgp3).
In collaboration with the VUB, two abundantly present saliva proteins Tsal1 and Tsal2 were fully characterized by using recombinant and RNA-interference technology and were demonstrated to be a novel class of salivary proteins in blood feeding insects with a combined endonuclease and apyrase activity.
In another close collaborative work with VUB, we showed that tsetse saliva accelerates the onset of a *T.brucei* infection in the murine host, associated with a reduced inflammatory reaction.

Expression of the human trypanolytic protein Apolipoprotein L-I in a bacterial endosymbiont of the tsetse fly

As part of a special research programme 'Innovation in the control of African Trypanosomiasis: development of novel tools, based upon pioneering scientific findings' that has started in July 2006, the use of the human trypanolytic protein ApoL-I to generate trypanosome refractory tsetse flies will be prospected. The objective of this study is to explore the possibility to express this trypanosome-killing protein in the bacterial endosymbiont of the tsetse fly, *Sodalis glossinidius*. We have isolated this organism from the haemolymph of our ITMA Glossina morsitans flies on blood agar plates in micro-aerophilic conditions and cultured them in a special liquid medium. The next step is now to determine the toxicity of the ApoL-I for the Sodalis bacteria and to construct a plasmid vector that can be used to express and secrete this human protein in this endosymbiont.

Tsetse flies and the control of sleeping sickness (TFCASS)

This 4-year Specific Targeted Research Project within the EU Sixth Framework Programme started in November 2006. The consortium comprises 10 partners from Africa and Europe and is coordinated by the Liverpool School of Tropical Medicine, UK. Our Unit is responsible for the determination of the vectorial capacity of genetically different sub-populations of *G. palpalis* group flies for different Trypanosoma sp.

Project Management Committee of the EC-FP6/TFCASS project during their first meeting at ICIPE, Kenya.

Unit of Parasite Diagnostics

Improved stage determination and follow-up of sleeping sickness patients through IgM quantification in cerebrospinal fluid under field conditions in Angola

Correct diagnosis of the disease stage in sleeping sickness is indispensable for treatment success. Drugs for the early stage (Pentamidine) are safe, but are inefficient in the meningo-encephalitic stage. Drugs for the meningo-encephalitic stage (mainly Melarsoprol) are very toxic with fatal adverse events in 5% of the patients. Improved stage determination, especially in patients with white blood cell counts in CSF up to 20 cells/µl, could lead to less relapses, complications and costs. LATEX/IgM and LATEX/*T.b. gambiense* are simple tests to monitor specific antibody concentrations in the cerebrospinal fluid and diagnose brain involvement in trypanosomiasis. We demonstrated that positivity in these tests is associated with increased risk of relapse if patients with ≤ 20 cells/µl are treated with first stage drugs. More data are needed before widely implementing LATEX/IgM and LATEX/*T.b. gambiense* for treatment, however in 2005, a multicentre prospective cohort was initiated in 5 trypanosomiasis treatment centres in Angola. The inclusion of patients was slow, due to decreasing sleeping sickness prevalences in Angola. A new participating center was therefore included in Ndalatando, in the Kwanza Norte province. The participating treatment centers were visited to consolidate laboratory techniques and to organize the follow-up of the patients.

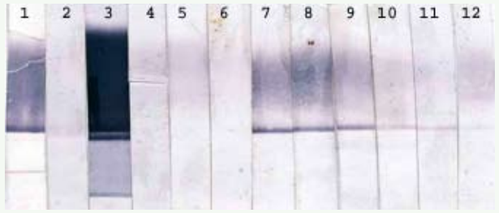
The LATEX/IgM test is performed at the trypanosomiasis treatment centre of Ndalatando, Angola.

Rationalizing follow-up after treatment for sleeping sickness

We previously investigated the neuro-inflammatory immune response of patients and identified alternative parameters for stage determination that can also be used to improve and shorten the follow-up after treatment. A new prospective study was initiated in Mbuji-Mayi (DR Congo), in collaboration with the Institut National de Recherche Biomédicale (INRB) and the Programme National de Lutte contre la Trypanosomiase Humaine Africaine (PNLTHA). Sleeping sickness around Mbuji-Mayi is characterized by high rates of treatment failures, allowing to identify risk factors and early prognostic markers. By now, 380 patients were followed-up 18 months after treatment.

Characterization of invariant surface glycoprotein 75 and 65 (ISG75, ISG65) of salivarian trypanosomes for diagnostic purposes

The objective of this project is to characterize ISG75 and ISG65 molecules of the trypanosome coats for incorporation into diagnostic tests as recombinant proteins or synthetic peptides, replacing the native antigens in the current serological tests. Recombinant ISG75 sequences were expressed in *Escheria coli* and ISG75 and ISG65 in *Pichia pastoris*. The recombinant proteins were purified by affinity chromatography and tested for diagnostic potential in Western blot and ELISA. Crystallisation of the recombinant ISG75, purified from E. coli, will allow unraveling the structure of this surface protein.



Evaluation of the diagnostic potential of purified ISG65 (Tev20) expressed in *Pichia pastoris* on positive and negative *Trypanosoma brucei gambiense* serum samples. Lanes: 1 anti-E tag antibody (mouse IgG); 2 hyperimmune anti-ISG64 rabbit serum; 3 hyperimmune anti-ISG65 rabbit serum; 4-5 endemic negative human sera; 6-12 positive human sera.

Identification of short diagnostic peptides by Random Phage Display Library screening

A commercial Random Phage Display Library, containing 2.7x109 different peptide sequences, has been screened with monoclonal antibodies raised against several VSG's of *T.b. gambiense* for selection of peptides mimicking the original epitopes on the native VSG's. Phages reacting with monoclonal antibodies against LiTat 1.5 and LiTat 1.3 VSG were isolated and tested in ELISA for reaction with their respective monoclonal antibody and for cross-reaction. The phages with the highest O.D. in ELISA were selected and the peptide sequences of these phages were determined. Thus, 13 different 12-mer sequences were selected, synthesized and tested in ELISA and dot blot with the biopanning monoclonals and human sera. One of these synthetic peptides reacted with its corresponding monoclonal but the diagnostic potential has still to be confirmed.

Development of saliva-based antibody detection tests for serodiagnosis of human trypanosomiasis and leishmaniasis

Detection of specific antibodies in saliva with on the left an experimental particle gel agglutination test for sleeping sickness and on the right a commercial lateral flow test for visceral leishmaniasis. For each test, a positive and negative reaction is shown.

Screening for sleeping sickness or visceral leishmaniasis is thus far based on the detection of specific antibodies in serum. Saliva collection is a non-invasive alternative for antibody detection.
For sleeping sickness serodiagnosis we successfully developed an ELISA on saliva without loosing test performance compared to serum. Since existing point-of-care tests for specific antibody detection in serum are not applicable on saliva, we explored the use of an experimental particle gel agglutination test (PaGia) and obtained sensitivities and specificities of respectively 82 and 99%. If test sensitivity could be further increased, a non-invasive relatively simple test for serodiagnosis of sleeping sickness could become available.
For the diagnosis of visceral leishmaniasis, the Dot Application Test (DAT) turned out to be less suitable when used with saliva. An existing commercial lateral flow test for serodiagnosis (Diamed IT-Leish) on serum was therefore adapted. The resulting saliva test was suitable for field conditions. The specificity was 100% but the sensitivity only 65% which limits its use for epidemiological studies.

National Reference Laboratory for Human African Trypanosomiasis in Kinshasa

To strengthen quality control, field activities and operational research of the sleeping sickness control programme in DR Congo, a reference laboratory was set up in Kinshasa at the Institut National de Recherches Biomédicale (INRB). Activities include the training of medical personnel, the production of the mini Anion Exchange Centrifugation Technique (mAECT) and providing facilities for operational research from various research groups.

Isolation and characterization of trypanosomes from treatment-refractory sleeping sickness cases

The objectives of this project are to isolate *T.b. gambiense* strains from treatment-refractory cases and to assess their drug sensitivity profile by in vitro and in vivo tests. Human specimens containing *T.b. gambiense* parasites are cryopreserved in a new medium developed at the Swiss Tropical Institute and adapted by our Congolese partners. Patients are sampled at Dipumba hospital in Mbuji-Mayi, DR Congo, where the treatment failure rate is very high. The parasite strains are then being isolated through inoculation in Grammomys surdaster and immuno-suppressed Mastomys natalensis.

PCR-Oligochromatography as a simple and rapid molecular diagnostic tool for *Trypanozoon* infection

This project aims at the development of a PCR-based dipstick (CORIS BioConcept). The test should allow a quick one-step detection of different gene amplification products without needing specific material or trained personnel. In 2006, the PCR-OC for *Trypanozoon* infection has been evaluated in a ring trial comprising laboratories in Belgium, Burkina Faso, Germany, Kenya, Uganda and Vietnam.

Simplified and rapid molecular assays for disease diagnosis and parasite (sub-) species identification (TRYLEIDIAG)

TRYLEIDIAG is a 4-year Specific Targeted Research Project under the Sixth Framework Programme of the EU. The consortium, coordinated by the Unit, comprises 9 partners (5 European, 4 African). The project aims at the development of rapid and sensitive molecular tools to diagnose human African trypanosomiasis and leishmaniasis. In February 2006 the project was started with a kick-off meeting in Uganda. During the first annual project meeting in Kenya in November 2006 the progression of the first year was discussed and the future work planned. Prototypes for simplified

TRYLEIDIAG kick-off meeting held in Kampala, Uganda, in February 2006.

detection of PCR- and NASBA-products in dipstick format have been developed for Trypanosoma brucei and Leishmania, clinical samples have been collected from sleeping sickness patients in DR Congo and Uganda and from leishmaniasis patients in Sudan and Kenya.
More information on the consortium and the project can be found on www.tryleidiag.org

PCR-Oligochromatography technique for molecular diagnosis and epidemiological monitoring of Chagas' disease

This project aims at the validation of a rapid PCR-dipstick test for the detection of Trypanosoma cruzi in clinical and biological samples. The assay is tested for diagnosis and epidemiological monitoring in Chile and allows the exchange of young Chilean and Belgian researchers.


Thylamys elegans, one of the wild mammal reservoirs of *Trypanosoma cruzi* in Chile.

Anti-disease vaccine and diagnostic tests for African trypanosomiasis (TRYPADVAC 2)

TRYPADVAC 2 is a 4-year Specific Targeted Research Project (EU Sixth Framework Programme) with 12 partners from Latin America, Europe and Africa and co-ordinated by IRD-CIRAD, France. Our Unit is responsible for the development of diagnostic antibody detection tests based on recombinant proteins expressed in *Escheria* coli and *Pichia pastoris* and derived from several trypanosomal proteinases.

Biology and clinical staging of trypanosome neuroinvasion in sleeping sickness (NEUROTRYP)

NEUROTRYP is a 3 year Specific Targeted Research Project (EU Sixth Framework Programme). Its objective is to unravel the mechanisms by which African trypanosomes cross the blood brain barrier and invade the brain, in order to develop new diagnostic markers and improved treatment for this neuroinvasive stage. The consortium of 8 partners In Europe and Africa is coordinated by the Karolinska Institute (Sweden). Our Unit is responsible for rodent models of *T.b. gambiense* and *T.b. rhodesiense* infection. The parasite strains will be genetically marked to allow in vivo tracking of the luminescent parasites during infection and brain invasion.
More information on the consortium and the project can be found on http://www.neuro.ki.se/neurotryp

Development of antibody ELISAs for the diagnosis of *Plasmodium vivax* and *Plasmodium falciparum*

Two antibody detection ELISAs were developed using specific antigens for *P. vivax* and *P. falciparum*, respectively. Subsequently these ELISAs were evaluated in a collection of human sera. The two tests were transferred to the laboratory of Immunology at NIMPE, Vietnam and are now used to measure the evolution of malaria sero-prevalence and the incidence of new infections in a community trial of Long Lasting Insecticidal Hammocks.

Establishment of a International Reference Laboratory for *Trypanosoma evansi* (Surra)

During the past years, the international exchange of equines and camelidae over the world has risen dramatically and so has the need for testing these animals for *T. evansi* infection. In May 2006 the Office International des Epizooties granted our laboratory the status of International Reference Laboratory for *Trypanosoma evansi* (surra) for a period of 5 year. Our laboratory also assisted other research laboratories in diagnostic, epidemiological and control studies on surra.

Equine trypanosomiasis *(Trypanosoma equiperdum* and *T. evansi)* in the Arsi and Bale highlands of Ethiopia

Trypanosomiasis is the most important disease and a serious threat to the life and productivity of equines in Ethiopia, especially in the highlands (Arsi and Bale zones). This project aims to apply new diagnostics and treatments. The molecular laboratory at the Addis Ababa University was equipped and its staff trained in advanced serological and molecular diagnosis. New Trypanosoma strains will be isolated from clinical cases in the field, and experimental infections will be combined with different treatment schedules.

Unit of Molecular Parasitology

Risk factors of the spread of leishmaniasis in the Mediterranean basin (Leish-Med)

Leish-Med is a multidisciplinary co-ordination action supported by the EU linking 22 European and South/East Mediterranean partners in order to document the main risk factors for the spread of leishmaniasis around the Mediterranean and to promote transborder control strategies. The project should allow to: 1) review, assess and inform on current scientific knowledge of the epidemiology and control of leishmaniasis around the Mediterranean; 2) create a common information system on the urbanization of leishmaniasis, therapeutic failure and parasite drug resistance, and the link between leishmaniasis and immuno-suppression; 3) coordinate existing research on the surveillance and control of leishmaniasis; 4) disseminate and standardize relevant tools and good practices resulting from research; 5) advise national, regional and international health authorities about the most effective transborder control measures; 6) identify the gaps in current knowledge and expertise, and to prepare future multidisciplinary research. During this second year, 3 work packages were completed. Workshops and training sessions were organized on diagnostics and epidemiometry in Marrakech and Rabat (Morocco) and on chemotherapy and drug resistance in Larnaca (Cyprus).
More details on this initiative are available at www.leishmed.net.


Risk factors for the spread of leishmaniasis in Chichaoua (Morocco).

Long lasting insecticidal nets for the prevention of Kala-azar

In this project on long lasting insecticidal nets (LLIN) for the prevention of VL in the Indian subcontinent (see Unit of Entomology and Department of Public health), our Unit doses the molecular tracking of leishmaniasis infections before and after the intervention, and determines if new infections have an endogen or exogen origin. A Nepalese PhD student, Mr Narayan Bhattarai, spent a part of the year in Antwerp, in order to be trained in molecular biology and take charge of the molecular tracking activities. During the first year of the project, we selected the most adequate markers for genotyping *L. donovani* samples in the study areas and optimized the methods for analyzing these markers.


S. De Doncker and N. Bhattarai (PhD student from Nepal) during a sampling visit at BPKIHS, Dharan, Nepal

Molecular epidemiology visceral leishmaniasis (VL) and mucocutaneous leishmaniasis (MCL) in South America

Molecular epidemiology and population genetics can explain the diversity and structure of Leishmania populations, for example the intricate relationships between clinical forms of human infection and mammal reservoirs. This project includes comparative investigations between endemic areas for VL and MCL in Paraguay, Peru, Brazil and Venezuela and will strengthen local research capacities and Latin American-European links. The technical aim is to develop a full range of microsatellite markers and Multilocus Sequencing Typing (MLST) of housekeeping genes for the *Leishmania braziliensis* complex, *L. guyanensi* and *L. infantum*. These will be applied to 1. elucidating parasite-vector-host relationships 2. assessing the epidemiological impact of VL-HIV co-infection (Brazil) 3. assessing the epidemiological importance of recombinant Leishmania genotypes and 4. assessing the spread of resistance against first line treatment (SbV). We will also compare genotypes of Leishmania isolated from diverse clinical and treatment failures and establish South American repository of Leishmaniastrains., Our Unit is responsible for the continuation of the activities in the Leishnatdrug-R project, that ended last year.

Molecular assays for the diagnosis of Leishmaniasis and Human African Trypanosomiasis and parasite (sub-)species identification (Tryleidiag)

The objective of molecular parasitology within the Tryleidiag consortium (see above) is the development of a simple molecular tool for the destruction of the five old world Leishmania species: *L. donovani, L. infantum, L. tropica, L. major*, and *L. aethiopica*. During the first year of the project, several genomic targets were evaluated. The internal transcribed spacer of the ribosomal RNA gene repeat unit was identified as a suitable candidate, except for discriminating *L. infantum* from *L. donovani*. Preliminary tests were done for identification of *L. donovani / L. infantum, L. major*, and *L. tropica*, and species-specific amplification was achieved. The results were presented at the annual meeting with all the partners, held in Nairobi, Kenya.

Thierry Laurent (formerly IMT, now Coris biosystems) and Gert Vanderauwera (IMT), during a laboratory visit at KEMRI, Kenya

Collaborative studies with the Institute of Tropical Medecine in Lima, Peru

Within this institutional collaborative programme, leishmaniasis activities focus on molecular diagnosis and the prediction of treatment failure. In collaboration with the Tryleidiag INCO project (S. Deborggraeve, Parasite Diagnostics), a new prototype for a simple and highly sensitive detection of Leishmania by PCR-oligochromatography was developed. Clinical samples were gathered in Lima. The performances of the kit will be evaluated in Lima and Cuzco. Studies on treatment failure and drug resistance were performed in synergy with the Leishepinet INCO project. During a pilot study three genes showed the highest expression in amastigote samples coming from patients that cured after antimonial treatment. V. Adaui completed her first training stay at the ITM on gene expression profiling and the application of this tool for comparative molecular characterization of sensitive or resistant strains. She transferred the technologies to Peru and worked on the standardization and optimization of the biological parameters for in vitro production of intracellular amastigotes. Another Peruvian PhD fellow D. Gamboa, came to Antwerp for her last experiments on the identification of virulence markers in *L. braziliensis*.

Capacity strengthening in Peru: the new generation of laboratory scientists, among which the two joint fellows, Dionicia Gamboa and Vanessa Adaui

Molecular monitoring of drug resistance in visceral leishmaniasis in Nepal

Drug resistance of leishmania has so far been studied in experimentally induced resistance, often on clinically non relevant species. We aim to phenotype clinically well-documented field strains and to develop molecular tools for the detection of natural SbV-resistance. During the first year of the project, in vitro drug susceptibility assays for the *L. donovani* complex were implemented and standardized and strains from the ITM collection (Leishnatdrug-R project) are being tested. SbV resistance in Nepal appears to be the product of various molecular features marking the different SbV resistant populations of *L. donovani*. The results encourage further exploration of gene expression profiling to identify specific expression signatures that correlate in vivo parasite susceptibility to treatment.

Continuity in the transition: S. Decuypere (finishing her PhD) and M. Vanaerschot (starting his PhD), students of drug resistance in Leishmania.

Unit of Epidemiology and Control of Parasitic Diseases

Phase III, randomized, non-inferiority trial on efficacy and safety of dihydroartemisinin-piperaquine in comparison with artemether-lumefantrine in African children with uncomplicated *P. falciparum* malaria

This project is funded by the Medicine for Malaria Venture (MMV) and aims at providing efficacy and safety data on dihydroartemisinin-piperaquine (DHAPQ or Artekin®) for registration in Europe and world-wide use. The target population is 1-4 year old children with uncomplicated *P. falciparum* malaria. The trial centers in Burkina Faso, Kenya, Mozambique, Uganda and Zambia have been strengthened with logistics, training and regulatory support. The field work has been completed and final results should be available by mid-2007.

Evaluation of 4 artemisinin-based combinations for treating uncomplicated malaria in African children

In this major project, co-funded by the EDCTP, amodiaquine+artesunate, dihydroartemisinin+piperaquine, artemether+lumefantrine and chlorproguanil-dapsone+artesunate will be compared in 10 different sites located in 7 African countries. A head-to-head comparison between these four (assumedly efficacious) treatments is indeed urgently needed. An extended follow-up will determine the rate of re-treatment for each drug, and in particular the impact of chlorproguanil-dapsone + artesunate on the selection of drug-resistant genotypes. Research institutes in Burkina Faso, Gabon, Mozambique, Nigeria, Zambia, Belgium, UK, Germany, France and Spain and the East African Network for Monitoring Antimalarial Treatment (EANMAT), are collaborating. The Institute of Tropical Medicine will coordinate the trial and act as legal sponsor. The trial has been prepared including strenghtening of the sites, training of staff and regulatory conformation in Europe and Africa. The first patient should be recruited in 2007. A course on GCP in Lamberené, Gabon, was offered to participants from collaborating sites.

Collaboration with the National Malaria Control Programme of Rwanda

We support a trial on intermittent preventive treatment (IPT) with Sulfadoxine-Pyrimethamine (SP) at three sites: Mashesha, Rukara and Kiculkiro. The aim is to determine whether this interventoin is still efficacious in areas of moderate to high SP resistance. Another trial on the safety and efficacy of chlorproguanil-dapsone + artesunate has been closed and data will be available by mid-2007. An evaluation of demographic surveillance has exposed the need for alternative approaches. An in vitro sensitivity study of *P. falciparum* to different antimalarial drugs was carried out in Rukara in collaboration with the Liverpool School of Tropical Medicine, where samples are currently being analyzed.

Paediatric Co-Artem in Benin

This trial is on randomized, investigator-blinded, multicenter, parallel-group study to compare efficacy, safety and tolerability of Coartem® dispersible tablet formulation vs. Coartem® 6-dose crushed tablet in the treatment of acute uncomplicated malaria in Benin. It is part of a multicentre trial carried out in several other sites in Africa. Children are treated with either the tablet or the syrup form of artemether-lumefantrine.

Children in Ladji where the study is carried out.

