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Abbreviations

AFRO  African Regional Office, World Health Organisation
AIDS  Acquired Immunodeficiency Syndrome
AMANET  African Malaria Network Trust
ANC  Ante-natal care
Bombo  Bombo Hospital, Tanga, Tanzania
CBHC  Community based health centres
CDC  Centres for Disease Control
CoM  College of Medicine, University of Malawi
CEEMI  Centre for the Evaluation of Effective Malaria Interventions, Tanzania
CIAM  Centre for Innovation against Malaria, The Gambia
CMP  Centre for Medical Parasitology, University of Copenhagen
DANIDA  Danish Agency for Development Assistance
DBL  Danish Bilharziasis Laboratory, Copenhagen
DRF  Drug Revolving Fund
DFID  Department for International Development
EDCTP  European/Developing Countries Clinical Trials Partnership
EOC  Expert Oversight Committee
ERD  Expanded Program on Immunization
KCMC  Kilimanjaro Christian Medical College, Tanzania
Gates Foundation  Bill & Melinda Gates Foundation
GIS  Global Information System
GMC  Ghana Malaria Centre, Ghana
GMP  Gates Malaria Partnership
IMCI  Integrated Management of Childhood Diseases
IPT  Intermittent preventive treatment
ITN  Insecticide treated net
KEMRI  Kenya Medical Research Institute
Lapdap  Chlorproguanil-dapsone
LBW  Low birth weight
LSHTM  London School of Hygiene & Tropical Medicine
LSTM  Liverpool School of Tropical Medicine
MIM  Multinational Initiative on Malaria
MOHP  Ministry of Health and Population
MRC The Gambia  Medical Research Council Laboratories, The Gambia
MAC  Malaria Alert Centre, Malawi
NASA  North American Space Agency
NGO  Non governmental organisation
NIAID  National Institute for Allergy and Infectious Diseases
NIBSC  National Institute for Biological Standards and Control
NIMR  National Institute for Medical Research, Tanzania
NIMR Mill Hill  National Institute for Medical Research, Mill Hill, London, UK
NMCC  National Malaria Control Committee
NMCP  National Malaria Control Programme
NSGA  Nova Scotia Gambia Association
Oxon  University of Oxford
Partnership  Gates Malaria Partnership
PCR  Polymerase chain reaction
PDT  Product development team
PHG  Public Health Group
PI(s)  Principal Investigator(s)
QECH  Queen Elizabeth Central Hospital, Blantyre, Malawi
RBM  Roll-back Malaria
SP  Sulfadoxine-pyrimethamine
SBRI  Seattle Biomedical Institute
SPH  School of Public Health, College of Health Sciences, University of Ghana
STI  Sexually transmitted disease
TB  Tuberculosis
TDR  Special Programme for Research and Training in Tropical Diseases, WHO
Introduction

The Gates Malaria Partnership (GMP) has been fully operational for just over a year and this is the second report of its activities. During this period, substantial progress has been made in many areas, as will be seen in this report. An important development has been the change in name of the initiative from the Gates Malaria Programme to that of the Gates Malaria Partnership, a change that reflects the fact that the nine institutions contributing to the initiative now feel a sense of ownership which was not present in the early months. This change has been particularly apparent in the training programme whose members are now getting to know each other better, to appreciate each others skills and past experience and to build links between Europe and Africa and across Africa.

Recruitment for staff and training posts is now almost complete with only two senior staff posts remaining to be filled. One will be based with African Regional Office, World Health Organisation (WHO AFRO) in Harare. The person taking up this position will contribute to capacity development in malaria endemic countries. The second post, for a person whose area of work will be that of research into practice, will probably be based in Tanzania. Joanna Schellenberg, an epidemiologist, joined the group at London School of Hygiene & Tropical Medicine (LSHTM) in March 2002 after a period in Tanzania where she led a team undertaking a social marketing, bednet programme. Her main interest currently is evaluation of Integrated Management of Childhood Illnesses (IMCI) programmes. Michael Hollingdale, employed part-time by the partnership, left in March 2002 to join the European/Developing Countries Clinical Trials Partnership (EDCTP), an important new initiative that he has helped to establish. It is hoped that strong links will be established between the EDCTP and GMP, especially in the area of training.