The impact of HIV on malaria control in Zambia

In collaboration with the Tropical Disease Resaerch Centre in Ndola we investigate several aspects of HIV-malaria co-infection in Zambia where both diseases are highly prevalent. A randomized clinical trial comparing SP and artemether-lumefantrine (AL) in HIV+ and HIV- adults with uncomplicated malaria in peri-urban Ndola ended in 2005 and the results have just been published. Additional investigations are ongoing in collaboration with other institutions, including a case-control study on HIV-1 as a risk factor for severe malaria. We also assess the impact of mefloquine malaria prophylaxis in HIV-1 infected individuals and its influence on the evolution to AIDS.

Safety and efficacy of dihydroartemisinin-piperaquine in the Amazon region of Peru

This study is part of a larger project of institutional collaboration between the ITM and the Institute of Tropical Medicine in Lima. Peru has recently changed its first-line antimalarial treatment to sulphadoxine-pyrimethamine (SP) + artesunate (AS) in the North and to mefloquine (MQ) + AS in the Amazonian region. The cost of the treatment and the low compliance of the patients jeopardise this strategy. A clinical trial comparing the safety and efficacy of

J.C. Dujardin, S. Decuypere, L. Maes (University Antwerp) and V. Adaui (PhD student from IMTAvH, Lima) with European and Latin American partners at the kick-off meeting of Leishepinet-SA in Berlin.

piperaquine and dihydroartemisinin (Artekin), a new drug, with the current first line drug combination was initiated in June 2003 in Iquitos and successfully completed by 2005. The genotyping of recurrent infections was completed in 2006.

Collection of a blood sample on filter paper for later genotyping.

PREMA-EU, a network dealing with malaria control during pregnancy

The PREMA-EU, started in 2001 to decrease malaria and anaemia among pregnant women and babies by promoting effective control strategies, ended in 2006. An ancillary project in Burkina Faso focused on the anthropological aspects of malaria control during pregnancy, such as the utilization of antenatal health services; local notions of pregnancy and traditional pregnancy-related health care; community knowledge of malaria and anaemia in pregnancy; health-seeking behaviour; acceptance of chemoprophylaxis; and adolescent pregnancies and malaria.

Improving coverage and compliance of antimalarial treatment for pregnant women in rural Africa (DELIMAL)

This study was carried out between 2003 and 2006 in 12 rural health centers in the Health District of Boromo in Burkina Faso with a total population of about 80.000 people. Health centers were randomized to three different strategies of malaria prevention: weekly chloroquine (CQ), intermittent preventive treatment with sulfadoxine-pyrimethamine (IPT/SP) and IPT/SP supported by a promotional campaign.

A poster in a village in the intervention area.

More than 6,000 pregnant women were included and 2,766 first and second pregnancies were followed until delivery. An additional component on nutrition during pregnancy was grafted onto this project from 2003 onwards. Field work has been completed and the data base finalized. Statistical analysis is currently ongoing.

A promotional campaign for antimalarial treatment of women.

Evaluation of control interventions in Vietnam

A cluster randomized trial was started in 2004 to evaluate the protective efficacy of Long Lasting Insecticidal Hammocks (LLIH) against malaria in forest areas of central Vietnam. The intervention has been implemented in December 2004 in 10 interventions clusters while the usual control activities were continued in the control clusters. Surveillance was based on Passive Case Detection (PCD) at village level and biannual cross sectional surveys on a predefined cohort. 2006 was the second year of follow-up, ending in December. The main outcome measures are the effect of the intervention on the incidence of malaria infecions. Preliminary data showed a much stronger decrease of the incidence of clinical malaria and the parasite prevalences in the intervention clusters. A third year of PCD was added to confirm the trends. Beside the epidemiological follow-up, the anthropological study has been completed in August and September 2006 by a 3rd and last field mission. The field studies on health economic aspects on the malaria burden have been completed.

Unit of Human Helminthology

Epidemiology and control of schistosomiasis in Northern Senegal

In collaboration with the regional health services and the University of Dakar, we monitor the evolution of infection, morbidity, and public health impact of S. mansoni infection in an epidemic situation in Northern Senegal. We focus on specific questions that have remained or emerged during the follow-up of control efforts. First, a small but increasing number of advanced clinical cases (hepatosplenic disease, hematemesis) has been reported, in spite of control measures through primary and secondary health care structures. By providing equipment and training, the capacity to manage these cases throughout the health system has been strengthened. Clinical and epidemiological studies are ongoing to document the size, nature and causes of this problem. In a second line of the control-oriented research the alteration of human behaviour in order to reduce exposure and contamination has proven very difficult, despite intensive health information, education, water supply and sanitation. In-depth studies on the determinants of faecal contamination and water contact behavior were carried out to better understand the human aspects of transmission. A third line consists of detailed studies on the ecological aspects of transmission in relation to infection and treatment, started in 2006 in response to a worrying increase of S. haematobium infections observed in the region.

Helminth infections and atopic diseases in Cuban children

The observation that atopic diseases are very common and helminth infections almost absent in industrialized countries, while the opposite is true in many developing countries, has led to the speculation that the two disease types may be inversely associated. In Cuba, we aim to shed more light on this complex interaction by means of clinical-epidemiological studies in urban and rural schoolchildren. Since 2003, two groups of children have been followed up to determine the geographical and epidemiological association between helminthic infections and atopic diseases as well as the impact of anthelminthic treatment and reinfection on this relationship. For the collection of data on allergic symptoms and helminth infections different standard methods are being used and compared. Different intervention strategies for helminth control are tested and evaluated.

Kim Vereecken, Mankeur Diop and Ngary Sy collect urine samples for *S. haematobium* in a village school in northern Senegal.

Diagnosis and epidemiology of *Strongyloides* in Peru

At the Instituto de Medicina Tropical Alexander von Humboldt (IMTAvH) in Lima, Peru, many patients with life-threatening *Strongyloides stercoralis* hyperinfection appear to suffer the human T cell lymphotropic virus type-1 (HTLV-1). The current diagnosis of *S. stercoralis* infections by microscopic examination of faeces (Baermann method) is not sensitive enough to detect all cases. A real-time PCR developed by the Parasitology Department of the Leiden University Medical Centre (LUMC) and a relatively simple ELISA to detect antibodies are being tested and evaluated as an alternative. In 2006, field and laboratory studies were carried out to improve and evaluate these new methods. They all hoped to provide alternative or additional diagnostic tests needed in patient-care as well as for epidemiological studies.

PROMOTERS & SUPPORT

Unit of Entomology

Monitoring of insecticide resistance and mapping of malaria vestors in South-east-Asia (MALVECASIA)

ITM promoter: M. Coosemans
ITM collaborators: W. Van Bortel, K. Verhaeghen (IWT), V. Obsomer, P. Roelants
External collaborators: L.K. Thuan, H.D. Trung (National Institute of Malariology, Parasitology and Entomology, Vietnam); S. Phompida, K. Keokenchanh (Centre of Malariology, Parasitology and Entomology, Laos); D. Socheat, T. Sochanta (National Center for Malaria Control, Parasitology and Entomology, Cambodia); V. Baimai, C. Sumrandee (Mahidol University, Thailand); J. Hemingway (Liverpool School of Tropical Medicine, UK); Sylvie Manguin, C. Garros, I. Dusfour (Centre of Biology and Management of Populations, France); R. Harbach (The Natural History Museum, UK), Pierre Defourny (Unité d'Environnemétrie et de Géomatique, Université Catholique de Louvain, Belgium)
Support: European Union; IWT-Vlaanderen, DGDC

Set-up of a Geographical Information System (GIS)

ITM promoter: M. Coosemans
ITM collaborators: W. Van Bortel, K. Verhaeghen (IWT), V. Obsomer, P. Roelants
External collaborators: L.K. Thuan, H.D. Trung (National Institute of Malariology, Parasitology and Entomology, Vietnam); S. Phompida, K. Keokenchanh (Centre of Malariology, Parasitology and Entomology, Laos); D. Socheat, T. Sochanta (National Center for Malaria Control, Parasitology and Entomology, Cambodia); V. Baimai, C. Sumrandee (Mahidol University, Thailand); J. Hemingway (Liverpool School of Tropical Medicine, UK); Sylvie Manguin, C. Garros, I. Dusfour (Centre of Biology and Management of Populations, France); R. Harbach (The Natural History Museum, UK), Pierre Defourny (Unité d'Environnemétrie et de Géomatique, Université Catholique de Louvain, Belgium)
Support: European Union; IWT-Flanders, DGDC

Malaria transmission studies in Uganda

ITM promoter: M.Coosemans
ITM collaborators: U. D'Alessandro, W. Van Bortel, P. Okello, K. Verhaeghen (IWT), A. Correwyn
External collaboration: A. Talisuna (Ministry of Health, Uganda); F. Kironde (Makerere University, Kampala, Uganda)
Support: DGDC; IWT

Insecticide target resistance in malaria vectors

ITM promoter: M. Coosemans
ITM collaborators:, K. Verhaeghen (IWT), W. Van Bortel
External collaboration: T. Backeljau (KBIN Brussels)
Support: DGDC; IWT

Prevention of malaria epidemics in the African highlands

ITM promoter: M. Coosemans
ITM collaborators: N. Protopopoff, W. Van Bortel, U. D'Alessandro, P. Roelants
External collaborators: B. Dismas (LMTC Burundi), J. Karenzo

(LMTC Burundi),
P. Maes, M Van Herp (MSF)
Support: MSF; DGDC

Vector control for the prevention of Leishmaniasis in India

ITM promoter: M. Boelaert
ITM collaborators: M. Coosemans, N. Speybroeck (Dept. of Animal Health)
External collaboration: D.Dinesh, P. Das (Rajendra Memorial Research Institute of Medical Sciences, Indian Council of Medical Research, Patna, India)
Support: European Commission

Collaboration with the National Institute of Malaria in Vietnam, Cambodia and Laos

ITM promoter: M. Coosemans
ITM collaborators: W. Van Bortel, P. Roelants, U. D'Alessandro, A. Erhart; P. Dorny, (Dept. of Animal Health)
External collaboration: L.K. Thuan, H.D. Trung, N.D. Thang, L.X. Hung N.V. De, H.V. Vien, D.C. Thach (NIMPE, Vietnam), Doung Socheat, Tho Sochanta (CNM, Cambodia).
Support: DGDC

Tsetse fly salivary glands and trypanosome development

ITM promoter: M. Coosemans
ITM collaborators: J. Van Den Abbeele, K. De Ridder, J. Van Hees
External collaboration: P. De Baetselier, G. Caljon (VUB, Brussels, Belgium) ; E.Pays (ULB, Gosselies, Belgium) ; M.Lehane (Liverpool School of Tropical Medicine, UK)
Support: ITM

Expression of the human trypanolytic Apolipoprotein L-I in a bacterial endosymbiont of the tsetse fly

ITM promoter: M. Coosemans
ITM collaborators: J. Van Den Abbeele, K. De Ridder, J. Van Hees
External collaboration: E.Pays (ULB, Gosselies, Belgium); P. De Baetselier, G. Caljon (VUB, Brussels, Belgium)
Support: DGDC

Tsetse flies and the control of sleeping sickness (TFCASS)

ITM-promoter: J. Van Den Abbeele
External collaborators: M. Lehane (Co-ordinator; Liverpool School of Tropical Medicine, UK); J.Pickett (Rothamsted Research, UK); A.Hassanali (International Center for Insect Physiology and Ecology, Kenya); L.Okedi (Livestock Health Research Institute, Uganda); D.Kaba (Institut Pierre Richet, Ivry Coast), P.Solano (IRD UR 177, Montpellier – France); A.Robinson (International Atomic Energy Agency, Austria), M.Camara (Programme National de Lutte contre la THA, Guinea); I. Sidibe (CIRDES, Burkina Faso)
Support: European Commission

Unit of Parasite Diagnostics

Improved stage determination and follow-up of sleeping sickness patients in Angola

ITM promoter: V. Lejon
ITM collaborators: P. Büscher (Dept. Parasitology); M. Boelaert, J. Robays (Dept. of Public Health)
External collaborators: D.D. Ndinga, T. Josenando, F. Makiadi (ICCT, Angola), C. Santercole (CTB-Luanda, Angola), P. Abel (Angotrip, Angola).
Support: WHO/CDS

Rationalizing follow-up after treatment for sleeping sickness

ITM promoter: P. Büscher
ITM collaborator: M. Boelaert, J. Robays (Dept. of Public Health)
External collaborators: D. Mumba, J.J. Muyembe (INRB, D.R. Congo); V. Kande (PNLTHA, D.R. Congo)
Support: DGDC

Characterization of invariant surface glycoprotein 75 and 65 (ISG75, ISG65)

ITM promoter: P. Büscher
ITM collaborators: T. Tran, S. Rogé (Dept. Parasitology)
External collaborators: H. De Greve, L. Wyns (Free University of Brussels); Y. Guisez (University of Antwerp)
Support: Private funding; IWT, DGIC

Identification of short diagnostic peptides by Random Pahge Display Library screening

ITM promoter: P. Büscher
ITM collaborators: L. Van Nieuwenhove, V. Lejon (Dept. Parasitology)
External collaborators: Y. Guisez, (Antwerp University)
Support: ITM; Antwerp University, DGDC

Development of saliva-based antibody detection tests

ITM promoter V. Lejon
ITM collaborators: P. Büscher (Dept. Parasitology); M. Boelaert (Dept. of Public Health)
External collaborators: V. Kande (PNLTHA, DR Congo); D. Mumba, J.J. Muyembe (INRB, Kinshasa, DR Congo); V. Jammoneau (IRD, France); Pascal Atchade (PNLTHA, Benin); S. Rijal (Koirala Institute for Health Sciences, Nepal); H. Louzir (Institut Pasteur, Tunis); Diamed Applied Diagnostic Systems (Switzerland & Belgium)
Support: Fund for Scientific Research-Flanders (FWO)

National Reference Laboratory for human African trypanosomiasis in Kinshasa

ITM promoter: P. Büscher
ITM collaborators: N. Bebronne (Dept. Parasitology); M. Boelaert, J. Robays (Dept. of Public Health);
External collaborators: J.J. Muyembe, J. Fumie, D. Mumba (INRB, Kinshasa, DR Congo)
Support: DGDC

Isolation and characterization of trypanosomes from treatment-refractory sleeping sickness cases

ITM promoter: P. Büscher
ITM collaborator: M. Boelaert, J. Robays (Dept. of Public Health)
External collaborators: P. Pyana, D. Mumba (INRB, Kinshasa, DR Congo),
R. Brun (Swiss Tropical Institute, Basel, Switzerland), A. Moore (CDC Atlanta, USA)
Support: DGDC

PCR-Oligochromatography as a molecular diagnostic tool for *Trypanozoon* infection

ITM promoter: P. Büscher
ITM collaborators: S. Deborggraeve, F. Claes, J.-C. Dujardin (Dept. Parasitology)
External collaborators: T. Leclipteux, P. Mertens, T. Laurent (Coris BioConcepts, Gembloux, Belgium); P. Herdewijn (Catholic University Leuven)
Support: International Atomic Energy Agency (IAEA)

Simplified and rapid molecular assays for disease diagnosis and parasite (sub-)species identification (TRYLEIDIAG)

ITM promoter: P. Büscher
ITM collaborators: S. Deborggraeve, J.-C. Dujardin, G. Van der Auwera, F. Balharbi (Dep. Parasitology)
External collaborators: Coris BioConcept (Gembloux, Belgium); Koninklijk Instituut voor de Tropen (Amsterdam, the Netherlands); University of Copenhagen (Denmark); Inserm Transfert (France); Makerere University (Kampala, Uganda); Kenya Medical Research Institute (Nairobi, Kenya); University of Khartoum (Sudan); Institut National de Recherche Biomédicale (Kinshasa, DR Congo)
Support: European Commission

PCR-Oligochromatography a molecular diagnosis and epidemiological monitoring of Chagas' disease

ITM promoter: P. Büscher
ITM collaborators: S. Deborggraeve, J.-C. Dujardin (Dept. Parasitology)
External collaborators: A. Solari (Universidad de Chile, Santiago, Chile), Coris BioConcept (Gembloux, Belgium)
Support: Bilateral Scientific Cooperation

Anti-disease vaccine and diagnostic tests for African trypanosomiasis (TRYPADVAC 2)

ITM promoter: P. Büscher
ITM-collaborators: P. Van den Bossche (Dept. Veterinary Medicine)
External collaborators: A. Boulangé (Laboratoire Commun IRD-CIRAD de Recherches et Coordination sur les Trypanosomoses, France) Centre International de Recherche-Développement sur l'Elevage en zone Sub-humide (Burkina Faso); Université de Bordeaux 2 (France); University of Glasgow (United Kingdom); University of Brussels (Belgium); University of Lisbon (Portugal); University of Kwa-Zulu Natal (South Africa); Makerere University (Uganda); Eduardo Mondlane University (Mozambique); University Simon Bolivar (Venezuela); DiaMed Ag (Switzerland)
Support: European Commission

Biology and clinical staging of trypanosome neuroinvasion in sleeping sickness (NEUROTRYP)

ITM promoter: P. Büscher
ITM-collaborators: F. Claes, N. Van Reet, V. Lejon (Dept. Parasitology)
External collaborators: K. Kristensson (Co-ordinator, Karolinska Institute, Sweden), M. Bentivoglio (University of Verona, Italy), G. Lubega (Makerere University, Uganda), M. Mulumba (Centre for Ticks and Tick Borne Diseases, Malawi), J.J. Muyembe (Institut National de Recherche Biomédicale, DR Congo), C. Mulenga (Tropical Diseases Research Centre, Zambia), A. Njamshi (University of Yaounde, Cameroon)
Support: European Commission

Development of antibody ELISAs for the diagnosis of *Plasmodium vivax* and *Plasmodium falciparum*

ITM promoter: F. Claes
ITM-collaborators: P. Büscher, F. Balharbi, A. Erhart, C. Van Overmeir, U. d'Alessandro (Dept. Parasitology)
External collaborators: L.X. Hung, N.D. Thang, N.X. Xa, T.T. Tinh (National Institute for Malariology, Parasitology and Entomology (NIMPE)(Hanoi, Vietnam), I. Soares (Brazil), M. Theisen (Denmark)
Support: Optimus Foundation (Union des Banques Suisses, Zurich); ITM; DGDC, Fund for Scientific Research Flanders (FWO)

Establishment of a International Reference Laboratory for *Trypanosoma evansi* (Surra)

ITM promoter: F. Claes
ITM collaborators: P. Büscher (Dept. Parasitology), J. Konings (Department of Clincial Sciences)
External collaborators: Office International des Epizooties (OIE)
Support: Fund for Scientific Research Flanders (FWO)

Equine trypanosomiasis (*Trypanosoma equiperdum* and *T. evansi*) in Ethiopia

ITM promoter: F. Claes
ITM-collaborators: P. Büscher (Dept. Parasitology)
External collaborators: B. Goddeeris (Coordinator, Catholic University Louvain, Belgium), H.T. Ashenafi (University of Addis Abeba, Ethiopia)
Support: Flemish Inter University Council–University Development Cooperation (VLIR-UOS); Research Foundation Flanders (FWO)

Unit of Molecular Parasitology

Risk factors of the spread of leishmaniasis in the Mediterranean bassin

ITM promoter: J.C. Dujardin
External collaboration: 22 Euro-Mediterranean research institutes
Support: European Union

Long lasting insecticidal nets for the prevention of Kala-azar

Co-ordinator: M. Boelaert, ITM-Public Health
Molecular Parasitology collaborator: J.C. Dujardin
External collaboration: S. Rijal (BP Koirala Institute of Health Sciences, Dharan ,Nepal), S. Sundar (Banaras Hindu University, India), C. Davies (London School of Hygiene & Tropical Medicine, UK), B Varghese (ICDDR,B , Dhaka, Bangladesh), F Chappuis (Hôpitaux Universitaires de Genève, Geneva, Switzerland)
Support: European Union

Molecular epidemiology of visceral leishmaniasis (VL) and mucocutaneous leishmaniasis (MCL)

Co-ordinator: M. Miles, LSHTM, London
Molecular Parasitology collaborator: J.C. Dujardin
External collaboration: L. Maes (University of Antwerp), G. Schoenian (Universitaetsmedizin Charité Berlin, Germany), C.Canavate (Instituto de Salud Carlos III, Spain), L.Campino (Instituto de Higiene e Medicina Tropical, Portugal), S. do Monte (Universidade Federal do Piaui, Brazil), A. Rojas de Arias (Instituto de Investigaciones en Ciencias de la Salud, Paraguay), J. Arevalo (Instituto de Medicina Tropical Alexander von Humboldt, Perú), N. Mello (Universidade Federal de Minas Gerais, Brazil), D. Feliciangeli (Univ. de Carabobo, BIOMED-Centro Nacional de Referencia de Flebotomos de Venezuela), E. Cupolillo (Instituto Oswaldo Cruz, Rio de Janeiro, Brazil) and J. Clos (Bernhard Nocht Institute, Hamburg, Germany).
Support: European Union

Molecular assays for the diagnosis of Leishmaniasis and Human African Trypanosomiasis and parasite (sub-)species identification (Tryleidiag)

Co-ordinator: P. Büscher
Molecular Parasitology collaborator: J.C. Dujardin
External collaboration: T. Leclipteux (Coris BioConcepts, Belgium), H. Schallig (Koninklijk Instituut voor de Tropen, The Netherlands), P.E. Nielsen (University of Copenhagen, Denmark), G.Lubegan (Makerere University, Uganda), M. Wasunna (Kenya Medical Research Institute), S. El Safi (University of Khartoum, Sudan), J.J. Muyembe (Institut National de Recherche Biomédicale, DR Congo), J. Weinbach (Inserm-Transfert)
Support: European Union

Collaborative studies with the Institute of Tropical Medicine in Lima (Peru)

ITM promoter: J.C. Dujardin
External collaborators: E. Gotuzzo, J. Arevalo, D. Gamboa, V. Adaui, A. Llanos-Cuentas (IMTL, Lima, Peru)
Support: DGDC

Molecular monitoring of drug resistance in visceral leishmaniasis in Nepal

ITM promoter: J.C. Dujardin
External collaborators: The Laboratory of Microbiology, Parasitology and Hygiene (Prof. L.Maes), University of Antwerp
Support: FWO

Unit of Epidemiology and Control of Parasitic Diseases

Phase III, randomized, non-inferiority trial on efficacy and safety of dihydroartemisinin-piperaquine in comparison with artemether-lumefantrine in African children with uncomplicated *P. falciparum* malaria

ITM promoter: U. D'Alessandro
ITM collaborators: J.C. Dujardin, C. Van Overmeir, J.P. Van geertruyden, P. Forret
External collaborators: H. Tinto (Centre Muraz, Bobo Dioulasso, Burkina Faso); M. Mulenga (Tropical Diseases Research Institute, Ndola, Zambia); J.P. Guthman, P. Guerin, P. Piola (Epicentre, Paris, France); M. Renom, Q. Bassat (Manhiça Health Research Centre, Mozambique), C. Menendez (Centre International Health, Barcelona, Spain); S. Borrmann (Kenya Medical Research Institute, Centre for Geographical Medicine Research - Coast/ Wellcome Trust Research Programme, Kilifi, Kenya); M. Corsi, A. Bacchieri (Sigma Tau, Rome, Italy); D. Ubben (MMV, Geneva, Switzerland)
Support: Medicine for Malaria Venture (MMV)

Evaluation of 4 artemisinin-based combinations for treating uncomplicated malaria in African children

ITM promoter: U. D'Alessandro
ITM collaborators: J.C. Dujardin, C. Van Overmeir, J.P. Van geertruyden, P. Forret
External collaborators and institutes: H. Tinto (Centre Muraz, Bobo Dioulasso, Burkina Faso); P. Garner, J. Critchley (Liverpool School of Tropical Medicine, UK); P.R. Williamson, C. Gamble (University of Liverpool, UK), W.M. Watkins (Nuffield Department of Medicine, UK), M. Meremikwu (University of Calabar, Calabar, Nigeria); M. Mulenga (Tropical Diseases Research Institute, Ndola, Zambia); B. Lell (University of Tuebingen, Germany); P.B. Matsiegui (Albert Schweitzer Hospital Lambaréné, Gabon); M. Kamya (Uganda Malaria Surveillance Project, Kampala, Uganda); J.P. Guthman, P. Guerin, P. Piola (Epicentre, Paris, France); C. Karema (National Malaria Control Program, Kigali, Rwanda); C. Menendez (Centre for International Health, Barcelona, Spain); E. Macete, M. Renom (Manhiça Health Research Center, Mozambique)
Support: European & Developing Countries Clinical Trial Partnership (EDCTP).