Five post-doctoral fellows from Cameroon, Ghana, Guinea, Nigeria and The Gambia were appointed in the middle of the year. They are now developing their research proposals and should start their fellowships around the end of the year. A second call for PhD scholarships led to over 150 applications from high class candidates; scholarships were awarded bringing the total number of PhD students supported by the programme to 26. It is hoped that it may be possible to find employment for some of the unsuccessful applicants in positions created through research awards and to ensure that endemic country scientists who take up these positions receive additional training through short courses or distance learning programmes.

A decision was made in the early days of the programme that the research component of the original proposal to the Bill and Melinda Gates Foundation (Gates Foundation) had not undergone sufficient scientific scrutiny to allow it to be implemented without further peer review. Thus, a review process was set up which involves pre-proposals, proposals, external referees and rigorous review by a research committee so as to ensure that only projects of high scientific quality are supported. Eleven major applications have been funded and most of these projects are now underway. All the areas of research identified as priorities in the original application are covered by at least one project. During the year, a decision was made to earmark research funds for PhD student and post-doctoral fellows research projects. Additionally, a sum of $500,000 will be held over until 2004 to allow exploitation of any new developments that emerge from the initial studies. Apart from these earmarked funds, the research budget is now sufficient to support only one or two major new projects so the initial research portfolio should be complete by the end of 2002.

The coming year will be a challenging but exciting one for the GMP. It is now time for it to show that it can deliver on the promises that it has made.
Conceptual Framework

During the early part of 2001/02 a conceptual framework was written, which developed the objectives of the original proposal to the Gates Foundation. The framework was prepared with the input and approval from all GMP partners and the members of the Expert Oversight Committee (EOC), who provide strategic advice to the GMP.

The framework describes the external environment in which the GMP operates and how it meets the Gates Foundation objectives. The goal of GMP, through the activities of a group of complementary partners, is to develop a programme of innovative approaches to the control of malaria in endemic countries, particularly those in sub-Saharan Africa by:

Capacity development

Developing needs-based, sustainable capacity strengthening programmes that improve the skills, knowledge and attitudes of those who should be involved in research in advocacy on the importance of malaria in global health, research and prevention and management of the infection. Specific objectives are:

- to provide multidisciplinary training curricula that use innovative approaches and are responsive to district, country or sub-regional needs;
- to build the capacity and sustainability of the GMP Training Centres and programmes in The Gambia, Ghana, Malawi and Tanzania;
- to provide quality education and training through effective review, monitoring and evaluation procedures;
- to establish a post-doctoral and PhD programme in strengthening malaria research capability.

Research

Promoting research in malaria endemic countries into new interventions. Specific objectives are:

- epidemic prediction;
- evaluation of new antimalarials and combinations of antimalarials;
- evaluation of new methods of killing, repelling and controlling mosquitoes;
- vaccine evaluation;
- evaluation of the impact of interventions at a community and health system level.

Knowledge into practice

Developing mechanisms/systems for transferring malaria related knowledge into use and control strategies into action. Specific objectives are:

- dissemination of existing knowledge;
- research into new methods for the dissemination of information on malaria;
- research into determining the main obstacle to the wider application of effective and affordable technology;
- scaling up the use of effective interventions.

The strength of the Partnership is the wealth of skills and experience of the partner institutions who are working together on a multidisciplinary programme of applied research and training. By complementing other malaria programmes, GMP can become a case example of new integrated approaches to malaria control.