Collaboration with the National Malaria Control Programme of Rwanda

ITM promoter: U. D'Alessandro
ITM collaborators: M. Coosemans, J.C. Dujardin, C. Van Overmeir, J.P. Van geertruyden
External collaborators and institutes: D. Ngamije (Programme de Lutte contre le Paludisme, Kigali, Rwanda); EANMAT (Nairobi, Kenya); S. Ward and G. Biagini (Liverpool School of Tropical Medicine, UK).
Support: DGDC, MMV.

Paediatric Co-Artem in Benin

ITM promoter: U. D'Alessandro
External collaborators: A. Nahum, CREC (Centre Recherches Entomologiques Cotonou).
Support: Medicine for Malaria Venture (MMV)

The impact of HIV on malaria control in Zambia

ITM promoter: U. D'Alessandro
ITM collaborators: J.P. Van geertruyden, J.C. Dujardin; L. Kestens (Dept. of Microbiology)
External collaborators: M. Mulenge, L. Mananyanda (Tropical Disease Research Centre, Ndola, Zambia)
Support: DGDC

Safety and efficacy of dihydroartemisinin-piperaquine in the Amazon region of Peru

ITM promoter: U. D'Alessandro
ITM collaborator: J.C. Dujardin, A. Erhart
External collaborators: A. Llanos, D. Gamboa, C. Miranda (IMT, Lima and Iquitos, Peru)
Support: DGDC

PREMA-EU, a network dealing with malaria control during pregnancy

ITM promoter: U. D'Alessandro
ITM collaborators: J.P. Van geertruyden, A. Erhart, S. Gies
External collaborators: B. Brabin (Liverpool School of Tropical Medicine, Liverpool, UK); Members of the PREMA-EU network; J. Muela Ribera, S. Hausman, K. Peeters (Department of Anthropology, Universitat autonoma de Barcelona, Spain)
Support: European Commission

Improving coverage and compliance of antimalarial treatment for pregnant women in rural Africa (DELIMAL)

ITM promoter: U. D'Alessandro
ITM collaborators: S. Gies;, P. Kolsteren, D. Roberfroid (Dept. of Public Health)
External collaborators: B. Brabin (Liverpool School of Tropical Medicine, UK); S.O. Coulibaly (Laboratoire National de Santé Publique, Ouagadougou, Burkina Faso); P. Kazembe (Lilongwe Central Hospital, Malawi); H. Tinto, N. Meda (Centre Muraz, Bobo Dioulasso, Burkina Faso)
Support: European Commission; DGDC

Evaluation of control interventions in Vietnam

ITM promoter: U. D'Alessandro
ITM collaborators: A. Erhart, C. Van Overmeir, F. CLaes, P. Büscher, W. Van Bortel, M. Coosemans;
External collaborators: L.X. Hung, N.D. Thang, N.X. Xa (National Institute for Malariology, Parasitology and Entomology (NIMPE), Hanoi, Vietnam); A. Mills, C. Morel (London School of Hygiene and Tropical Medicine, U.K.); Koen Peeters (Pass-International)
Support: Optimus Foundation (Union des Banques Suisses, Zurich); ITM; DGDC

Unit of Human Helminthology

Epiediomology and control of schistosomiasis in Northern Senegal

ITM promoter: K. Polman
ITM collaborators: K. Vereecken, L. Kestens (Dept. of Microbiology)
External collaborators: M. Diop, L. Dieye, S. Sow, D. Faye (Health Services of Northern Province, Senegal), S. Mboup (CHU, Dakar, Senegal)
Support: DGDC

Helminth infections and atopic diseases in Cuban children

ITM promoter: K. Polman
ITM collaborator: M. Wördemann
External collaborators: M. Bonet, R. Junco Diaz and colleagues (National Institute for Hygiene, Epidemiology and Microbiology INHEM, Havana, Cuba); L. Rojas, F. Nunez and colleagues (Pedro Kouri Institute of Tropical Medicine IPK, Havana, Cuba)
Support: DGDC

Diagnosis and epidemiology of *Strongyloides* in Peru

ITM promoter: K. Polman
External collaborators: M. Canales (IMTL, Lima, Peru); J.J. Verweij (LUMC, Leiden, the Netherlands)

PUBLICATIONS

Publications in international peer-reviewed journals

Attaran A, Barnes KI, Binka F, D'Alessandro U, Fanello CI, Garett L, Mutabingwa TK, Roberts D, Hopkins Sibley C, Talisuna A, Van Geertruyden JP, Watkins WM. The World Bank: false financial and statistical accounts and medical malpractice in malaria treatment. Lancet 2006; 368(9531): 247-252.

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Grandesso F, Bachy C, Donam I, Ntambi J, Habimana J, D'Alessandro U, Maikere J, Vanlerberghe V, Kerah CH, Guthmann JP. Efficacy of chloroquine, sulfadoxine-pyrimethamine and amodiaquine for treatment of uncomplicated *Plasmodium falciparum* malaria among children under five in Bongor and Koumra, Chad. Trans R Soc Trop Med Hyg 2006; 100(5): 419-426.

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Public Health

The Department of Public Health aims to contribute to the development of sustainable, effective and efficient health care systems that assure equity, quality and participation. To this end it uses an integrated strategy in which teaching, research and technical assistance interact. The different units embody specific technical expertise, particularly with respect to teaching. The research is managed in task-oriented groups.

In line with the growth of the department over the last decades, the number of units formally went from 3 to 5 in the course of 2006, named after their primary domain of expertise and interest: Health Policy and Financing, Public Policy and Management, Quality and Human Resources, Epidemiology and Disease Control, and Nutrition and Child Health.

Research, capacity strengthening and international policy development cannot be separated from teaching, which remains the department's primary task in terms of workload (more information can be found in the chapter on Education). Local and institutional capacity strengthening are essential components of all our field projects, as described in the chapter on Development Cooperation.

Condom promotion in Cambodia.

Our research priorities are primarily based on the relevance for healthcare systems in developing countries, the objectives and values formulated in our mission statement, and the pursuit of added value or innovation in international health policies. The research portfolio focuses on the realities of the field and the real needs of the populations, by covering four basic domains: health policies, access to care, quality and human resources, and disease control.

Access to Care

Lack of access is perhaps the most fundamental health care problem in developing countries. There are multiple, often combined causes for this: services are physically unreachable; social and cultural factors may restrict their attractiveness; the offer is of such poor quality that people opt for other channels and for many people they are simply unaffordable. In 2006, the department concentrated its research on the financial accessibility of health services at primary and secondary levels.

Our research on financial access followed two closely related tracks: on the one hand the research on the potential of Mutual Health Organizations (MHOs), or Community Health Insurance (CHI), autonomous, not-for-profit voluntary associations based on solidarity between members, and on the other hand the study of systems of Social Assistance for health care. The cost of health care for the poorest is paid through a fund managed by a local private or public institution.

In 2006 we further developed our working relations with various organizations involved in the promotion of CHI and Social Assistance systems in different African countries (Benin, Mali, Mauritania, Tanzania and Uganda), Asia (Cambodia and India) and Latin America (Ecuador). Field research looks especially at the strategies and modalities to scale up CHI schemes, but also addresses the impact of CHI on quality of care and on the construction of social capital in the community. We furthermore address the issue of the possible articulations between Community Health Insurance and Social Assistance for health care. Consultancy work in the domain of CHI was carried out for the World Health Organization and different non-governmental organizations. The Belgian network of academic institutes and development organizations interested in the promotion and systematic study of CHI was further consolidated (the Belgian platform Micro Assurance Santé/Mutuelles de Santé – 'MasMut').

Quality and Human Resources

Improved access to health care makes no sense if its quality is not adequate. Two major approaches to improve quality of care can be distinguished: rationalization of procedures and definition of standards (technical, clinical, managerial and operational) coupled with quality management techniques, and human resources management emphasizing adequate training and support as well as staff motivation, both extrinsic (acceptable salaries and working conditions) and intrinsic (interesting content of work and professional responsibilities).

Building on previous research on the interaction between organizational culture and quality management, we started to investigate the implementation of "criterion based clinical audits" in Moroccan hospitals. The underlying assumption of such audits is that self evaluation of clinical practice against established standards will trigger self regulation and improvement. We study how the organizational configuration of the Moroccan health care system affects appropriation of the audit process by actors involved.

In countries where specialists are rare at peripheral level, delegation of competences is often the only solution to improve access to life-saving care. In Senegal, our unit was involved in the evaluation of delegations of surgical tasks to general practitioners and basic emergency obstetric care to health centres nurses. The outcomes comprise the evolution of (un)met obstetric needs, the proportion of stillbirths and of deliveries with skilled personnel.

In the reproductive health domain, we develop and study how to improve the provision and quality of care, the setting up of coordinated networks between different types of health facilities and owners providing reproductive health care, the setting up of specific services for the youth, improving information to target groups regarding reproductive health rights in three African cities (Mopti, Mali; Maroua, Cameroon; Ouagadougou, Burkina Faso). In Burkina Faso we evaluate the skilled care at delivery and the determinants of maternal mortality (Immpact), including the quality of services provided.

A REACT-project started in 2005, aims to test the "accountability for reasonableness" framework in


Immpact evaluation of Skilled Care Initiative in Burkina Faso: field supervision of data collection, meeting with the villagehead.

Kenya, Tanzania and Zambia. It proposes to evolve from approaches based on cost effectiveness and epidemiological data towards a process of fair decision based on explicit values.

A case study in Cape Coast Regional Hospital

(Ghana) explored workforce management practices within the hospital, their effects on a conducive work environment and the factors enabling such workforce management.
We investigate the professional careers of doctors as first line care providers in rural Mali and the social and professional support provided by a professional organization (Association Malienne des Médecins de Campagne). The attraction of a job in rural areas is also studied in Niger and Senegal, where the problem of access to general surgery is solved by giving surgical skills to general practitioners.
We also study the health seeking behaviour and the utilization of health care in four villages in rural Mali. We thus explore the quality of care and access to care from the point of view of the communities.
The cooperation between vertical programmes and comprehensive services was discussed at a symposium organized by the Public Health Department at the Geneva Forum: "Towards Global Access to Health".
The effects of intensive mass campaigns on the functioning of health services and attitudes of staff and communities were studied in Mali.
In Cuba, we continued research on the development of group practices in family medicine, including the roles of family doctors and nurses. This is expected to improve the functioning of first line care and increase the efficiency of the system.
In Thailand, we support ongoing health care reform and more particularly the development of family practice as a cornerstone of the health care system, boosting the quality and acceptability of first line care.
In many countries heavily affected by HIV/AIDS, like South Africa and Mozambique, human resources are insufficient to deal with the scaling up of Anti-Viral Treatment (ART). We investigate under what conditions care can be delegated to "expert patients" and /or low skilled workers.

Integrated Disease Control

Our research on neglected tropical diseases currently focuses on the interaction between a disease-specific and a health-services approach. The department organized a symposium on this topic at the Geneva Forum "Towards Global Access to Health" in May 2006.
A tuberculosis project on diagnostic quality assurance at clinical, laboratory, and service organization level with partners from Bolivia, Cuba, Peru and Leeds was successfully completed. In Indonesia, TB research concentrated on the role of the private sector. In Peru we develop and validate an algorithm for the diagnosis of smear-negative TB.
The sleeping sickness research focuses now on the integration of control activities in general health services in low endemic contexts. Suman Rijal of the BP Koirala Institute for health sciences in Nepal defended a PhD thesis on the control of kala-azar in Nepal at the Ghent University in February 2006. Research on clinical management of kala-azar continued with Nepali and Swiss partners. The EU-supported community trial on the effectiveness of long-lasting insecticide treated bed nets in the prevention of kala-azar (KALANET) completed all baseline assessments, and the bed nets were distributed in the 13 intervention clusters. Follow-up will last two years.
In Cuba an intervention study on different strategies for improving community participation in dengue control was implemented and one of the strategies is scaling-up. In December 2006, Lizet Sanchez defended a thesis on the subject at the University of Havana. The EU funded DENCO projects in Thailand and Venezuela, two different models for vector control at community-level with an approach based on health service and on partnership. All baseline assessments were completed and implementation plans are ready.

Strategic Immpact Work Programme Leaders and Partners meeting in Antwerp before field data collection.

The nutritional research of the department focuses on the optimization of care for malnourished children and the control of low birth weight. In Burkina Faso we test the effect on birth weight of a supplement of micronutrients during pregnancy. The clinical trial phase was successfully completed in 2006 and is now followed by a field trial combining food and micronutrient supplements. This study is part of a WHO/SCN/UNICEF review initiative.
Three projects were initiated in 2006 to study the effect of dietary changes on the health of children and adolescents. One study was completed in 2006 and Armando Perez Cueto defended a doctoral thesis on nutrition transition in Bolivia. The study continues with an evaluation of the magnitude of the metabolic syndrome in Bolivian adolescents. A second study started in Benin and a third in Vietnam, both with school-aged children which are the primary target group for these interventions.
Studies to evaluate the exposure of mycotoxines in weaning foods and their effects on the growth and development of children living in the affected areas are due in Tanzania, in close collaboration with the Ghent University.
The EU-funded study on nutrition in North Africa was successfully completed in 2006. It documents biochemical parameters of diet related chronic diseases and relates these to food intake, physical activity and perceptions. This study was completed in partnership with institutes in Algeria, Tunisia and France.

Health Policies

One core objective of our department is advocacy for strengthening health systems based on primary health care. The department considerably expanded its work in the fast-moving field of international health policies. The health sector in some low-income countries is receiving unprecedented funding from public and philanthropic sources. They are a mixed blessing for countries with weak health systems and create both opportunities and challenges. Most funding, although undoubtedly welcome, is often earmarked for specific diseases, mainly AIDS, TB and malaria. These disease-specific programmes identify weaknesses in the health systems, however, which in turn are a major factor in the slower-than-expected progress of disease control. Consequently, the need for 'health systems strengthening' has now risen prominently on the international health policy agenda, once more confirming the Antwerp "Health Care for All"declaration of 2001. An important focus is on the need for more and better prepared human resources for health.

National Forum on Health Equity Funds in Cambodia

At the same time, economic and societal transitions and international trade agreements, like GATS and TRIPS, have an important impact on access to health care and affordable generic drugs like anti-retrovirals. In many middle-income countries, especially in Latin America, privatization and the participation of multinational corporations in public services have created barriers to access due to co-payments and decreased clinical services for the poor at public hospitals and health centres.

Against this background, our health policy research in 2006 focused on a number of specific themes: (i) initiatives to harmonize the increasingly fragmented donor landscape, such as sector-wide approaches (SWAps) and Global Health Initiatives; (ii) the impact of AIDS in sub-Saharan Africa and the human resources need for scaling-up of anti-retroviral therapy; (iii) the impact of fast economic transition in China and Cambodia on hospital performance and access for the poor and attempts to create safety nets, such as Health Equity Funds; (iv) the impact of economic liberalization on public health systems in Latin America; (v) improved access for the poor through community-based health insurance in sub-Saharan Africa and India; (vi) evidence and advocacy for safe motherhood and neonatal health, and for neglected diseases.

In all these themes the department pleads for evidence-informed policies, which require stronger links between researchers and policy makers, with methods ranging from quiet diplomacy over networking to academic activism (Getting Research Into Practise and Policy, GRIPP). Our research also influences our Master's training programmes, especially in the new Option on Health Policy, where we close the circle. Basic principles of public health, disease control and health policy, all are embedded in the core values of primary health care: the universal right of every person to accessible, effective and high quality health services.

PROJECTS

Access to care

Community Health Insurance

Since 1998, the Department has been exploring the potential of Community Health Insurance (CHI) to contribute to the performance of health systems. This research is carried out as a scientific guidance to a wide range of field projects and aims to feed health policies with new knowledge on technical, managerial, socio-cultural, economical and political conditions under which the CHI potential to more effective, equitable and democratic health systems can be achieved.

Health Equity Funds

Since 2002, the Department also investigates the potential of Healthy Equity Funds (HEFs) which finance health care for the poorest. These funds are conceptually similar to Social Welfare systems as in the North – i.e. systems that fund health care for those who slip through the safety net of existing social security systems. The main objectives are: exploring the institutional aspects of these HEFs as organizations that take care of the poorest and studying the impact of HEFs on the health system. This multidisciplinary field research is nested in existing projects and networks.

Cuba - Organization of care delivery

Since the 90's Cuba's fully developed primary health care model became strained by economic hardships. Cuba's economic performance recently started to improve, which gives possibilities to rehabilitate the health infrastructure and to develop an ambitious programme of strengthening the first level of care.

Collaboration between family doctors

The dense network of family doctors suffers from a lack of temporal accessibility, partially caused by the too comprehensive definition of the GP's tasks. The research project tests the potential of "group practices" to optimize the distribution of tasks among different first line health workers. The "group practice model" has now become the standard for GP functioning at the first level of care.

Improved management of the first line health services

More efficiency without loss of accessibility requires careful experimentation in confrontation with international experiences. Therefore, our research evolves to an overall intervention study on improved management of the Cuban first line health services. From the definition and division of tasks between doctors and nurses, we move to comprehensive planning of all curative, preventive, and educative activities with participation of the community.

Cuba - Determinants of health differences

Global socio-economic reforms over the last decade and health sector reforms could have entailed health and health care differences in the Cuban society. First results show a complex national pattern. The next step is a depth study of possible occurrences of undesired effects at local level, and what caused them. We will propose specific corrective measures and interventions.

The "Specialization Course in Tropical Medicine and Disease Control in Bolivia"

The Universidad Mayor de San Simon (UMSS) in Cochabamba, Bolivia, and the ITM have developed a joint diploma course in Tropical Medicine and Disease control. Participants of various countries in the region have enrolled, the students are satisfied and positions are occupied by alumni. It has become an acknowledged model for post-graduate education at the UMSS and some of its modules are being integrated in pre-graduate teaching at the Faculty of Medicine. The ITM continues to give scientific and didactic support to the academic staff of UMSS and assures the quality and relevance of the programme.

The ITM also collaborates with the UMSS on developing the postgraduate course into a Master programme. The concrete curriculum has been set in 2006 and the necessary didactic material is being developed.

The first edition of this new Master programme will be launched in the academic year 2007-2008. Structural collaboration with the ITM Master programmes and venues for organizing student mobility and exchange will be explored.

Cuba – Training and research in biomedical statistics

A Cuban-Flemish training and research program in biomedical statistics and bioinformatics is being developed. Four Belgian and five Cuban research institutes are involved.

The Belgian platform of Community Health Insurance

This platform was created in 2003 and was officially launched in March 2006. It builds on the Belgian expertise in the field of Community Health Insurance (CHI) and Social Health Insurance (SHI) and actively promotes interaction and synergies between researchers, policy makers and field workers. The members of the platform gather six times a year and exchange information and experiences, discuss and clarify new concepts and challenges, and develop common field activities in the developing world.

Protecting the rural poor against the economic consequences of major illness: a challenge for Asian transitional economies (POVILL)

Major illness in the family has become an important cause of household impoverishment in China and other countries in the Southeast Asia, as these economies are transiting into a market economy with governments hardly funding health care and medical costs rising. China and Cambodia have developed policy initiatives to address this problem. This project supports these initiatives and assesses their performance, by contributing to international knowledge about how to help poor households cope with major illness. The study will take place in rural areas in Cambodia, Laos and two provinces in Central China.

Quality and Human Resources

Scaling up criterion based clinical audits (CBCA) in Morocco

For the Ministry of Health (MOH) of Morocco the improvement of quality of care is one of the top priorities. To achieve this objective a set of quality management tools was defined by the Directorate of Hospitals and Ambulatory Care and provided to clinicians and managers. Among these tools, CBCA was considered particularly appropriate for hospitals as it remains a continuing self-evaluation process of patient centred care. In collaboration with WHO, the scaling up of CBCA was started in May 2005 in the region of Casablanca and Fes and the university hospitals of Rabat and Casablanca. This project includes the training and coaching of at least two departments of the 12 public general hospitals concerned and at least two departments of the two university hospitals.

Perception of clinical audits by professionals in Morocco: discussion with Dr Belghiti (Director) and V. De Brouwere in Rabat (November 2006).

Perception of clinical audits by clinicians

In 2005 a clinical audit was introduced in 4 public hospitals of Casablanca to improve the quality of clinical care. We carried out a qualitative analysis of in-depth group interviews documenting the process of professionals and organizational change dynamics. The level of appropriation remains limited with wide variability. The implementation is faced with the poor quality of clinical records and the limited capacity to analyze data. Improvements remain limited by the capacity to implement changes, revealing the high interdependency of medical activities across and beyond hospital departments, calling for the integration of audit in a global quality improvement strategy.

Professionals attribute the gap between actual practice and standards to resources shortage, to patients' behaviour and to other departments' dysfunctions. They only marginally question possible competence or professional deficiencies, justifying them by the need to cope with practising under resource poor conditions.

Creation of a public health institute supporting public-oriented health services and systems in Ecuador

The institutional collaboration between the ITM Department of Public Health and the Catholic University of Ecuador (PUCE) began in August 1998. It wants to develop an organization of health care systems emphasizing the public interest and the right to health care in a neo-liberal political context. The strategy consists of creating a public health institute (ISP) endowed with teaching, research and service delivery functions. Teaching focuses on a two-year MPH programme, relying on problem-based learning and concepts from the ITM Master of Public Health. Since 1999, 7 cohorts of students were drawn from several Latin American countries. At the same time, action research projects were developed with the MPH students, mainly focusing on topics such as the delivery of quality care, health care at local level and citizen participation. The challenges for this collaboration are testing models of health services organization, progressive participation in local policy-making, strengthening the sustainability of ISP and making study grants available for MPH students. The ISP is now strongly represented in the local public health arena, while the specificity of its approach is acknowledged.

Improving quality of care in Costa Rican health services

Since many years Costa Rica's first line health services use management contracts, a modified version of 'pay-for-performance'. Apparent results are gloomy: doctors complain that they devote the bulk of their time to 5 (evaluated) chronic conditions; patients complain that they need to go to hospitals because doctors are barely available in health centres and communities complain that their demands are not met. The ITM Public Sector Health Policy and Management unit led an operational research to document the problems. It also offered a technical guidance to the regional health services (CCSS) in Huetar Atlantica, the country's most deprived region (500,000 inhabitants) in order to introduce alternative methods to managed care techniques in first line health services, and develop local health systems where hospitals and health centres support each other.

Human Resources for Health in Tete, Mozambique

In 2006, we started a project to support the Ministry of Health in Mozambique in their development of human resources for health. Mozambique is one of the countries with the lowest numbers of qualified health workers. The government has now recognized this situation as a major obstacle for improving access to health care, including AIDS care. ITM will support the Ministry of Health in the province of Tete with advice and operational research. The Clinical Department of ITM is supporting the provincial hospital, especially for AIDS care in the same province. Both projects are designed to create synergies.

INCO ARVMAC

In November 2006, a new research project "Effects of anti-retrovirals for HIV on African health systems, maternal and child health (ARVMAC)" was started up. The research is centred around three demographic surveillance sites (DSS) in Burkina Faso, Tanzania and Uganda. The research wants to document the effects of the rapid scale-up of AIDS programmes and AIDS services on the health systems, all the way from health policy, over district level effects and effects on health services, to the impact on the population. ITM was invited to join the consortium that leads the work package on human resources for health at all levels of the health system.

PASSAGE: Projet d'Approche Solidaire en Santé Génesique

The "Project of solidarity approach in reproductive health" (PASSAGE) aims to improve reproductive and sexual health of populations, especially the adolescents of the project areas (three towns: Mopti, Mali; Ouagadougou, Burkina Faso; Maroua, Cameroon). Target groups are the youth, women and the poor. Actions include an improvement of provision and quality of care, the setting up of coordinated networks between different health facilities and owners providing reproductive health care, the setting up of specific services for the youth as well as better information to target groups regarding their reproductive health rights. Results of these actions are expected to better meet the demands of the population on reproductive health and provide a more adapted response.

Project PASSAGE: partners meet every 6 months in Burkina Faso, Mali or Cameroon.

Niger and Senegal: support to health systems development

ITM was selected by BTC to provide scientific guidance to its development programmes in Niger and Senegal (2006-2009). In Niger, BTC supports a broad development programme strengthening health systems and services of two regions (Niamey and Dosso), strengthening training institutions with emphasis on skills needed at district level, and supporting national policy formulation. In Senegal, BTC supports the development of two Regions (Kaolack and Fatick) with special focus on district health systems. The input of ITM consists of technical advice for implementation, development of policy strategies, continuous training of BTC technical assistants, and documenting and disseminating experiences and action research results.

PROMOTERS & SUPPORT

Access to care

Community Health Insurance

ITM promoter: B. Criel
External collaborators: Caritas (Mauritania); Memisa (Belgium); Cordaid (TheNetherlands); MOH (Uganda) and the Makerere University Institute of Public Health (Kampala, Uganda); *La Concertation* (Dakar, Senegal); Swiss Red Cross Cambodia; Union Technique de la Mutualité, (Bamako, Mali); GTZ (Tanzania).
Support: DGDC, ITM

Health Equity Funds

ITM promoters: B. Meessen, W. Van Damme, B. Criel
External collaborators: MoH Cambodia, MoH Mauritania, WHO Cambodia, GTZ (germany) and BTC.
Support: DGDC, ITM, EuropeAid. Cuba - Organization of care delivery

Cuba: organization of care delivery

ITM promoter : P. Van der Stuyft
External collaborators : M. Bonet, director of INHEM Cuba (Instituto Nacional de Higiene, Epidemiología y Microbiología)
Support : DGDC

Cuba - Determinants of health differences

ITM promoter: P. Van der Stuyft
External collaborators: M. Bonet, director of INHEM Cuba (Instituto Nacional de Higiene, Epidemiología y Microbiología)
Support: ITM-DGDC

Support to the "Specialisation Course in Tropical Medicine and Disease Control"

ITM promoter: P. Van der Stuyft
UMSS promoters: Dr. Faustino Torrico

Cuba – Training and research in biomedical statistics

ITM promoter: P. Van der Stuyft
Support: VLIR

The Belgian platform of Community Health Insurance

ITM promoters: B. Criel
External collaborators: Belgian Christian Mutualities, National Union of Socialist Mutualities, Hoger Instituut voor de Arbeid (HIVA) at the Catholic University of Leuven, Centre d'Economie Sociale (CES) at the University of Liège, DGDC, BTC
Support: DGDC, ITM

Protecting the rural poor against the economic consequences of major illness: A challenge for Asian transitional economies (POVILL)

ITM promoters: B. Meessen, W. Van Damme, G. Kegels
External collaborators: Institute of Development Studies (UK); Chinese Health Economics Institute (China); Zhongnan University of Economics and Law (China); Huaxi School of Public Health (China); Institute of Social Development and Public Policy, Beijing Normal University (China); National Institute of Public Health (Cambodia) ; Center of Advanced Studies (Cambodia) ; Division of International Health, Department of Public Health Sciences, Karolinska Institute (Sweden) ; National Institute of Public Health (Lao PDR).
Support: European Union – INCO-DC

Quality and Human Resources

Scaling up Criterion Based clinical Audits (CBCA) in Morocco

ITM promoter: V. De Brouwere
External collaborators: Directorate Hospitals and Ambulatory Care (DHSA) Ministry of Health (Morocco)
Support: WHO Rabat

Perception of clinical audits by clinicians

ITM promoter: V. De Brouwere
External collaborators: A. Sahel, Directorate Hospitals and Ambulatory Care (DHSA) Ministry of Health (Morocco); ME Gruénais, IRD (Marseille, France); S. Nanni, Department of Community Health, Faculty of Medicine, University of Casablanca (Morocco).
Support: DGDC through the BVO Health Care for All

Creation of a public health institute supporting public-oriented health services and systems in Ecuador

ITM promoter: J.P. Unger
External collaborators: BTC/CTB, APS project; Instituto Ecuatoriano de Seguridad Social; Ministerio de Salud Publica del Ecuador; Municipio de Quito; NGOs and hospitals
Support: ITM-DGDC

Improving quality of care in Costa Rican health services

ITM promoter: J.P. Unger
Participating institution: Caja Costaricense de Seguridad Social (Costa Rica)
Support: ITM-DGDC

Human Resources for Health in Tete, Mozambique

ITM promoter: W. Van Damme
External collaborators: Ministry of Health (Mozambique); National Institute of Health (Mozambique); Department of Community Health, Eduardo Mondlane University (Maputo, Mozambique); Médecins Sans Frontières (Belgium) and University of Gent (Belgium).
Support : Flemish Community

INCO ARVMAC

ITM promoter: W. Van Damme
External collaborators: Karolinska Institute (Sweden, coordinator); Institute of Public Health (Makerere, Uganda); Centre de recherche de Nouna (Burkina Faso); Heidelberg University (Germany); Swiss Tropical Institute (Basel, Switzerland); Ifakara research centre (Tanzania)
Support: INCO – European Commission

PASSAGE: Projet d'Approche Solidaire en Santé Génesique

ITM-promoter: V. De Brouwere
External collaborators: B. Dujardin, ULB (Belgium); C. Wissocq, Equilibres & Populations (France); J. Compaoré, ASMADE (Burkina Faso); Direction Régionale du Centre, Ministère de la Santé (Burkina Faso); P. Thonneau, Université Paul Sabatier (Toulouse, France); ME Gruénais, Institut d'Etudes Africaines, IRD (Marseille, France); F.T. Touré, ASDAP, (Mali); S. Samaké, Ministère de la Santé, des Personnes Agées et de la Solidarité (Mali).
Funding: European Union, Europaid

Niger and Senegal : support to health systems development

ITM promoters: G. Kegels, M. Van Dormael,
Support: BTC

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Medical Services

Medical Services

The Medical Services of the ITM provide specialized outpatient, diagnostic, clinical and preventive care to travellers and migrants. They comprise the national reference centre for tropical and infectious diseases and the provincial reference centres for HIV/AIDS treatment and diagnosis. The Medical Services consist of the Travel Clinic, the Service for Tropical and Import Pathology (including Dermatology and Paediatrics), the Service for HIV/STD Care, the Medical Laboratory and the Hospital Ward. The latter is located in the Antwerp University Hospital. The Medical Services form a separate administrative and operational entity within the Institute. Research, education and scientific service functions are carried out under the umbrella of the Department of Clinical Sciences.

Medical Services

The Medical Services performed 29,792 consultations in 2006, of which:

Pre-travel advice	15,092 (51%)
Tropical/import pathology	5,889 (19%)
Dermatology	632 (2%)
Paediatrics	204 (1%)
STD	1,551 (5%)
HIV	5,520 (19%)
Help Center	904 (3%)

Secretariat of the travel clinic.

Travel Clinic

The pre-travel advice and care is provided by the Travel Clinic, staffed by a team of specialized doctors, nurses and clerks. They offer general, country-specific and disease-specific information, vaccinations, chemoprophylaxis, advice about treatment, and anything else to promote healthy travelling. Beside the 15,092 consultations the Travel Clinic administered 32,165 vaccinations.

A telephone hotline is accessible 24/7 for external physicians with questions on import pathology, allowing to solve diagnostic and therapeutic problems at a distance.

ITM website

Extensive information on travel health can also be found via the ITM website, www.itg.be, or directly at www.reisgeneeskunde.be (Dutch), www.medecinedesvoyages.be (French) or www.travelhealth.be (English).

This website received over 175,000 hits in 2006. This information is also continuously updated, expanded and fine-tuned. The website includes separate fact sheets for more than 200 countries, lists of obligatory and recommended vaccinations, an overview of malaria risks and prophylactic measures, and many other items and recommendations. The texts are based on the directives of the World Health Organization (WHO) and the consensus policy of the Belgian Scientific Study Group on Travel Medicine, chaired by the ITM.

Members of the clinical laboratory team.

The ITM Medical Services are permanently on call to advise authorities on the surveillance and management of imported diseases. As in previous years, we participated in the main national and international scientific meetings on travel medicine (see chapter on the Department of Clinical Sciences). We contributed in various ways to international travel health publications, including the WHO manuals.

The HIV/STI department

The HIV/STI department performed 8,808 consultations in 2006, of which 5,706 from HIV patients and 3,102 for other Sexually Transmitted Infections (STI). Our 'AIDS-care reference Centre' (ARC) followed up nearly 1,429 HIV-infected patients, of which 966 were on anti-viral treatment. These patients are seen at least three to four times a year to monitor their immunological and viral status. In 2006 we registered 156 new HIV patients. 54% of our patients are from Belgium (mainly Men having Sex with Men), 28% from sub-Saharan Africa and 18% from elsewhere.

Helpcenter

The Helpcenter is a new pilot project that was started up in 2006 with support of the Ministry of Social Affairs. It aims at the secondary prevention of HIV with the following strategies: (1) screening of high-risk groups, such as migrants of endemic regions (especially sub-Saharan Africa), young people and homosexuals;, (2) access to treatment and care for People Living with HIV (PLWH), (3) positive prevention through change of sexual behaviour in PLWH, (4) change of attitudes in people with sexual high-risk behaviour.

The Helpcenter is located in a separate and discrete building and staffed by two doctors, who offer medical and sexualogical consultations, including testing for HIV/STD, free of charge and anonymous if required. They collaborate closely with other organizations involved in the primary prevention of HIV and STI.

As one of three such pilot projects for the Ministry of Health and Social, the Helpcenter also aims at policy research and advice on HIV prevention in complex urban settings. In this first start-up year, the Helpcenter managed 900 patient contacts, of which 46% came for voluntary counseling and testing, 23% for questions or fears about STI and 50% for gynaecological reasons (PAP-smear, contraception, pregnancy,…).

Medical Laboratory

The outpatient activities are supported by the Medical Laboratory. As part of the ITM's national reference role, the Medical Laboratory also serves other laboratories and medical institutions throughout Belgium. In 2006, the ITM Medical Laboratory processed samples from 29,764 patients, of which 11,121 internal and 18,643 external. Besides routine biochemistry, haematology and microbiology, the Laboratory performed 116.327 specific serological or parasitological tests for tropical and imported diseases. Some typical diagnoses are listed below. The Mycology laboratory received 6,581 samples, including 436 cultures for identification and 24 yeast cultures for sensitivity testing. Interesting strains are sent to the BCCM/IHEM (Biomedical Fungi/Yeast Collection of the Scientific Institute of Public Health (IPH), Brussels).

Overview of some typical laboratory diagnoses in 2006

Diagnosis	
Ancylostomidae	15
Ascaris lumbricoïdes	14
Balantidium coli	1
Blastocystis	676
Chilomastix mesnili	37
Clonorchis sinensis	2
Cryptosporidium	17
Cyclospora	6
Dengue virus	34
Dientamoeba fragilis	66
Endolimax nana	249
Entamoeba coli	355
E. hartmanni	122
E. hystolytica/dispar	199
Entamoeba histolytica	15
Enterobius vermicularis	2
Giardia lamblia	240
Heterophyes heterophyes	1
Hymenolepis nana	12
Iodamoeba butschlii	61
Isospora belli	2
Leishmania	10
Loa loa	7
Mansonella perstans	1
Microsporidium	2
Onchocerca volvulus	1
Plasmodium falciparum	113
Plasmodium malariae	2
Plasmodium ovale	12
Plasmodium vivax	12
Plasmodium species	2
Sarcocystis	4
Schistosoma haematobium	4
Schistosoma mansoni	26
Strongyloides stercoralis	6
Taenia saginata	2
Taenia spp.	7
Trichomonas vaginalis	1
Trichostrongylus spp.	3
Trichuris trichiura	33

Dr. G. Luyckx, radiology consultant.

Hospitalization Unit

In the Tropical Disease Ward at the University Hospital of Antwerp (UZA) we took care of 218 inpatients in 2006. Two-thirds had HIV-related problems, one third suffered from severe tropical or travel related diseases, most frequently malaria.

Since 2005, the ITM and UZA have extended their clinical collaboration to general infectiology, in association with the UZA departments of Microbiology and General Internal Medicine. On a daily basis, hospital-wide laboratory results are reviewed and joint rounds are made to selected patients. The team also provides in-house consultancies on demand, and provides training in infectiology.

Development Cooperation

Development Cooperation

The Belgian Directorate-General for Development Cooperation (DGDC) and the ITM have been collaborating for decades through numerous projects, scholarships and contracts. Since 1998, these activities have been integrated in a comprehensive Framework Agreement. Under this agreement, the DGDC supports the ITM in a coherent set of activities in medical, veterinary and scientific training, research and capacity building that are planned and agreed upon as five-year programmes.

CAPACITY STRENGTHENING

The first Five-Year Programme ("5YP-I") started in 1998 and was concluded in 2002, with total expenses exceeding 21 million Euro.
The second Five-Year Programme ("5YP-II") started in 2003 and runs until the end of 2007. The projected total budget will be in the range of 45 million Euro. The contract with DGDC was further modernized into a succinct, results-oriented management agreement. The DGDC defines its expectations in terms of output and quality, to which it links its financial support. It is up to the ITM and its partners to define the strategies and activities to achieve the set objectives and measurable targets. In practice, the DGDC remains closely involved in the planning and monitoring of the programme through a joint steering committee.
The main objective of the 5YP-II has been defined as "capacity building of institutions in the South, which through research, education and the provision of services, can provide sustainable improvements to the health care strategies, and thus to poverty reduction, in their countries and regions". This objective is pursued through three inter-linked strategies: individual training and support; institutional strengthening; international networking and policy development. We network and collaborate with 27 institutions or organizations in 17 developing countries, train some 100 individuals to the Master of PhD level annually and support the DGDC in international health fora and with policy research.


Training laboratory staff in Kikwit, DR Congo.

On an **individual level**, we focus primarily on training international, 'cutting-edge' experts, both at the ITM and in the partner institutions (see chapter Education). The stimuli given to doctoral training, distance learning and alumni support are starting to pay off. We offer 60 one-year fellowships to participants from developing countries in our Masters programmes. Every year, the students from our Masters courses have the opportunity to compete for three full four-year doctoral "sandwich" scholarships. Additional PhD scholarships are also awarded within the specific


Amazone trade in Peru.

capacity strengthening projects of the 5YP-II. We develop strategically important e-learning courses and interactive expert programmes, among others to support the roll-out of ART in developing countries. We further strengthen, expand and harmonize the support to and networking of our alumni.

Our second strategy aims at long-term support and sustainable **strengthening of partner institutions** in the South. These institutional collaborations, governed by transparent contracts, consist of close cooperation at various scientific and administrative levels. The support is not limited to joint research projects, but also includes strategic and operational management, logistics, administration and personal exchanges. The scope of most of these institutional partnerships develops gradually, with intermittent evaluations and re-orientations. We have by now established a full-fledged cooperation with several partners across the entire institutional spectrum. Other collaborations have a thematic focus or concentrate on either research or training. Most partners are scientific institutes or references laboratories, but some projects involve public health services or NGOs in order to support and document operational experiences with a generic interest.
Many projects of the 5YP-II are a continuation of the 5YP-I and/or the Aids Impulse Programme (AIP), and could therefore thrive on the existing élan while reorienting gradually (in some cases even drastically) to an explicit institutional approach. The process is highly welcomed, but not always easy as the structure, management and attitudes of most institutes are rather geared at project-based collaborations.
On an **international level,** we aim to generate, distribute and apply general cross-border knowledge, and to influence regional and global health policies. To this end we use a variety of mechanisms: direct flow of results and recommendations for operational services from our partners to national ministries of health in their countries; dissemination of results through the usual scientific national and international channels (publications, reports, congresses); creation and support of regional or international networks. Other outlets and instruments are the alumni networks, the annual ITM-colloquia and of course the ITM's teaching programmes. Generic policy questions are addressed in a number of policy-support research projects. For 2003-2007 these include the follow-up and evaluation of international health policies focused on the "global initiatives"; the follow-up of the "Health Care for All" agenda; the roll-out of anti-retroviral treatment for HIV/AIDS; and rational strategies for surveillance and control of zoonoses in Africa.

Centennial partner meetings

Gathering our institutional south-partners to work and celebrate was one of the great joys of ITM's centennial events. They were among the guests of honour at the official academic session and the inauguration of Rochus Campus, and participated actively in the **Centennial Colloquium** "Tropical Medicine in the 21st century: switching the poles" (see Introduction). But before these events, all promotors from South and North spent two intensive but fruitful days reviewing the lessons learned and achievements of the first and second 5-year programmes, and discussed the concepts, objectives and conditions of the third one which will run form 2008 tot 2013, with an anticipated total budget of 60-70 million Euro.

The Mid-term review

In order to assess the performance of the programme, as well as to prepare the planning of the ITM/DGDC Framework Agreement III (FA-III), the ITM

commissioned an in-depth **Mid Term Review** of the first half of the FA-II, but looking back equally to FA-I and forward to FA-III. The contract was internationally tendered and attributed to a consortium consisting of HERA (Belgian consultancy company in international health) and the Swiss Tropical Institute.

The focus of the review was on the three main components of the FA: education, institutional strengthening / joint research projects and policy support. The overall assessment was very positive: "DGDC gets good value for money for each component". Activities are in line with the Belgian health sector strategy, the Health Care for All declaration and the ITM's own policy plans. The collaboration with partners in the South varies but is based on true partnership and on mutual respect. Projects are mostly on track according to plan. Administrative management is transparent and efficient. The resolute introduction of the project cycle management into the ITM has certainly helped to achieve the positive results and is quite exemplary for an academic institution.