A copy of the full conceptual framework can be obtained from www.lshtm.ac.uk/gmp/governance.php
Capacity Development & Training

Introduction

GMP has established a Training Committee comprising representatives from the partner institutions, together with the GMP Management. The Committee oversees the development of multidisciplinary and integrated training curricula for each training centre and ensures that high quality education and training is provided through effective review, monitoring and evaluation procedures.

During 2001/02 temporary offices for three training centres in Ghana, Malawi and Tanzania have been set up and all staff have now been recruited. Building plans are at an advanced stage for an appropriate building for each centre. An office in The Gambia is currently being refurbished. All four training centres are working to develop and implement innovative training activities that meet GMP capacity development objectives. Links have been forged between proposals in the same country, between countries interested in developing similar proposals, and with non-governmental organisations (NGOs) and other programmes. Opportunities for links with GMP research projects such as in Côte d’Ivoire are now being investigated. Once the EDCTP is operational, it is hoped that some of its training activities will be conducted through the training centres.

The European trainers have been working extensively with the training teams in Africa to help develop and define their training proposals. This has included working with the team currently developing two training programmes in Tanzania, one for journalists and media chief executives and another a post graduate Diploma in health communication (which will contain a module on malaria reporting) at the School of Journalism, the University of Dar es Salaam. In Malawi, the European Trainers have been assisting with the implementation of a training programme for health surveillance officers in community based demographic data collection and management in Mwanza. In The Gambia, they have been working on programmes associated with schools and radio and in the development of a module in planning malaria programmes with the School of Community Health in Mansakonko. In all there are fourteen training proposals under active development.

GMP Training Committee

The GMP Training Committee met on two occasions during 2001/02, first in Liverpool in October 2001 and then in Copenhagen in March 2002. The October 2001 meeting concentrated on determining how training activities would be developed by the malaria endemic partner institutions, and how the European institutions could contribute. Additionally, the mechanisms for approving training activities were developed and agreed.

By the meeting in March 2002, the Committee had a full complement of members. The meeting was also attended by the heads of the National Malaria Control Programmes (NMCPs) in The Gambia, Ghana, Malawi and Tanzania, thus ensuring that all training activities are linked to the objectives of the respective NMCPs. Training proposals from Tanzania and Malawi were approved, and the newly appointed Training Co-ordinator for The Gambia and the Training Manager for Ghana discussed their plans for the next few months.

The July 2002 meeting will focus on consideration of proposals from all four countries and the development of a business plan by each Centre in order to leverage funds for the post GMP funding period.

Ghana Malaria Centre (GMC), Ghana

Staff: The team (Figure 1) is headed by Mr Said Al Hussein who is the Training Manager. He is supported by two project officers – Ms Lynda Osafo and Mr Kwabena Ophku-Mensah. GMC is additionally supported by an accountant, two secretaries, and a messenger/cleaner. A driver will be recruited once the Centre’s vehicle arrives.

Administrative Structure: A local steering committee has been established. Members of the committee have been drawn mainly from relevant departments within the Ministry of Health, the
School of Public Health and Noguchi Memorial Institute for Medical Research. The committee has met four times during the year, and sub-groups have met to focus on specific topics such as the proposals being developed and the framework of the operations of GMC with the NMCP.

**Activities:** GMC has made contact with a range of organisations and agencies which are involved in malaria control or related health activities at the community level. Within Ghana these have included the NMCP, Ministry of Health, Ghana Health Services, the Accra Metropolitan Assembly Environmental Health Initiative, WHO. Internationally, links have been established with the Malaria Consortium (LSHTM and LSTM), John Hopkins Centre, and the Environmental and Occupational Health Science Institute in the USA. The GMC team participated in the Africa Malaria Day celebrations with the Ministry of Health in April, participated in the RBM IMCI review and planning meeting in May and participated in the Ghana Health Planning and Service trainers workshop in June.

**Figure 1:** The Project Team Staff, Ghana. From left to right: Mr Said Al Hussein, Mr Kwabena Ophku-Mensah, Ms Lynda Osafo, Mr Rockson Baah-Achamfour, Ms Pearl Naa Ayorkor Aryee and Ms Patience Ayiku. (Photo: Tracey Henshaw)

**Building Works:** A new building is currently under construction. The building, which will be part of the new School of Public Health complex, is expected to be completed and ready for occupation in September 2002. The building will consist of classrooms, seminar rooms, offices, an IT suite, a library and a laboratory.

**Facilities:** The offices are currently located in facilities located at the University of Ghana’s Balme Library Annexe. This comprises one office for the Training Manager, one office for the project Officers and a further office for the project accountant and secretaries. All the offices are now fully equipped.

**Figure 2:** The Training Centre, Ghana. This picture was taken in June 2002 and shows the building phase is nearing completion. Works are due to finish in August 2002. (Photo: Tracey Henshaw)

**Training proposals approved in principle:**

- **professional development for consultants:** This is a pilot capacity development activity aimed at developing and broadening knowledge and skills in consultancy in malaria control and related policy issues. It addresses the need to develop a larger cadre of African consultants able to provide effective technical support to Roll-back malaria (RBM) partners in Africa. The activity comprises a formal training course and a follow-up support scheme involving mentorship and consultancy assignments with partner organisations. The first course will be held at the Ghana Malaria Centre, School of Public Health in Accra. If the first course is a success it is planned to establish similar courses at the other Training Centres.
Training proposals being considered:

- GMC is developing a proposal that aims to trains health workers how to recognise attitude and behavioural changes.

Malaria Alert Centre (MAC), Malawi

Staff: At the start of 2001/02 the immediate task for the Director, Dr Grace Malenga, was to draw up job descriptions for MAC staff and effect their recruitment. The Deputy Director/Senior Training Officer, Vincent Kamange, was recruited in March 2002. The administration assistant is expected to start work very soon. There are plans to recruit nurses with public health training or environmental health officers as part of the core team once the training programme is fully operational, MAC also intends to work with 'external' experts from within and outside the college, including the GMP PhD Scholarship recipients, for many of its training activities.

Administrative Structure: MAC activities are overseen by a Board which meets twice a year. Members of the Board are drawn from within the college, Ministry of Health and Population (MOHP)/NMCP and NGOs engaged in malaria related work. Day to day operational issues are guided by a smaller committee, the MAC Action Group, made up of the director, deputy director/senior training officer, the college registrar and finance officer and the director of the Wellcome Trust and Malaria Research Project. The local training committee is to be served by the same forum as the National Malaria Control Committee (NMCC), comprising malaria experts, trainers, policy makers, public and private health sector and media representatives.

Facilities: Activities of MAC are run from temporary offices in the Paediatrics Annex of the College. Office equipment and vehicles for field activities have been purchased. The office has been discussing plans with the visiting college IT specialist to include the new training centre building on the college-wide area network, once construction is completed.

Building Works: Land for the new training centre building has been identified within the Queen Elizabeth Central Hospital grounds in Blantyre. The plot is close to the hub of clinical and research activities in malaria, and other teaching annexes of the college. Government approval has been obtained for this, and all other technicalities required by LSHTM/GMP have been finalised. A building contract has been awarded and construction should start in early July 2002. Construction is expected to take about six months. The building will consist of seminar rooms, a library and IT suite, small dining area and offices.

Activities: Training centre staff are participating in collaborative training activities initiated by other stakeholders, such as IMCI training for tutors of training institutions, initiated by MOHP and supported by UNICEF. The senior training officer hopes to participate in a WHO sponsored training course as the development of proposals for operational research for malaria control to be held in Zambia in the next few months.

Training proposals under way:

- management of severe malaria: Training of the district health team in the management of severe malaria in children, at Ntcheu district hospital is under way. The Malaria Alert Centre is running the management of malaria training jointly with the University of Carolina/Centres for Disease Control (CDC). Currently, the team is collecting baseline data on prevailing hospital and community practices regarding malaria.