For a possible FA III a number of recommendations were made, in summary:

1. Intensive preparation through in-depth strategic discussion at ITM and wide brainstorming with south partners
2. Negotiate a "full-blown" result-based contract with DGDC
3. Define mutual medium and longer term needs in function of ITM's future over-all role in a changing global environment
4. Consider strategic institutional partnership with a smaller number of strategic partners, while maintaining a variety of joint research projects
5. Balancing sector and institutional needs versus narrower project objectives
6. More explicit translation in national and international health policies
7. A clear vision and policy regarding sustainability
8. Deal with cross-project issues at programme level, including gender, ethics, intellectual ownership, harmonization of standards and equipment
9. Strengthen interdepartmental collaboration through policy support activities
10. Pro-active harmonization with other donor inputs
11. Strategic networking between institutes and international organizations
12. Maintain scientific independence as "Centre of Excellence and Influence".

The Joint Partner Meeting

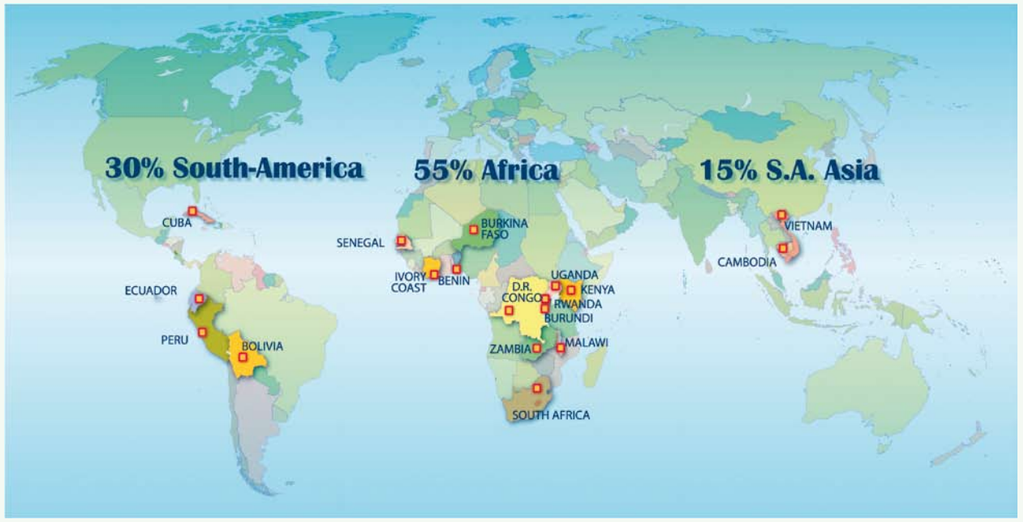
This Mid Term Review was discussed during the (second) **Joint Partner Meeting** (November 20-21, 2006) in which all FA institutes of the South participated. After two days of lively debates, consensus was reached on the principles for the following framework agreement.

The ITM constituted an internal "Working Group on the Framework Agreement III" (WGFAIII) to follow up this meeting.

At the end of 2006 a call for proposals was launched to 30 of ITM's partners in the South for Institutional Collaboration for a six year period (2008-2013). A final proposal for FA-III will be presented to DGDC mid 2007.

On the following pages we report mainly on institutional collaboration and policy support projects. Specific research results have been described in the departmental chapters, the training components in Education, the financial aspects in Management.

INSTITUTIONAL COLLABORATION



Institutional partnerships in the South under the ITM-DGDC Framework Agreement
The total budget for the 5Y-II from DGDC is 42,5 million Euro. Two thirds is spent in the South: 55% in Africa, 30% in South-America and 15% in Asia. The other third is used for activities at the ITM, mainly training and policy support.

DR Congo, Kinshasa: Institut Nationale de Recherche Biomédicale (INRB)

The Institut Nationale de Recherche Bio-Médicale (INRB) in Kinshasa is a long-standing partner of the ITM. The central aim of the current collaboration is to assist the INRB in establishing itself as the main reference laboratory for infectious diseases in DR Congo by supporting its scientific activities, the human resource policy and the laboratory infrastructure.

Scientific collaboration between INRB and ITM covered the fields of *Buruli ulcer,* malaria, schistosomiasis and Human African Trypanosomiasis (HAT). The latter was conducted in collaboration with LABOVET (national veterinary reference laboratory) for the research on urbanization of HAT. New prospects for funding were found for the HAT-related research activities through a partnership with FIND and through two EU funded research projects: TRYLEIDIAG and NEUROTRYP, as well as the HAT-Impulse fund of the Belgian cooperation.

P. Lutumba joined the INRB as a scientific advisor with a post-doctoral grant and D. Mumba and A. Kibadi continued their PhD research. The laboratories of the parasitology department, the animal house and the production centre of the mAECT for HAT diagnosis received substantial support. The 4th International Congress of Tropical Infectious Pathology had to be postponed to July 2007, due to the civil unrest in a post-electoral period.

DR Congo: Laboratoire Nationale de Référence pour le SIDA (LNRS)

The main objective of this collaboration is strengthening the capacity of the HIV/AIDS reference laboratory (LNRS, Laboratoire National de Référence SIDA/IST) in Kinshasa (DR Congo). This program assists the LNRS in the accurate diagnosis and follow-up of persons infected with HIV. Training courses, held at the ITM or in DR Congo by staff of the ITM, have allowed the LNRS to considerably improve the quality of the viral load testings and CD4 counts, two crucial assays for the follow-up of HIV infected individuals. In the mean time prices for these tests have been drastically reduced. Standard Operating Procedures (SOP's) for most of the tests have been finalized with the help of ITM and validated with the help of

Blood collection on Lukula Avenue, Kikwit, DR Congo.

the CDC. A last challenge of the project is the implementing of the quality system as it has been described in the Quality Manual.
A great number of health workers in and outside Kinshasa have been trained by the LNRS in HIV testing and quality. The laboratory is in high demand and has become an inevitable partner in the field of HIV testing in the DR Congo.

Rwanda: Clinical Research Centre, Centre Hospitalier Universitaire de Kigali (CHUK)

The "Centre Hospitalier Universitaire de Kigali" (CHUK) is the national reference and main training hospital of Rwanda. We support the set-up of a clinical research unit focusing on infectious diseases and aiming at diagnostic and therapeutic strategies for clinical practice. Ongoing research concentrates on TB in children, HIV diagnosis in infants and validation of several algorithms in immunocompromized patients.

Burundi: Programme de Lutte contre les Maladies Transmissibles et Carentielles (LMTC)

The principal objective of this programme is the sustainable prevention of malaria epidemics in the highlands of Burundi. The strategy is based on selective indoor spraying (IRS) during the hottest month of the year in houses near the mosquito breeding sites.
After 4 years (2002-2005) of selective indoor spraying, vector control activities were stopped. After the first intervention, we observed a reduction of the anopheles density in the valleys ranging from 96% to 60%. The risk to have an infected anopheles in a house is 2.5 lower in the treated areas. The transmission was reduced by 90% (3/8 surveys) to 100% (5/8 surveys). The malaria prevalence was lower in the intervention valleys, with 40% to 50% reduction after the third survey. Children under 1 year are 10 times less at risk to have malaria in the intervention valleys compared to the control valleys. After 3 years of IRS (survey 7), an important increase in the allele frequency of the knock down resistance gene has been observed in *Anopheles gambiae*. But it is too early to conclude if selective pressure is due to IRS or insecticides used for crops. Eighteen months after the last spraying round, malaria prevalence and the Anopheles density were lowest ever observed during the 10 surveys, in intervention and in control areas. This reduction is probably due to unusual rains occurring between October and December 2006. Bioassays used for the monitoring of insecticide resistance were performed in the province of Gitega on the south border of Karuzi. *An. gambiae* was found to be resistant in two communes and susceptible to DDT and deltamethrin. The kdr allele frequency fluctuated between 16% and 58%. Expertise was provided to LMTC for the monitoring of antimalarial drugs.

Zambia: Tropical Disease Research Centre of Ndola (TDRC)

In collaboration with the Tropical Disease Research Centre (TDRC) in Ndola, Zambia, we are investigating several aspects of HIV-malaria co-infection. Malaria remains the most important parasitic disease, while the HIV prevalence (which varies between 15% and 30% of the general population) is among the highest in the world. Therefore, HIV+ individuals with clinical malaria represent a substantial part of patients attending health facilities. New projects and funding have already been attracted, among others the EDCTP.
A randomized clinical trial, comparing SP and artemether-lumefantrine (AL) in HIV+ and HIV- adults with uncomplicated malaria in 3 health facilities in peri-urban Ndola, ended in 2005. Results have just been published. Investigations in collaboration with other institutions are ongoing as well as a case-control study on HIV-1 as a risk factor for severe malaria. We also assess the impact of mefloquine malaria prophylaxis in HIV-1 infected individuals and its influence on the evolution into AIDS.
The long-term objective of the collaboration is to assist the development of the TDRC as a national and regional health research institute. As a start, a first joint research project was initiated that will allow to explore and test the collaborative potential. Meanwhile, projects in other fields as TB and STDs are being prepared.

Uganda, Rwanda: East African Network for Monitoring Anti-malarial Treatment (EANMAT)

The ITM collaborates with the East African Network for monitoring Anti-malarial Treatment (EANMAT), which comprises Burundi, Kenya, Rwanda, Tanzania, Uganda and Zanzibar. A first collaborative project investigated how the intensity of malaria transmission contributed to the spread of drug resistance in Uganda. This led to the PhD of Ambrose Talisuna, who is now in charge of malaria clinical trials in Uganda. The project has been expanded with an entomological component aiming at characterizing the dynamics of malaria transmission in the sentinel sites, insecticide resistance and at defining the link between entomological and epidemiological data. Results on transmission dynamics and insecticide resistance in Uganda are now available. Several studies on the efficacy of anti-malarial drugs or drug combinations have been carried out in Rwanda as well as in Uganda. The sites have recently attracted additional projects and funding for capacity strengthening and research from the EDCTP.

Kenya: Nyanza health services, KEMRI and NGOs

The aim of this collaborative project is to provide appropriate sexual and reproductive health education, training in life skills for in and out-of-school youth, personal counseling and tailored health services to young people aged 10 to 20 years in two neighbouring districts in Nyanza Province, Kenya. The main objective of the youth programme is to reduce the spread of HIV infection through a delay in sexual initiation and a reduction in unsafe sexual behaviour. In 2005 we expanded the programme from Asembo to Gem and concluded a baseline survey on sexual behaviour, HIV and other STI.
We monthly counsel and test on average 600-800 persons for HIV, treat 120 STIs and have more than 60 HIV-positive youth in care. More than 20,000 adolescents have been reached with behaviour change communication activities in 2006. An intervention to promote positive parenting and parent-child education about sexuality and sexual risk reduction was scaled up. In Asembo, 65% of all families with children aged 9-12 years were reached by the end of 2006.

The livelihood component of the programme, vocational skills training and access to micro credits continued to face challenges throughout 2006. Membership increased and more loans were disbursed. However, the collaboration with the micro credit organization did not go smoothly and alternatives for sustainability were sought.

Senegal: Immunology Laboratory of the Centre Hospitalier Universitaire

The general aim of this project is to strengthen the capacity of the Immunology laboratory of the Faculty of Medicine and Pharmacy of the University Cheikh Anta Diop of Dakar, train scientific and technical personnel and evaluate new and mobile methods for the immunological follow-up of HIV/AIDS patients. We introduced instrument calibration and quality control in the CD4 laboratory of the Immunology Laboratory of the Centre Hospitalier Universitaire Le Dantec in Dakar, Senegal. The recruitment of HIV serodiscordant couples and the study of immunological factors of protection of the negative partners continued. So far, 91 couples have been enrolled, among whom 28 HIV serodiscordant couples. The objectives of this project are to study immunological and virological factors associated with protection against HIV infection in the seronegative partners and low level of HIV transmissibility of the seropositive partners. Finally, we have started a preliminary study on the regeneration of the TB specific immune response in HIV patients receiving ART. The results will be used to set up a study on TB-associated Immune reconstitution inflammatory syndrome in HIV patients receiving ART in Dakar. The possible unbalanced regeneration T regulatory cells after ART is also being investigated.

Ivory Coast: Institut National de Santé Publique / ASAPSU

The ITM collaborates with the Institut National de Santé Publique (INSP) in Abidjan since 1998, in particular for the establishment of effective HIV-prevention strategies. The project consisted of training of staff of the INSP, support for improving the infrastructure and joint research projects. Most research activities were carried out in collaboration with the Projet Retro-CI in the "Clinique de Confiance", a clinic for sex workers in Abidjan. Recently, the focus shifted from research to prevention and care interventions among sex workers, and the NGO ASAPSU was selected as the implementing partner. The Clinique de Confiance was further strengthened, including the treatment of Sexually Transmitted Infections and rapid testing for HIV. Services at the clinic are closely linked with outreach activities by clinic staff and peer educators including group education sessions and condom promotion in all districts of Abidjan. Two satellite sex worker intervention sites were operational in 2006, one in a general health centre in a high transmission area in Abidjan (Yopougon) and one free-standing dedicated clinic in San Pedro. Two new sex worker intervention sites were created, one in Gagnoa, and one in Yamoussoukro.

Hôpital Général de Référence de Bwamanda, DR Congo: main analyst and adjunct with the microscope.

Burkina Faso: Centre Muraz, Bobo-Dioulasso

The Centre Muraz is one of the major research institutes in West Africa, until recently as part of the Franco-African network OCCGE. The project objective is to strengthen relevance, quality and efficacy of the scientific actions of the CM, and testing mechanisms for mutual evaluations and policy reviews.
Two joint research projects (MISAME I initiated in 2003 and MISAMEII begun in February 2006) should pave the way for a broader mutual reconnaissance. Randomized controlled trials study ways to improve children's health by preventing intrauterine growth retardation through the provision of an improved package of prenatal care. The package includes multivitamin-mineral supplements (in the form of food supplements in MISAME II) and malaria prophylaxis by sulfadoxine-pyrimethamine. Activities during the year were mainly focused on reinforcing the local research team and health services. Investigations on practices during pregnancy, as well as a fifth food consumption survey have been organized. The local food production unit is now fully functional. The collaboration also includes clinical trials and maternal health in projects co-funded by other organizations.

Benin: Reference Laboratory for Mycobacterial Diseases

Tuberculosis (TB) and Buruli ulcer (BU) are the two most important mycobacterial diseases in Benin. The general aim of this project is to support the national reference laboratory for mycobacteria (LRM) in Cotonou, which through a multidisciplinary approach for quality case management can strengthen the national control programmes. Its activities are focused on the detection of *Mycobacterium tuberculosis* and *M. ulcerans* in clinical specimens from TB and BU patients by microscopy and by culture, and the resistance of *M. tuberculosis* to anti-tuberculosis drugs. The international quality control confirmed the high quality of microbiological analyses performed by the LRM.

The personnel has been trained in seminars in Benin and abroad. The randomized controlled trial aimed at treating TB in 4 months instead of the usual 6 months started in 2005. Rapid methods have been successfully applied to exclude multi-drug resistant patients from the trial. Genetic fingerprinting analyses confirmed true relapses (with the same strain) and did not show any case of reinfection. Training of health professionals has substantially increased the number of BU patients detected and treated in Benin. A total of 94 BU cases (all forms) were treated with anti-mycobacterial drugs for at least 8 weeks. Microbiological tests performed at the start, during and after 4 weeks of the treatment did not reveal any significant difference. For the first time, the presence of *M. ulcerans* (African genotype) in aquatic insects has been confirmed.

South-Africa: Department of Veterinary Tropical Diseases (DVTD) of the University of Pretoria

To facilitate the transfer of expertise in Southern Africa in the research and control of major parasitic diseases of livestock to other African countries, the DAH started an institutional collaboration with the DVTD, Faculty of Veterinary Sciences of the University of Pretoria. The institutional collaboration aims at increasing the DVTD's capacity to deal with trypanosomosis, theileriosis and helminthosis. In the fourth year of this collaboration, the diagnostic capacities of the tsetse/trypanosomosis enabled the support of research in tsetse and trypanosomosis in Malawi and South Africa. Within the framework of the collaboration 7 PhD students and one MSc student are conducting their research in the fields of trypanosomosis and tsetse control, Corridor disease and Theileria identification, modelling in ovine haemonchosis, canine babesiosis, and tuberculosis. We also supported the development and delivery of the modules on trypanosomosis, tick-borne diseases and helminthology of the web-based MSc course in Tropical Veterinary Medicine that was launched in 2005.
The Centre for Ticks and Tick-borne Diseases (CTTBD) is a Southern African Development Community (SADC) and African Union (AU/IBAR) centre of excellence for training in veterinary epidemiology, vaccine production and backstopping service. CTTBD continued to produce titrate and test East Coast fever vaccines for Kenya, Tanzania, Uganda and Zambia. Two courses were organized: epidemiology for veterinarians (6 participants) and laboratory diagnostics (6 participants). The alumni support network continued to function, albeit on a more informal and ad hoc way, because the centre's staff was more involved in vaccine production and consultation exercises.

OAU/IBAR Centre for Ticks and Tick-borne diseases (CTTBD)

The Centre for Ticks and Tick-borne Diseases (CTTBD) is a Southern African Development Community (SADC) and African Union (AU/IBAR) centre of excellence for training in veterinary epidemiology, vaccine production and backstopping service. CTTBD continued to produce, titrate and test East Coast fever vaccines for Kenya, Tanzania, Uganda and Zambia. Two courses were organized in 2006: epidemiology for veterinarians (6 participants) and laboratory diagnostics (6 participants). The candidates came from DR Congo. The courses were organized locally by Dr Gondwe, relying on ITM and own alumni as course trainers. The alumni support network continued to function, albeit on a more informal and ad hoc way, because the centre's staff was more involved in vaccine production and consultation exercises. The CTTBD website was maintained.

Peru: Instituto de Medicina Tropical "Alexander von Humboldt", Universidad Peruana Cayetano Heredia, Lima

The Instituto de Medicina Tropical (ITMAvH) is a research and training institute for infectious and tropical diseases, and a part of the Universidad Peruana Cayetano Heredia (UPCH). After several joint research projects (mainly on leishmaniasis), the ITM and the IMTAvH since 1998 intensified their collaboration in molecular biology, extended it to clinical research, and developed a concept for a broad and long-term institutional collaboration. Our aim is to improve the clinical management and control of infectious and tropical diseases in Peru and the Andean region. Further strengthening of ITMAvH clinical and biomedical research capacities, and of its role as a national and international reference centre is the main objective with the following components: (1) institutional policy, management and networking (2) human resources, (3) logistic and techniques (4) training, research and field actions. The TB component deserves special mentioning. A large panel of samples from TB patients are being analyzed with molecular biology techniques, rendering better information quality to clinical research studies.The trend of increased joint scientific publications and external funding application pursued. The administration core has homogenized its standards according to DGDC parameters.

Cuba: Institutional Collaboration between ITM Antwerp and Instituto Nacional de Higiene, Epidemiología y Microbiología and Instituto Pedro Kouri

We aim to promote health development and strengthen research and action into public health sector care, disease control and applied biomedical research in Cuba, and to valorize the Cuban expertise and experience at international level. We strengthen the Institutional capacity of INHEM and IPK by investing in equipment and technology transfer, by practical training in quantitative and qualitative research methods, by masters courses and support for PhD programmes, and by developing the library resources. Joint research activities include
1) Health care organization: Cuba has set up a nation-wide programme of home care for selected patients that would otherwise require hospitalization. We have analysed the shifts this entails in patients flows and measured patient and provider satisfaction. We have also been conducting a pilot intervention study to test the potential of "group practices" for strengthening the performance and availability of first level care. While the MOH had already translated some key findings of our pilot experiences into its national health policy, it has requested to ensure research on different aspects of the new organisational setup of the Cuban first line health services during the FA3. Finally, we globally document whether equity in health is secured under the present health sector reforms in Cuba.
2) Integrated disease control: We evaluated the current practice towards smear negative TB diagnosis and formulated policy recommendations. We also developed protocols to re-centralize laboratory diagnostic facilities in Havana and to identify high risk groups for active case finding. In the field of dengue control we designed and executed interventions to evaluate the effectiveness of different participatory processes (school based, health services based and inter-sectoral). The related cost-effectiveness studies are being concluded. The MOH sees the results of this dengue research as pivotal for the elaboration of its new policy on dengue prevention. Two field studies evaluate community intervention strategies for the prevention and control of helminthiases, and clarify the relation between helminth infection and childhood atopy.
3) Applied biomedical research: We developed serological and molecular tools for the diagnosis of New World Leishmaniasis. After the collection of patient samples, we ensured the successful transfer of the necessary technology. Training was organized in production and execution of DAT and in molecular epidemiology.

Bolivia: Universidad Mayor de San Simon (UMSS)

The Universidad Mayor de San Simon (UMSS) in Cochabamba and ITM have developed a joint Postgraduate Diploma Course in Tropical Medicine and Disease control. ITM continues providing scientific and didactic support to the academic staff of UMSS and contributes to assuring the quality and relevance of the programme. The course is successful: participants of various countries in the region enrol, the students are satisfied and alumni occupy high positions. It has become an acknowledged model for post-graduate education at the UMSS and some of its modules are being integrated in pre-graduate teaching at the Faculty of Medicine.
At the same time the ITM collaborates with the UMSS on developing this Postgraduate Course into a Master programme.

Ecuador: PUCE (Pontificia Universidad Católica del Ecuador)

The institutional collaboration between the ITM Department of Public Health and the Catholic University of Ecuador (PUCE), begun in August 1998, seeks to develop health care systems emphasizing the public interest and the right to health care in a neo-liberal political context. The strategy consists of creating a public health institute (IPH) with teaching, research and service delivery functions. Teaching focuses on a two-year MPH program relying on problem-based learning and concepts from the ITM Master of Public Health. Research and service delivery functions always relate to the teaching activities: testing of theoretic models in practical circumstances and integration of "lessons learned" in the IPH courses.
The organization and structure of the MPH course was revised. The final new design was completed mid 2005 and presented to the PUCE authorities and to CONESUP (Higher Education National (regulatory) Committee) for approval. Changes include a new sequence of the teaching modules, and the acquisition of a MPH degree with mentions (HS Research and Hospital Management). These changes were finally approved in September 2006 and the 7th cohort began classes on October. Students can now get the "specialty in public health" at the end of his first year. In March the new IPH Director Dr. Edison Aguilar, decided to reform the IPH as a new Academic Unit with more autonomy and its own budget.
A tight collaboration relationship with Public Health Faculty of "Universidad de Antioquia", Colombia was established. This could include students' and teachers' interchanges. In a joint effort with the BTC "Salud de Altura" project in Quito, IPH developed an international meeting on Health insurance policies.

Ecuador: International Centre for Zoonosis

We have supported the establishment of the International Centre of Zoonosis (CIZ) at the Central University of Ecuador since 1998, and maintain a close collaboration on major zoonoses in the region. The research concentrated on epidemiological surveys and control studies on cysticercosis and brucellosis. We demonstrated high exposure of the population to *T. solium* cysticercosis in Loja province. Preliminary results indicated that between 13 to 17% of the cases of epilepsy occurring in this area are caused by neurocysticercosis.
Mapping of bovine brucellosis in Ecuador continued by means of several transversal surveys, augmented by ad hoc serum collections. As expected, considerable variation was observed, confirming the need for zoning of the country in order to use available optimal control options. The impossibility to distinguish vaccinated from naturally infected animals still hampers the interpretation of test results. A serum bank has now been established. Retesting of samples at VAR was used to ensure the quality control of the diagnostic capacity of the laboratory and a high concordance wasobserved between the local results and the confirmatory testts.

Vietnam (Cambodia, Laos): National Institutes of Malariology, Parasitology and Entomology (NIMPE)

This institutional collaboration aims at strengthening the scientific capacity of NIMPE and sister institutions in SE Asia, involved in the control of malaria and other parasitic diseases. Specific joint research projects address constraints in the control of malaria and helminthic diseases. One main problem for further reducing malaria in SE Asia is developing an appropriate strategy against forest malaria. The vector is an early biting mosquito that stays outside the houses so that classic prevention methods (impregnated bed nets, indoor spraying) have little or no impact. Evaluation of the effectiveness of long lasting insecticidal hammocks (LLIH) is ongoing in 20 forest communities in Vietnam. Socio-economic and entomological surveys started in 2004, an ancillary anthropological study in 2005. Preliminary analysis of the intervention study shows encouraging results with malaria incidence and prevalence reducing faster in the intervention clusters. The impact of insecticide-treated hammock nets on the biting behaviour of malaria vectors was assessed in two forest villages by NCMC (Cambodia). First results suggest a reduction of bites of *An. minimus* but not of *An. dirus*. A new study was started in Cambodia to explore the epidemiology of forest malaria in 12 villages (3 provinces).
Another regional project aims at monitoring insecticide resistance in vectors and the mapping of mosquitoes in relation to the environment. Partners of 4 Asian countries (Cambodia, Laos, Thailand and Vietnam) created a network under the impulse of this institutional strengthening programme and meet each year. More than 110 sites have been prospected. Achievements of this

regional network MALVECASIA (supported by EC INCO and the present agreement), involved in the monitoring of insecticide resistance and mapping malaria vectors, was presented in a final meeting in Sihanoukville. The Asian partners formulated recommendations to their Ministries of Health and defined further research priorities. Monitoring insecticide resistance is now integrated in the national malaria control programmes.
A community based survey on cysticercosis in Bac Giang province (Vietnam) was completed and a new case-control study to analyze the relation between cysticercosis and epilepsy is foreseen in 2007.

Cambodia: Sihanouk Hospital Centre of HOPE (SHCH)

The Sihanouk Hospital Centre of HOPE (SHCH) in Phnom Penh is a privately funded NGO-hospital that combines high accessibility with quality care, and provides post-graduate training to Cambodian health professionals. It plays a national role as a referral and training hospital for HIV/AIDS. The ITM is coaching the infectious diseases and AIDS department in the SHCH to reinforce the diagnostic, clinical and research capacity. 1,647 HIV patients were in active follow-up, of which 1,115 on ART. 13 doctors from other public hospitals and NGOs were trained in HIV medicine. Additional investments were made in the capacity of the laboratory to perform microbiological techniques and viral load testing. New TB diagnosis techniques were started: fluorescence microscopy and mycobacterial cultures. The electronic database, established in 2003, was monitored in 2006 with an excellent match between the patient's file and the database. Doctors of the Infectious diseases unit monitor the national Aids programmes and train the medical staff. The SHCH and ITM have also been instrumental in successful bids for funding by the Global Fund to fight Aids, Malaria and Tuberculosis. A working group on research meets on a regular basis. In 2006 the hospital staff presented 4 abstracts at international conferences. Three research protocols funded by the EC (EUROPE AID) and ITM/DGCD were implemented. Three more protocols on TB/HIV co-infection were developed and submitted to the WHO- TDR's Capacity Strengthening Programme for funding.

Cambodia: National Centre for HIV/AIDS Dermatology and STDs (NCHADS)

This collaboration, a follow-up of a previous EU-supported implementation programme, consists of technical assistance to NCHADS in matters of STD control, programme management, capacity building and procurement. One focus is on the organization of monthly meetings of the Technical Working Group (TWG) on STI management. Representatives from the government and partner organizations involved in STI services meet to discuss technical issues and make recommendations to the Ministry of Health. Technical support is also given to the Research unit of NCHADS. A study was finalized on the prevalence and risk factors of HSV-2 infection in female commercial sex workers in Sihanoukville.

PROMOTERS & SUPPORT

DR Congo: Institut Nationale de Recherche Biomédicale (INRB)
INRB promoter: J.-J. Muyembe Tamfum
INRB collaborators: A. Kibadi, A. Lukuka, P. Lutumba, D. Mumba
Other institutions: J. Sumbu (LABOVET); V. Kande (PNLTHA)
ITM promoter: M. Boelaert
ITM collaborators: P. Büscher, U d'Alessandro, R. De Deken, K. Polman, F. Portaels, J. Robays

DR Congo: Laboratoire Nationale de Référence pour le SIDA (LNRS)
LNRS Promoters: J. Muwonga (LNRS), A. Okenge (PNLS)
LNRS Collaborators: H. Engele (LNRS)
ITM Promoter: K. Fransen
IMT Collaborators: L. Kestens, L. Boel

Rwanda: Clinical Research Centre, Centre Hospitalier Universitaire de Kigali
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CHU Collaborators: J. Mugabekazi, J. Vyankandondera.
Support: DGDC
ITM Promoter: J. Van den Ende
ITM Collaborators: J. Clerinx, L Lynen, L. Kestens, L. Boel, M. Van Esbroeck, T. Vervoort.

Children in Iquitos, Peru.

Burundi: Programme de Lutte contre les Maladies Transmissibles et Carentielles (LMTC)
LMTC promoter: D. Baza, J. Karenzo (LMTC), N. Protopopoff
LMTC collaborators: P. Maes, M. Van Herp (MSF- Brussels)
Support: ITM-DGDC Agreement
ITM promoter: M. Coosemans
ITM collaborators: W. Van Bortel, N. Protopopoff, U. d'Alessandro

Zambia: Tropical Disease Research Centre of Ndola (TDRC)
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ITM promoter: U. D'Alessandro
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ITM promoter: U. D'Alessandro
ITM collaborators: M. Coosemans, J.C. Dujardin, C. Van Overmeir

Kenya: Nyanza health services, KEMRI and NGOs
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ITM promoter: A. Buvé
ITM collaborators: H. Vandenhoudt, E. Blommaert

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CHU Collaborators: T. Dieye, M. Camara, A. Diallo, P. A. Diaw, M. Diop, S. Sow, D. Faye.
ITM Promoter: L. Kestens
ITM Collaborators: P. Ondoa, W. Jennes, K. Polman, K. Vereecken, C. Vereecken

Ivory Coast: Institut National de Santé Publique / ASAPSU
ASAPSU promoter: P. Agbré
ASAPSU collaborators: G. Mah-Bi, S. Yayo, A. Langui, S. Elloh, C. Zouzoua, M. Dodo
ITM promotor: M. Laga
ITM collaborators: A. Buvé, T. Delvaux

Burkina Faso: Centre Muraz, Bobo-Dioulasso
CM promoter: N. Meda
CM collaborators: S. Drissa, H. Tinto, R. Guigemdé
ITM promoter: P. Kolsteren, V. De Brouwere, U. D'Alessandro
ITM collaborators: D. Roberfroid, S. Gies

Benin: Reference Laboratory for Mycobacterial Diseases
RLMD promoter: S. Anagonou
RLMD collaborators: M. Gninafon, B. Tanimomo, F. Kassa, J. Aguiar
ITM promoter: F. Portaels
ITM collaborators: M. Debacker, C. Johnson, D. Affolabi, G. Sopoh

South-Africa: Department of Veterinary Tropical Diseases (DVTD) of the University of Pretoria
DVTD promoter: J.A.W. Coetzer
External collaborators: J.A.W. Coetzer, B. Gummow, J. Van Wyk (DVTD), M. Mulumba (Centre for Ticks and Tick-borne Diseases, CTTBD, Malawi)
ITM promoter: P. Dorny, P. Van den Bossche
ITM-collaborators: D. Berkvens, D. Geysen, N. Praet, M. Madder, P. Van den Bossche, T. Marcotty

Malawi: OAU/IBAR Centre for Ticks and Tick-borne diseases (CTTBD), Lilongwe
CTTBD promoter: Misheck Mulumba
CTTTB collaborators: University of Zambia
Collaborators: G. Chaka, S. Tempia, M. Ouagal
ITM promoter: D. Berkvens
ITM collaborators: T. Marcotty

Peru: Instituto de Medicina Tropical "Alexander von Humboldt", Universidad Peruana Cayetano Heredia, Lima
IMT AvH promoter: E. Gotuzzo
IMT AvH collaborators: J. Arevalo, D. Gamboa, B. Bustamante, H. Guerra, P. Ventosilla, I. Best, and colleagues
ITM coordinator: J.C. Dujardin
ITM collaborators: T. Verdonck, D. Swinne, L. Lynen, U. D'Alessandro, K. Polman, F. Portaels, L. Rigouts, G. Vanham, P. Van der Stuyft

Cuba: Institutional Collaboration between ITM Antwerp and Instituto Nacional de Higiene, Epidemiología y Microbiología and Instituto Pedro Kouri
IPK-INHEM-promoters: G. Kourí and M. Bonet Gorbea)
IPK-collaborators: M.E. Toledo, D. Perez Chacon, A. Baly, A. Reyes Jimenez, M. Peralta Perez, J. Fraga, L. Rojas Rivero, F. Nunez Fernandez, A. Ruiz Espinosa, L. Pelayo Duran, R. Cordovi Prado, I. Atencio Millan
INHEM-collaborators: A. Rodriguez Salvá, A.G. Alvarez Pérez, A. García Fariñas, R. Junco Diaz, AM Collado Madurga, L. Menocal Heredia, K. Alfonso Sague, A. Escobedo
ITM promoter: P. Van der Stuyft
ITM collaborators: M. Boelaert, P. De Vos, V. Vanlerberghe, F. Matthys, P. Lefèvre, J.-C. Dujardin, K. Polman, M. Wördemann

Bolivia: UMSS
UMSS promoters: F. Torrico
UMSS collaborators: 26 UMSS academic staff
ITM Promoter: P. Van der Stuyft
ITM Collaborators: M. Pirard, J. Van der Vennet, G. Van Heusden

Ecuador: PUCE

PUCE promoter: E. Aguilar
PUCE collaborators: J. Palacios, K. Pesse, E. Rojas, R. Goyes, I. Debrouwere, J. Sola and A. Rojas
Collaborators: BTC/CTB, APS project; Instituto Ecuatoriano de Seguridad Social; Ministerio de Salud Pública del Ecuador; Municipio de Quito; PAHO; SOLCA; Universidad Central de Quito; FLACSO sede Ecuador; Universidad Autónoma de Barcelona; Universidad del Noreste (Argentina); Escuela Politécnica del Litoral; Universidad de Antioquia, Colombia, NGOs and hospitals.
ITM promoter: J.-P. Unger
ITM collaborators: G. Van Heusden, J. Van der Vennet, P. Daveloose, M. Van Dormael, P. De Paepe, W. Soors

Ecuador: International Centre for Zoonosis

ICZ promoter: W. Benitéz-Ortíz
ICZ collaborators: M. Chavéz-Larea, M. Barionuevo-Samaniego, M. Celi-Erazo, J. Ron-Roman, F. Proano,R. Rodríguez-Hidalgo, Rommel Lenin.
ITM promotor: D. Berkvens
ITM collaborators: P. Dorny, N. Praet, D. Geysen, F. Portaels, L. Rigouts

Vietnam (Cambodia, Laos): National Institute of Malariology, Parasitology and Entomology (NIMPE)

NIMPE promoter: L. K. Thuan
NIMPE collaborators: H. D. Trung, L.X. Hung, N.D. Thang, N.X. Xa, T. T. Tinh, D. Thach, T. Sochanta, K. Keokenchan.
Regional collaborators (Cambodja, Laos): D. Socheat, S. Phompida, V. Baimai.
ITM promoter: M. Coosemans
ITM collaborators: W. Van Bortel, K. Verhaeghen (UA), U. D'Alessandro, A. Erhart, P.Büscher, F.Claes, P. Dorny

Cambodia: Sihanouk Centre of HOPE

SCHC promoter: T. Sopheak
SCHC collaborators: G. Jacques, C. Haener, G. Lucas, S. An, S. Teav, C. Chandarith
ITM promoter: L. Lynen
ITM collaborators: D. Sculier, O. Koole, J. Jacobs, L. Rigouts, A. Feyens, R. Colebunders

Cambodia: NCHADS

NCHADS promoter: M. Chhi Vun
NCHADS collaborators: E. Huot, central and provincial staff of NCHADS
ITM promoter: A. Buvé
ITM collaborators: F. Crabbé, T. Delvaux

DGDC-SUPPORTED POLICY SUPPORT STUDIES (PSS)

Health Care for All (HCA)

The "Health Care for All" Conference and Declaration (Antwerp, October 2001 - www.itg.be/hca) emphasized the need for strong health systems to achieve the Health Millennium Goals - four years before this message was picked up by the World Health Organization. The conference also highlighted the factors that hold back equitable access and adequate quality of health care in large parts of the world. Shortage of funds and personnel are compound by poor management and deficient aid policies. In the wake of the conference (2003-2007), the ITM set up a world-wide collaborative "Health Care for All" research project to deal with these issues along four interlinked lines: access, quality, human resources and integration of health care and disease control.
The access line focused on sustainable solutions for financial barriers. We study innovative financial systems, mainly community-based Mutual Health Organizations (MHI) in Benin, Mali, Mauritania, Tanzania, Uganda, Cambodia, India and Ecuador, and Health Equity Funds (EF) as a safety net for the poorest in Cambodia and Mauritania. The knowledge is shared and promoted through various networks, workshops and publications.
Quality of care is studied in various aspects, to start with the impact of MHI and EF and of standardized procedures. Quality requires first and foremost competent and dedicated health workers capable to make contextualized decisions, a subject addressed e.g. in clinical audits in Morocco, and among rural first line community doctors in Mali. This research lines further examine attraction and retention of qualified staff in rural areas (Mali), decision-making in human resource management in strongly bureaucratized systems (Morocco), high commitment management practices (Ghana and Uganda), community perception of access to and quality of care and determinants of health seeking behaviour (Mali).
Finally the HCA project analyzes how international policies affect the integration of disease control programmes in health care services. It unearthed, among others, shortcomings of policies relying on public services for disease control programmes and on for-profit services for health care delivery. It developed concepts of "publicly oriented" (not necessarily governmental) as opposed to "for profit" (not necessarily private) services, and proposes orientations for promoting the former such as community co-management and family or community medicine.

Market in Phnom Penh, Cambodia.

HIV Care and Prevention of Mother-to-Child transmission in developing countries

In this project we document the effect of prevention of Mother-to-Child HIV Transmission (PMTCT) on the quality of maternity care services. In 2002-2003, a baseline survey was conducted in five health facilities in San Pedro and Abidjan, Ivory Coast, in collaboration with the Institut National de Santé Publique, Abidjan (INSP) and the London School of Hygiene and Tropical Medicine. In 2004, PMTCT services were implemented in the same five facilities by the national PMTCT programme. The "after" study was carried out in the same facilities from August to October 2005. Data were collected and entered by the team at INSP. Analysis and write-up of results went on in 2006.
In Rwanda, a study on access to and utilization of prevention of mother-to-child transmission of HIV was conducted in 12 nationally representative PMTCT sites from March to May 2006, in collaboration with the Treatment and Research Aids Centre (TRAC) in Rwanda and Columbia University (USA). 162 HIV-negative women and 246 HIV-positive women completed close-ended interviews about antenatal and delivery care, HIV testing, family planning knowledge and practices. HIV-positive women were also asked about their experience with PMTCT prophylaxis and infant feeding. In-depth interviews were conducted with 26 HIV-positive women and 11 of their partners at two sites.
(http://www.columbia-icap.org/)
This PSS allowed to gain and divulge considerable experience in the evaluation of PMTCT programmes. Other projects, in particular among sex workers in Abidjan and Cambodia, and on youth interventions in Kenya, also deal with evaluation issues.
We also explored how health care services can meet sexual and reproductive needs of women and men living with HIV. A background paper on "Reproductive choices for women and men living with HIV - Policy and programmatic guidance: Contraception, abortion and fertility " was written for a WHO co-sponsored "Global consultation on the rights of people living with HIV to Sexual and Reproductive health". in Addis Ababa (March 2006).

International Health Policies

We continued the two collaborative country studies in Mozambique and DR Congo on introduction of Global Health Initiatives and their impact on national decision making and donor coordination in health systems development.
We also undertook two missions to Malawi and Uganda to document task shifting practises in several ART delivery sites. Task shifting to non-specialist doctors or nurses, supported by nursing assistants or people living with AIDS (PLHAs), is one of the strategies proposed to cope with shortages in human resources. We continue to assist the DGDC in various meetings of the Global Fund, WHO, GAVI and other global programmes, and provide DGDC partners with scientific publications, reports or support in preparation of policy meetings.
As one of the centennial meetings, we organized an international expert workshop on 'Global Health Initiatives: a country perspective'. A final project report can be expected in 2007.
In the field of neglected diseases, we have further reflected on the trend towards verticalisation of disease control and its impact on health systems. We participated in diverse research policy groups in the field of neglected disease research, such as the TDR steering committee on Implementation Research, the Scientific Advisory Committee of the Drugs for Neglected Diseases Initiative (DNDi), and the EU International conference on Neglected Diseases in November 2006.

Be-cause Health: Belgian platform for International Health Development

In 2004, the ITM initiated the Belgian Platform for International Health, later called "Be-cause health". Its main objective is to strengthen the role and effectiveness of Belgian stakeholders in the access to quality health care worldwide, through policy dialogue, co-ordination of efforts, exchange of information, knowledge and experiences and enhanced interaction with South-partners. The platform unites almost all relevant public, non-governmental and academic organizations in Belgium as well as committed individuals. An active steering committee takes care of planning and management; the ITM provides secretarial support. The common charter is the "Health CARE for All" declaration of 2001 (www.itg.be/hca).
In 2006 the platform was further consolidated. The steering committee is composed of 9 members, representative for the main public and private constituencies of the platform. The mailing list contains 170 persons, attached to about 45 organizations and stakeholders. The website, launched in May 2005
(www.be-causehealth.be), has attracted roughly 50.000 visitors, and by the end of 2006 about 200 web visitors were recorded daily.
The platform has formulated several policy recommendations to the Ministries of Development Cooperation and of Health, particularly on topics dealt with by 2006 World Health Assembly and by several fora of the European Commission, such as on human resources for health, HIV/AIDS, export of medicines and health research.
The second Be-cause health seminar on 20th December 2006 focused on Sector wide approach (SWAP). In the past few years, considerable efforts have been made at an international level to

better coordinate and harmonize development cooperation and to avoid its fragmentation. This message is at the core of the Paris Declaration on alignment, harmonization and ownership in international aid, ratified by a large majority of bilateral and multilateral development actors. New tools were developed, such as the PRSP (Poverty Reduction Strategy Paper) and budget support. SWAP - Sector Wide Approach - is a process that aims at making these new tendencies workable in the health sector by offering more systemic support. At the request of the Belgian Development Cooperation, a group of Belgian universities have made an in-depth study of sector-wide approaches in health. The intermediary conclusions were presented at the seminar, which sought to raise awareness amongst Belgian stakeholders for this new sectoral approach. 180 participants, half of them Masters Students from the South in Belgium, attended the seminar.

Be-cause health co-organized a seminar on *'Competency-building approach and integration of vertical programs in health education*', on 25th and 26th September, in collaboration with Nesi and Are@santé. It contributed to the conception and promotion of a brochure on the Millennium Development Goals in health.

Two working groups, respectively on 'Human Resources for health' and on 'Access to drugs of good quality', concentrated on exchange of information, policy advice and coherence of internal policies.

In October DGDC invited Be-cause health to participate in the review of its strategic policy document on health, which set out one of our major tasks for 2007.

A weak point of Belgian development policies is the poor coordination of its bilateral and non-governmental stakeholders in the field. Be-cause health participated actively in a workshop in Burundi on collaboration of Burundian and Belgian NGOs in 4 priority areas, including health, that was organised by 11 11 11, the Belgian NGO federation. The Institute of Tropical Medicine was also involved in several other networking initiatives linked to global health issues:

- the platform on population and development organised a seminar on 'migration and development'. The recommendations have inspired the Belgian viewpoint at the annual meeting of the UN Commission on Population and Development. The platform has also contributed to the preparation of the DGCD policy paper on Reproductive and Sexual Health and Rights;
- the multisectoral working group on HIV/AIDS organised a seminar on HIV/AIDS and disability;
- the platform on community health insurance (Masmut) held its kick-off meeting and set up its website;
- the Belgian platform on tropical animal health and production (Be-troplive) was officially established and started of with a conference on 16th November (see below).

These initiatives encompass non-health sectors (such as demography and social economy). ITM keeps an overview in order to promote coherence and synergy between the various initiatives.

Be-troplive: Belgian platform on tropical animal health and production

The objectives of Be-troplive are to create a network allowing exchange of information on ongoing research, training and development projects, to stimulate synergy in the field, to increase the national, European and international visibility of the Belgian expertise and to improve the coherence of the Belgian co-operation in the field of tropical animal health and production. It should also improve the relations with the agricultural and the medical sector to enhance the efficacy of animal health and production activities.

The initiative started in 2006 with funding under the DGDC-ITM framework agreement. A website (www.be-troplive.be) was launched mid-2006. An online form allows candidates to register as a member. There are now 76 members and 21 member's associations, among which universities, research institutes, NGOs, …. A mailing list of 322 addresses is available, including those of 190 experts, 19 private companies and 113 decision-makers (staff of EU, headquarters BTC, DGDC …).

Almost 120 experts attended on 16th November the symposium "Strengthening the livestock services in the tropics", which was hosted by ITM in the new location of the international Rochus campus.

PROMOTERS & SUPPORT

Health Care for All (HCA)

ITM promoter: M. Van Dormael

ITM collaborators: B. Criel, G. Kegels, V. De Brouwere, J.-P. Unger, M. Van Dormael, M.P. Waelkens, B. Meessen, M. Noirhomme, B. Marchal, P. Blaise, S. Dugas, A. Cavalli, W. Soors, P. De Paepe

HIV Care and Prevention of Mother-to-Child Transmission in developing countries

ITM promoter: A. Buvé, M. Laga

ITM collaborators: T. Delvaux, J. Vandepitte, W. Van Damme, R. Colebunders, L. Lynen, B. Meessen, L. Kestens, G. Vanham, K. Fransen

International Health Policies

ITM promoters: W. Van Damme, M. Boelaert.

ITM collaborators: G. Laleman, P. Van der Stuyft, D. Van der Roost

Be-cause Health: Belgian platform for International Health Development

ITM promoter: D. Van der Roost

ITM collaborators: M. Van Dormael, B. Criel, M. Laga, T. Delvaux, M-P. Waelkens and others

Be-troplive: Belgian platform on tropical animal health and production

ITM promoter: E. Thys

ITM collaborators: P. Dorny, S. Geerts and others

Management

SUPPORT SERVICES

In 2006 the Support Services faced three main challenges: the implementation of the integrated data processing system (IVAN, short for innovative administrative network), the renovation and move to the Capuchin convent (Campus Rochus) and the celebrations of the ITM centenary.

The "Ivan" project had teething problems as a result of integration conflicts between the project and financial software modules. In spite of extensive preparation efforts, the central and departmental administrators had to take a leap in the dark when finally implementing the package. However, by now all Support Services work online with interactive software integrating stock list, invoices, orders and budget, which is no less than a revolutionary progress.

Renovating, equipping and finally occupying the former convent (Campus Rochus) required a carefully balanced response to the needs and wishes of the future users. Despite the many complications which inevitably arise in such a project, we were able to move all students and staff by the end of September 2006. The interior decoration and technical finishing touches were carried out in a record time, and the start of the Master courses as well as the official opening of the Campus went ahead as planned, thanks to huge efforts and perfect coordination by our Technical Services.

Renovation of the convent

The ITM's centennial demanded a lot of extra work from the management and support services, especially the Graphics Service and the organization team, craftfully coordinated by Andrea Zavala. Read more about the centennial activities elsewhere in this report.

Each support unit produced an action plan 2006-2010 in an effort to reach full quality assurance and to evaluate the achievements over the period 2001-2005. The new policy goals were presented to all staff members during an extremely successful and pleasant "day for the support services units" on 23 June 2006.

A day out for the support services

ADMINISTRATIVE SUPPORT

The Purchasing Service handled 4.386 order forms, 794 of which originated from the technical services. They arranged 1.285 urgent deliveries, 27 export shipments, 52 deliveries of dangerous goods and 115 air shipments. This represents a threefold increase of their activities over 10 years. Additionally, they made 431 travel bookings and processed the related visa requirements. The General Accounts Service processed 8,884 invoices and claims and 1,810 foreign payments requests. The Medical Accounts Service handled 2,819 supply invoices, 57,305 patient invoices, 40.,889 client invoices and 41,879 invoices for mutual insurance companies. The Personnel Service managed the salary administration of 361 staff members and coordinated the recruitment of 48 new employees. They implemented a new version of the software for the salary administration.
The External Funds Service changed its name last year into the "Service for Project Management", which better cover the activities. They ensure the administrative and financial follow-up of ITM's 200 projects, next to the small consultancies and clinical trial contracts. 34 new projects started in 2006.

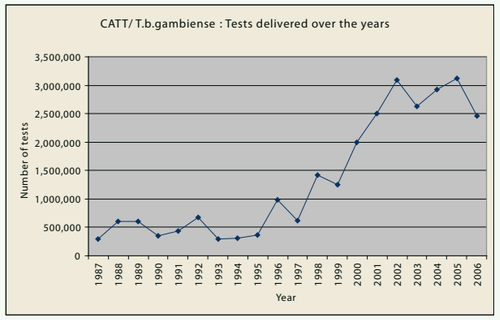
ACADEMIC SUPPORT

As in previous years, the Graphics unit was responsible for the layout and printing of most of the ITM's publications, including this annual report. In 2006 they designed the logo, banners and other promotional material for our centennial celebrations.

The Applied Technology and Production Unit provides the necessary support to the research departments and the Clinical Laboratory within the Institute. The institutional cryobank contains 49,237 vials of which 3,325 vials newly added in 2006. The Unit also produces culture media and after an increase of 36% in 2005, the preparation of culture media stabilized in 2006 at 105,822 item. The number of items being decontaminated decreased further by another 6%, but the number of items handled increased (filling 17%, washing 5%, drying 3%). The overall workload remained thus the same.

On the other hand, the unit manufactures non-commercial diagnostic kits for neglected diseases, such as trypanosomiasis and visceral leishmaniasis. The kits are supplied at non-profit cost to external organizations, NGOs and control programmes in endemic countries.
The main activity is the production of the CATT / *T.b. gambiense* test with 2,484,115 tests produced in 2006 and 2,454,330 supplied (see **table 1**). Other production lines are CATT/ *T. evansi* (16,750 tests supplied), LATEX/*T.evansi* (0), LATEX/ *T.b.gambiense* (750), LATEX/IgM (11,750), DAT/Leishmania (45,700 mainly for the EC program KALANET), KIVI-Tryps (120).

Table 1



The activities of the Library and the Student Services are described elsewhere in this report (in chapter on Education).

TECHNICAL SUPPORT

The Technical Services finalized the conversion of the convent and the move and equipment of classes and offices to the new campus. They carried out the technical maintenance of the L3/L2 laboratory and other infrastructure, and started rearranging and refurbishing the vacated parts of the main building.

The activities of the IT unit continue to increase exponentially. It was reinforced in the fields of database management by Vera Van Boxel and in e-learning by Inge De Waard. Next to their efforts for the administrative network "IVAN", the unit registered 13.000 support calls, assisted with the installation of 225 new machines (camera's, portable PC's, printers, projectors and wireless Lan) and maintained 918 tools. The ITM network registered 3.171.413 incoming and 447.375 outgoing mails; 69% of incoming mail was SPAM which was to a very large part filtered before reaching the users, and 1% contained a virus, all of which were successfully fended off

The Health and Safety Unit upheld and extended the fire regulations, access control and signposting in the new Campus. They acquired a new peroxide-based decontamination machine (on a peroxide basis) for the L3 laboratories and new types of disinfectant for the endoscopic tools in the medical services.
They carried out legally required controls of 4 elevators, 2 high tension and 2 low tensioncabins, 3 autoclaves and numerous other machines.

The move to the Rochus Campus.

The Quality Assurance Unit coordinated another major audit by BELAC (Belgian Accreditation Organisation) in June 2006. They were rewarded with a very positive audit report and an extension of the accredited activities to the STD Reference Laboratory.
The accreditation of 'Genotyping of Plasmodium falciparum by the PCR' in the Department of Parasitology and 'The Evaluation of Test Kits according to WHO protocol' in Virology, further steps were made towards the integration of the research laboratories in the formal and certified quality system. In that respect, the new policy plan 2006-2010 lays the basis for further accreditations and certifications according to ISO 17025.2005 and ISO 15189:2003. Our quality system, manuals and procedures were adapted to these formats.
The quality manual was divided in a general and a laboratory-specific part. All laboratory equipment (research and routine) is now centrally calibrated and validated. The WEBISO software was made more efficient and user-friendly.

The IT unit.

HUMAN RESOURCES

On 31 December 2006 the ITM employed 361 people or 321.7 full-time equivalents (FTE), compared to respectively 349 and 313.1 in 2005. The following data and graphs are based on this cross-section.
As stated in the Management Agreement with the Flemish Government, the ITM applies the same salary scales, recruitment procedures and working conditions as the Flemish universities. Its personnel structure and policies are therefore very similar. The personnel categories are:
Senior scientific staff: academic, scientific and medical personnel with an indeterminate contract
Temporary (assisting) scientific staff: academic personnel, scientific and medical personnel with a temporary contract
Support staff: administrative and technical staff
The staff regulations, approved by the Board of Governors in October 2004, establish the recruitment, vacancies, grading, promotion and salary scales as well as professional career breaks (sabbaticals). They are an essential cornerstone of the ITM's integrated quality system.

Figure 1 gives an overview of staff numbers (in full-time equivalents) over 1996, 2001 and 2006 divided over the three funding types and the three staff categories. Over this period, staff numbers rose by 44% i.e. from 224 to 322 full-time equivalents.
The strongest increase, 52%, is found in the temporary scientific staff. 57% of this group is paid from external research funding or the DGDC. The graph does not include the 63 PhD students who carry out their research at the ITM with a fellowship.
The graphs also show a total increase by 42% in the number of administrative and technical staff (ATP). This increase reflects the growing needs of patient care, quality assurance and policy support.
Of all support staff, 50% is now funded through institutional resources, 35% by external funds and 15% by the medical service, as compared to respectively 47%, 41% and 12% in 1996.

Figure 2 shows that 82% of the ITM's staff have a higher education diploma, of which 44% from universities and 38% from other graduate schools. The ITM stimulates continued education for all staff though internal seminars, training sessions, external and internal courses.

Figure 2: Education level

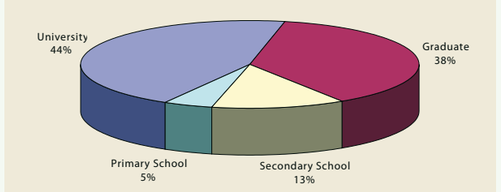


Figure 1: Overview of Personnel: number of staff (FTE) according to funding source in 1996, 2001 and 2006

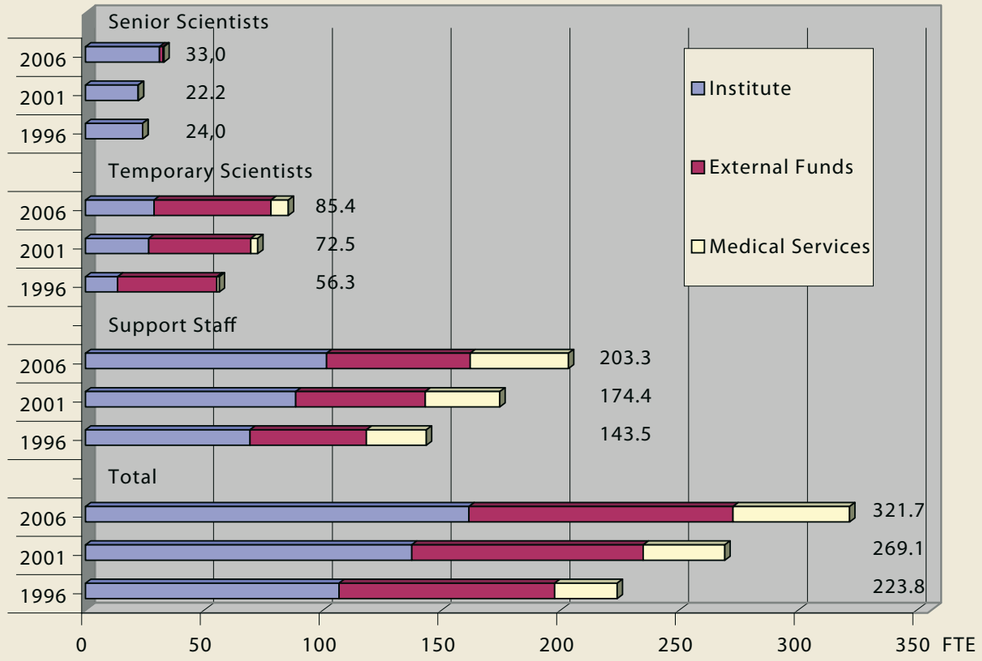


Figure 3 shows the distribution of temporary and permanent employment contracts. Although most staff members have been with the ITM for many years, only 52% have a permanent contract. The mandates of the assisting academic staff are restricted in time by definition and many others are linked to temporary external project funding The employment conditions of temporary staff are similar to those of permanent staff.

Figure 4 indicates that women represent 56% of the ITM staff. There is gender equilibrium in the temporary scientific and technical staff, but women are still clearly underrepresented at the postdoctoral level (35%) and particularly in the permanent scientific staff level (19%). This is nevertheless a vast improvement over 2001 (7%). As is the case in most orgnanizations, women are overrepresented in the administrative and maintenance units.

Figure 5 shows the age structure of our staff. 28% is older than 50, 36% is in its 40s and 24% in their 30s. Of permanent scientific staff, 74% is aged 50 or more, compared to 18% of temporary scientific staff and 25% of the support staff.

Figure 3: Permanent versus temporary contracts

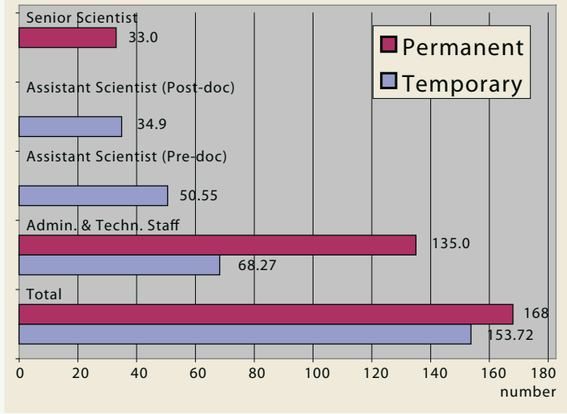


Figure 5: Age structure per category

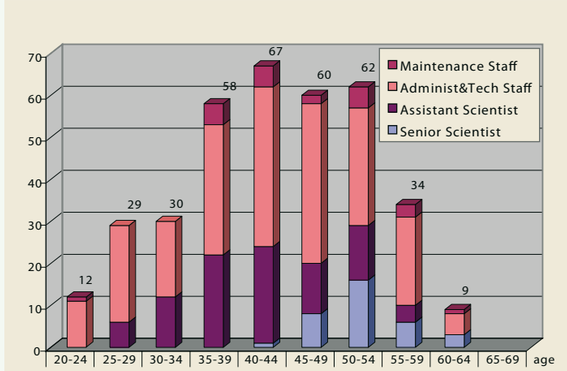
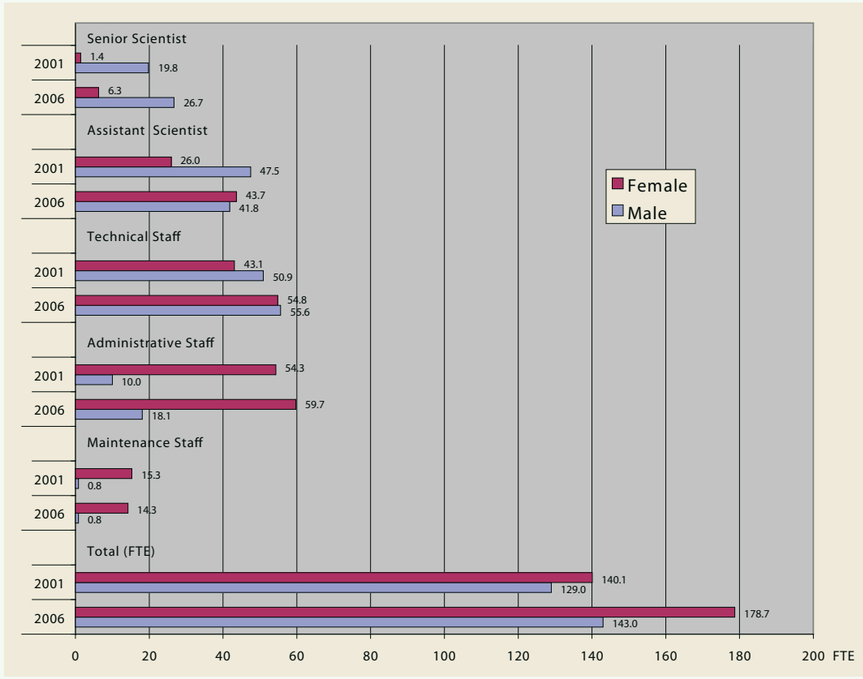


Figure 4: Gender distribution



FINANCES

As in previous years, we start this chapter with general observations and graphics, followed by a detailed financial statement of the annual accounts, the balance sheet and the auditor's rapport.
The graphs below do not include the income and expenditure under 'Trusts and legacies' and 'Investments'. A number of duplicate entries in the results (tuition fees, overhead and internal adjustments) have been neutralized.

INCOME

In 2006, the adjusted net income of the ITM totalled nearly 38 million Euro, an increase of 7% against 2005 and 135% against 1995. The peaks in 2002 and 2003 were due to the temporary AIDS Impulse Programme funded by DGDC.
The core funding by the Flemish Ministry of Education makes up 24% of the total income, tuition fees 4% and medical services 13%. External project funding and the DGDC programme account for respectively 25 and 19% of the income. Own income (overhead, social and fiscal refunds and internal invoices) makes up 15% of the income.

Figure 6: overview of income since 1995
Over the past 11 years, the core funding from the Flemish Ministry of Education nominally increased by 23%. In actual value, however, this represents a decrease by 21%. This core funding nevertheless guarantees the scientific independence of the research, education, services and international status of the ITM.
The contribution of own income, through overhead, internal invoicing, fiscal and social refunds and (since 2002) also the production of diagnostic kits, increased sevenfold to 15% since 1995.
The turnover of the Medical Services has doubled since 1995 due to the increase of the workload as well as additional subsidies for reference tasks. Nevertheless, this income remains insufficient to cover the full costs of the highly demanding reference care and diagnostics.
External project funding keeps increasing but shows a tri-annual cycle movement, mainly in the European funding programmes. It now amounts to 25% of the total income, an increase of 87% since 1995 and of 46% since 2000 The framework programme with the DGDC represents 19% of the income and 47% of the external funding.

Figure 7 and **table 8** show the evolution of DGDC since 2000 and the project funding, according to the finance source. For a large part this increase is due to the DGDC framework programme. The European research funds (secondary funding) and the European projects (tertiary and quaternary funding) make up 23% of the income and remain thus an important sponsor of the ITM's research activities. The subsidies of the National Lottery for the renovation of our laboratories and the convent are included in 'Investments' and do not appear in this list. The negative amounts in some columns represent adjustments of received advances and final accounts of projects against last year.

In 2006, the ITM started up 34 new projects. With 5 new projects from the European Commission (DG Research) ITM now 29 major EC-projects, which is 50% of all Flanders for EC-International Cooperation (INCO) initiatives.

ITM also takes part in Public-Private-Partnerships (PPP), Global Health initiatives and non-governmental organisations, among others the Medicines for Malaria Venture (MMV), the Foundation for Innovative New Diagnostics (FIND), Bill & Melinda Gates Foundation, Family Health International (FHI), the U.S. President's Emergency Plan for AIDS Relief (Pepfar), Damian Foundation, MSF, Memisa and others. The projects financed by the FWO (Belgian Fund for Scientific Research) and the World Health Organization, in particular the Special Programme for Research and Training in Tropical Diseases (TDR) are small but valued parts of our research portfolio.
Innovative contracts were signed with the Belgian Technical Cooperation for the scientific guidance of the medical projects of in Western Africa (Benin, Niger and Senegal) and DR Congo. With the federal Ministry for Science Policy we signed a contract to monitor the Bluetongue outbreak among sheep in Belgium.

Figure 6: Overview of the adjusted net income since 1995 (x 000 Euro)

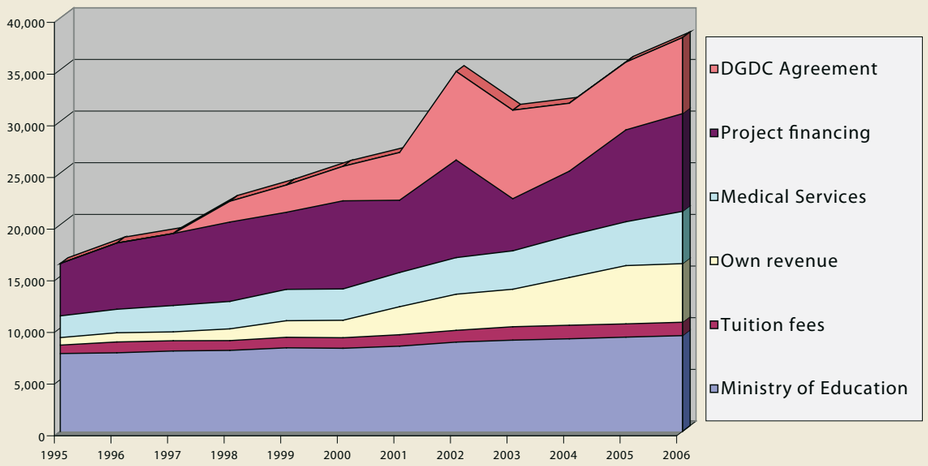


Figure 7: Overview project funding 1995-2006 (x 000 Euro)

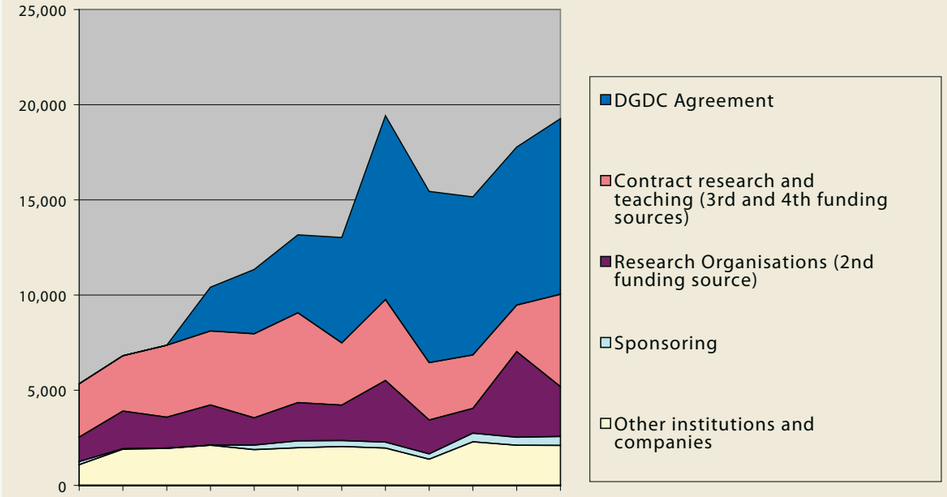


Table 8: Overview project financing (x 000 Euro)

	2000	2001	2002	2003	2004	2005	2006
Research Organisations (2nd funding source)							
Fund for Scientific Research	476	309	424	470	395	282	255
IWT	314	176	226	275	-58	0	0
Institute for Biotechnology	84	50	40	130	0	0	0
European Community - DG Research	1,140	1,329	2,543	901	967	4,216	2,362
Subtotal	**2,015**	**1,863**	**3,232**	**1,776**	**1,304**	**4,498**	**2,617**
Contract research and teaching (3rd and 4th funding sources)							
Flemish Authorities	168	178	298	254	894	758	618
Federal Authorities	1,304	807	1,810	1,734	-111	849	1,095
BTC	786	651	833	-11	-137	0	9
DGDC Agreement	4,090	5,107	5,949	7,500	8,300	8,300	9,224
DGDC Impulse programme		431	3,718	1,500	0	0	0
European Community - other DG 's	1,587	1,026	394	234	1,422	226	2,157
World Health Organization	516	206	120	81	252	135	227
Others	359	399	798	721	487	478	746
Subtotal	**8,809**	**8,804**	**13,920**	**12,012**	**11,107**	**10,746**	**14,075**
Other organisations	1,973	2,040	1,957	1,373	2,286	2,106	2,097
Sponsoring	364	317	317	286	457	426	474
TOTAL	**13,161**	**13,025**	**19,427**	**15,447**	**15,154**	**17,776**	**19,263**

EXPENDITURE

Figure 9 shows the distribution of effective expenditures which amounted to 38.3 million Euro. Transfers to partner institutes amounted to 6.0 million Euro and are not included here. The distribution expenditure remains more or less stable over the reference period 1996-2006: 68% goes to education and research, 13% to the medical services and 18% to management and support services.

Table 10 shows the details of the expenditure under the DGDC framework programme (see chapter on Development Cooperation). The strong increase in general costs and scientific support since 2003 is due to the new contract format, with a fixed fee of 25% for scientific support and 12% for general overheads. Previously, these costs were spread over the different projects. The external mid-term review explains the increase of the general costs in 2006 (see chapter Development Cooperation). Over 65% of the DGDC funds are spent on training and capacity strengthening in the South. In geographic terms, 62% is spent in Africa, 11% in Asia and 27% in South-America.

FINANCIAL RESULTS

The following pages give an overview of the total income and expenses accounts, including a number of duplicate entries for tuition. These can be divided into four sections:

- Institute (core funding, own income and tuition fees)
- Project funding and DGDC Agreement
- Medical Services
- Trusts and Legacies

The section 'Institute' shows a positive financial result of 205,343 Euro, partly due to delayed recruitments by lack of long-time perspectives. Given the dwindling core funding, expenses were carefully monitored. In the meantime the Ministry of Education has started its catch-up operation, together with the Flemish Ministry of Science (see forewords). These new funds will allow us to start realizing our policy plans.

As in previous years, 10% of the financial result will be allocated to the ITM's Fellowship Fund, another part to the investment fund for the further equipment of Rochus Campus.

In spite of the increase of the funding for the Aids reference care centre the Medical Services still show a negative result. The reduced tariffs for the clinical laboratory and the labour-intensity of the reference tasks continue to put pressure on the financial balance.

The positive result of the diagnostics production unit is, as in previous years, allocated to a reserve fund for times of lesser demand and to the improvement of diagnostics for sleeping sickness and other neglected diseases.

The section 'Project Financing and DGDC Agreement' includes duplicate entries with the section 'Institute', mainly from overhead, tuition fees and internal accounting. The balance of non-executed research credits is transferred to 2007. In 2006 the research projects had more expenditure than income, mainly due to personnel and working costs, and the booking of advances to partner institutes in 2006. The results of the section 'Trusts and legacies' were allocated to the specific objectives of the various funds (investments, awards, early retirement premiums,….).

Of the total expenditure, 47% went to salaries and other employment costs. For the section 'Institute' this percentage was 77 % (70% of income). Personnel costs increase by 7%, largely in the research funds and the medical services. This increase is partly due to recruitments (+ 8FTE) for additional assignments and partly to the annual indexation of salaries, promotions and salary raises.

The strong increase in working and investments costs mainly appears in the research projects and is a logical consequence of the renovation works on the Capuchin convent. Since a number of years, the investment subsidies of the Flemish Ministry of Education have been saved up for this purpose. The grants from the Flemish Ministry of Monuments and Landscapes and of the National Lottery were also put to use in 2005.

Large sums were transferred to our institutional partners in the South as part of in the DGDC Framework Agreement and the research projects.

Figure 9: Overview expenditures 1995-2006 (x 000 Euro)

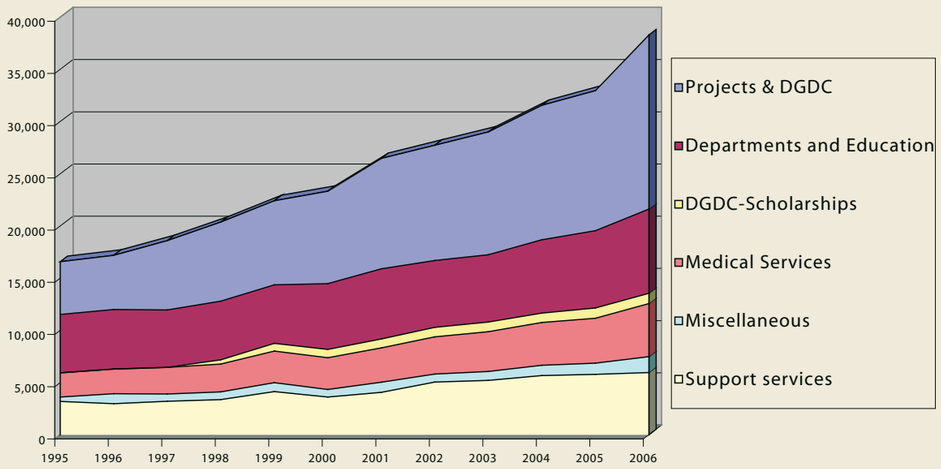


Table 10: DGDC Agreement Expenditure (x 000 Euro)

Expenses	1998	1999	2000	2001	2002	2003	2004	2005	2006
Training in Belgium	377	816	888	1,011	1,333	1,022	1,145	1,172	1,212
Fellowships	403	755	726	919	899	936	900	980	983
Local courses	87	0		100	64	0	0	0	0
Conferences	111	63	87	66	43	25	108	134	91
Institutional Cooperation	744	895	1,202	1,223	1,526	1,519	1,805	1,854	1,697
Operational Collaboration	296	358	584	893	1,025	866	1,034	1,115	1,220
Policy research	222	370	431	538	610	98	180	212	177
General support	13	97	122	133	149	2,437	2,913	2,975	3,593
Total	2,253	3,354	4,040	4,883	5,650	6,902	8,084	8,442	8,972
AIDS Impulse Programme					3,484	1,470			

Income and expenses account (in Euro)

INCOME		2006	2005
Section Institute	**subtotal**	**16,227,672**	**16,230,399**
a) Section Subsidy Flemish Government		8,732,000	8,594,000
social security reductions		530,346	521,140
mediation Fl. Government. (training cheque)		555	1,500
b) Tuition fees		1,304,241	1,288,934
c) Financial income		61,913	278,978
d) Letting		15,099	14,529
f) Overhead income		1,486,770	1,370,895
g) Other income		4,096,749	4,160,423
Project financing Section and DGDC Agreement incl. overhead and registration fees		**21,167,542**	**19,328,750**
a) Flemish Community		873,577	1,042,363
b) Federal government		1,145,472	849,362
c) European Community		4,636,633	4,521,848
d) WHO		226,525	134,735
e) Private		4,153,972	3,737,815
f) Sponsoring		817,645	729,236
g) DGDC / BTC (not included in agreement)		89,718	10,048
h) DGDC Agreement		9,224,000	8,300,000
i) DGDC Agreement (tuition fees)		0	3,343
Section Medical Services	**subtotal**	**5,057,541**	**4,233,103**
a) Turnover		3,774,660	3,273,622
b) Subsidies (UZA)		89,008	87,264
(Flemisch Government)		29,311	25,365
(RIZIV,DOSZ)		994,080	736,564
c) Miscellaneous		170,482	110,288
Section Funds and Legacies	**subtotal**	**2,246,280**	**2,011,838**
a) Funds and Legacies		9,432	61,320
e) Fund for early retirement premium		150,000	0
f) Investment fund		2,086,847	1,950,517
	TOTAL INCOME	**44,699,035**	**41,804,089**

EXPENSES			2006	2005
PERSONNEL COSTS				
Section Institute		**subtotal**	**12,085,906**	**11,448,122**
a) Senior academic staff			3,073,361	2,556,950
b) Assisting academic staff			2,454,385	2,375,535
c) Administrative and technical staff			5,684,073	5,471,757
d) Other personnel costs			790,470	930,779
e) External lecturers			83,618	113,101
Section Projects and DGDC		**subtotal**	**5,792,259**	**5,272,201**
a) Senior academic staff (Projects)			226,256	69,718
Senior academic staff (DGDC)			0	0
b) Assisting academic staff (Projects)			1,848,073	1,849,968
Assisting academic staff (DGDC)			1,973,160	1,783,574
c) Administrative and technical staff (Projects)			1,411,931	1,286,384
Administrative and technical staff (DGDC)			332,840	282,557
Section Medical Services		**subtotal**	**2,726,732**	**2,461,992**
a) Salaries and social costs			2,266,476	2,070,406
b) Fees			460,256	391,586
		TOTAL PERSONNEL COSTS	**20,604,897**	**19,182,315**
OPERATING AND EQUIPMENT COSTS				
Section Institute		**subtotal**	**3,463,074**	**3,334,950**
g) Operating costs			2,668,391	2,708,506
h) Equipment costs			530,480	391,618
i) Financial costs			264,203	234,826
Section Projects and DGDC		**subtotal**	**16,914,808**	**14,239,769**
e) Operating costs	External Funds		5,226,515	4,001,891
	DGDC (agreement + impulse programme)		3,983,714	3,654,271
f) Overhead	External Funds		649,706	583,460
	DGDC (agreement + impulse programme)		1,006,178	870,977
g) Subcontracts	External Funds		4,392,896	3,278,353
	DGDC (agreement + impulse programme)		1,655,799	1,850,817
Section Medical Services		**subtotal**	**2,349,511**	**1,848,824**
d) Operating costs			2,029,113	1,626,756
e) Depreciation			275,077	175,576
f) Depreciation of current assets			27,648	22,868
g) Provisions			9,237	19,066
h) Investment provision			-2,926	-6,108
i) Financial costs			9,165	10,198
j) Exceptional costs			2,197	468
Section Funds and Legacies		**subtotal**	**4,406,444**	**2,436,711**
a) Results from previous financial year			2,396	5,645
b) Awards			0	1,000
c) Financial costs			315	730
d) Investment costs			4,400,014	2,425,092
e) Support medical costs patients			3,718	3,718
f) Other costs			0	525
		TOTAL OPERATING AND EQUIPMENT COSTS	**27,133,837**	**21,860,253**
		TOTAL EXPENSES	**47,738,735**	**41,042,568**

RESULTS	2006	2005
a) Section Institute	205,343	871,717
Funds	473,350	575,611
b) Section Project Financing	-1,811,834	-44,367
DGDC Agreement	272,309	-138,852
c) Section Medical Services	-18,703	-77,713
d) Funds and Legacies	3,002	49,702
h) Early retirement premium	150,000	0
i) Investment Fund	-2,313,167	-474,575

BALANCE

The balance sheet below gives an overview of all assets and provisions, and of the state of the financial accounts, debits and credits.
Over the past decade, major investments were made in the ITM buildings, more particular in the Kronenburgstraat 25 (Department Animal Health), the Campus Rochus and the main building in the Nationalestraat and the new laboratories in the Rochusstraat. These costs are depreciated through the investment fund or covered by long-term loans. The technique required a revaluation of the properties in the balance sheets from 6.5 million Euro to 11.3 million Euro. In agreement with the auditors, the fire insurance capitals were taken as a reference. The main building at the Nationalestraat will be revalued next year.

This operation results in a higher 'Fixed Assets' and 'Own Funds', and a more accurate evaluation of the actual values.
Due to the major investments in Campus Rochus the 'Financial Accounts' have decreased and the 'Receivables on maximum one year' have strongly increased.
The financial indicator for 'Floating Assets', calculated as the ratio between the 'Floating Assets' (14.1 million Euro) and 'Short-term Debts' (6.5 million Euro), equals 2.2; there are thus sufficient funds to cover short-term debts.

Balance on 31 December, 2006 (in Euro)

ASSETS	2006	2005
Fixed assets	14,685,714	8,039,851
Stock of consumables	132,784	124,252
Receivables on maximum one year	1,443,136	1,660,528
Financial accounts	8,598,623	12,008,156
Transferable accounts	3,929,815	2,861,596
Floating assets	14,104,359	16,654,531
Total assets	**28,790,073**	**24,694,383**

LIABILITIES	2006	2005
Own funds	7,072,332	2,960,150
Provisions for risks and payments due	3,604,994	3,484,908
Long-term debts	3,826,078	4,074,411
Short-term debts	6,480,266	5,531,215
Transferable accounts	7,806,403	8,643,698
Total liabilities	**28,790,073**	**24,694,383**

VDPAUDIT

BEDRIJFSREVISOREN – RÉVISEURS D'ENTREPRISES

Registered auditor's report for the year ended December 31st 2006
to the Board of Directors of
the Prins Leopold Institute of Tropical Medicine

In accordance with legal and regulatory requirements, we report to you on the performance of the audit mandate which has been entrusted to us. This report includes our opinion whether the financial statements and the additional informations give a true and fair view.

Unqualified audit opinion on the financial statements

We have audited the financial statements for the year ended on the December 31st 2006, prepared in accordance with the financial reporting framework applicable in Belgium, which show a balance sheet total of EUR 28.790.073,28 and a result carried forward for the year ended of EUR – 2.002.687,02.

The preparation of the financial statements are the responsibility of the board of directors. This responsibility includes among others: the design, the implementation of and maintaining an internal control in order to achieve the entity's objectives with regard to the design and the true view of the financial reporting, which is free of material misstatement due to fraud or mistakes; the choice and use of the accounting policies; and the design of the significant estimates which are reasonable.

It is our responsibility to express an opinion on the financial statements based on our audit. Our audit of the financial statements was carried out in accordance with the legal requirements and the auditing standards applicable in Belgium, as issued by the Institute des Réviseurs d'Entreprises / Instituut der Bedrijfsrevisoren. The above mentioned auditing standards require that we plan and perform our audit to obtain reasonable assurance whether the financial statements are free of material misstatement.

In accordance with those standards, we considered the Institute's administrative and accounting organisation, as well as its internal control procedures. The Management has responded clearly to our requests for explanations and information. We have examined, on a test basis, the evidence supporting the amounts in the financial statements. We have assessed the accounting policies, the significant estimates made by the institute and the overall presentation of the financial statements. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, taking into account the legal and regulatory requirements applicable in Belgium, the financial statements for the year ended December 31st 2006 give a true and fair view of the institute's assets, liabilities, financial position and results of operations.

Vandaele, Pirenne & Co BVBA-SPRL
Avenue Louise/Louizalaan 66 B4, B-1050 Bruxelles/Brussel – T: +32/ (0)2/410 05 65 – F: +32/ (0)2/414 40 47 – www.vdpaudit.be
Ondernemingsnummer/Numéro d'entreprise 0437.435.950 – BTW/TVA BE 437.435.950 – RBV/RSC 2559
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VDPAUDIT

BEDRIJFSREVISOREN – RÉVISEURS D'ENTREPRISES

Additional certifications and information

The implementation of the law on non-profit organizations and the bylaws are the responsibility of the management of the institution.

It is our responsibility to supplement our report with the following certifications and information which do not modify our audit opinion on the financial statements :

- In accordance with art. 19 of the statutes a budget has been established for the accounting year 2007.
- Without prejudice to certain formal aspects of minor importance, the accounting records were maintained and the financial statements have been prepared in accordance with the legal and regulatory requirements applicable in Belgium.
- There are no transactions undertaken or decisions made in violation of the bylaws. The appropriation of the result proposed to the board of directors complies with the legal and statutory provisions.

May 14th, 2007

Vandaele, Pirenne & Co. Burg. BVBA
Bedrijfsrevisoren
Represented by
Jean-Pierre Vandaele
Registered Auditor

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Situation on december 31, 2006

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Representative of the Assisting Academic Staff of the ITM
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Representative of the Antwerp City Council

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Liaison officer of the Flemish Minister of Education

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Prof.Dr. E. Van Marck
University of Antwerp (UA)

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Programme Coordinators
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Nauwelaerts André
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Vice-Head
Geerts Stanny
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Berkvens Dirk
Van Den Bossche Peter
De Deken Redgi
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de Borchgrave Jean
Delespaux Vincent
Geysen Dirk
Madder Maxime
Maes Louis
Marcotty Tanguy
Praet Nicolas
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Thys Eric
Van Hul Anke
Vermeiren Lieve
Victor Bjorn
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Debois Danielle
Goemaere Noor

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Head of Department
Van den Ende Jef
Vice-Head
Vervoort Tony
Permanent scientific staff
Colebunders Robert
Jacobs Jan
Swinne Danielle
Van den Enden Erwin
Vandenbruaene Marc
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Alou Assebide
Apers Ludwig
Bastiaens Patrick
Bottieau Emmanuel
Clerinx Joannes
Collier Ilse
Cordemans Katrien
Croughs Mieke
De Roo Ann
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Deprest Arlette
Desmet Patrick
D'Hondt Agnes
El Osri Najoa
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Guetens Pieter
Guns Veronique
Hemelaer Eva
Huyskens Liesbeth
Ketels Joseph
Kinif Michèle
Konings Johan
Kouraich Ahmed
Laaziz Karima
Lamonte Cora
Lepage Bernadette
Mertens Liesbet
Mertens Wendy
Platteau Tom
Potters Idzi
Roels Roger
Roovers Miek
Sculier Delphine
Van De Velde Titania
Van den Daele Alex
Van Der Meer Annemie
Van Dingenen Martine
Van Humbeeck Veerle
Van Lent Kurt
Van Loon Kim
Van Looveren Karin
Van Rompaey Sandra
Van Wijk Veronica
Vanlouwe Hilde
Vereecken Henk
Verhaegen Nadine
Verhoeven Lieve
Vermeulen Anita
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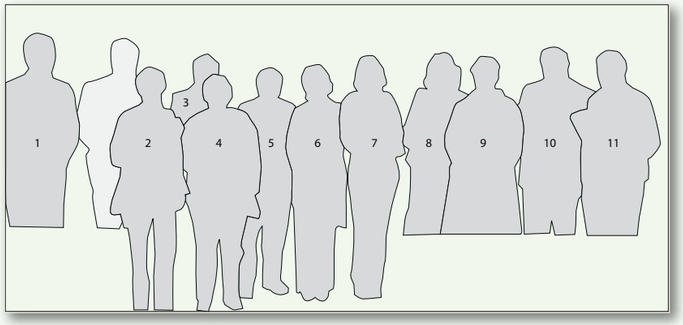

1 Dujardin Jean-Claude
2 Penne Godelieve
3 Cornelis Molly
4 Jacquet Diane
5 Van Tiggel Louis
6 Desager Sabine
7 Dillen Carina
8 Schueremans Lieve
9 Bogaert Isa
10 Vermeulen Louis
11 Schoonbaert Dirk

from left to right:
De Sadeleer Koen
Verlinden Rita
Vanbergen Fons

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