Training proposals agreed in principle:

- data collection and management: Training of Mwanza District health management team and its community health workers in community based data collection and management is proposed. This project builds on existing skills that were pioneered in the district for WHO Expanded Program on Immunization (EPI). By incorporating malaria data, monitoring the training and introducing innovative ways of data presentation such as Global Information System (GIS) district mapping, the training centre aims to improve malaria data management for district health planning and create a model that can be replicated elsewhere in Malawi. Consultations with various stakeholders are taking place.
- **drug revolving funds:** Training of community health workers (Health Surveillance Assistants) and the Mpemba Health Centre management team for the establishment of a drug revolving fund (DRF) in the entire Mpemba health centre catchment area will be undertaken. This project will investigate ways of improving drug access for the community and, as a public health planning exercise, for the health centre staff.

- **training of entomology assistants:** Assistants will be trained through a modular training programme developed by the University of Liverpool and CDC. The need for such trainees and higher grades for research and national control programmes activities was identified during the RBM needs assessment exercise for Malawi.

- **essential medical laboratory services:** Malaria services (malaria microscopy, haemoglobin and blood transfusion) together with tuberculosis (TB) diagnosis comprise 90% of the district hospital laboratory’s workload in Malawi. The development of an evidence based cost effective model for district hospitals by the MOHP in Malawi and LSTM has been supported by Department for International Development (DFID). By rolling out a holistic package consisting of laboratory refurbishment, equipment, consumables, and staff training and supervision, the quality of laboratory services will improve, which in turn will improve malaria case management and the rational use of antimalarials at the district hospital level. GMP will fund the training element of this package for a three year period.

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**Figure 3: Profile of Vincent Kamange, Deputy Director, National Malaria Training Centre**

Vincent comes from the Kasungu District in the Central Region of Malawi. He trained for three years as a medical assistant at the Malawi College of Health Sciences in Lilongwe, and then worked as a medical assistant in Salima District for nearly 13 years. Realising that he could improve his knowledge further, and take on additional responsibilities, he returned to the College of Health Sciences for a two-year upgrade course to become a Clinical Officer.

Following this he has worked at Mwanza, Ntchisi, Ntcheu and Mchinji District Hospitals. During this time he had a number of responsibilities, including that of acting District Health Officer, and as the District Malaria Co-ordinator. As Co-ordinator he trained health personnel in case management of malaria and also worked with communities to raise their awareness of ITNs.

Vincent believes that a Centre that focuses on malaria can respond well to the needs of the country and hopes to build on his training experiences to date to both contribute to the training needs of Malawi and improve his own skills.

Vincent’s wife is also from Kasungu District, and is an enrolled community health nurse. She hopes to work in a health clinic in Blantyre once she and the family join Vincent. They have five children in their teens and twenties. In Vincent’s spare time he enjoys playing football and bawo, and watching TV, reading newspapers and listening to the radio.

(Photo: Cathy Bowler)
Centre for the Evaluation of Effective Malaria Innovations (CEEMI), Tanzania

Staff: Dr Jasper Ijumba was appointed as Deputy Director in August 2001; Dr Andrew Kitua is the Director. Administrative support is provided by the Joint Malaria Programme Manager, with additional support provided by a secretary, an office assistant and a watchman.

Facilities: CEEMI offices are currently located at Ocean Road Cancer Institute in Dar es Salaam. The office space comprises 80m² and is rented jointly with the Joint Malaria Programme. The office is now fully equipped.

Building Works: The training centre in Tanzania is to be located at National Institute for Medical Research (NIMR) headquarters in Dar es Salaam. A new building on this site is being co-funded by GMP, DFID and NIMR. The additional funding from other sources will enable Tanzania’s NMCP to be located in the same building as CEEMI. The building has been designed so that offices are located on the first floor and facilities such as classrooms, library and laboratory are easily accessible on the ground floor. It is hoped that building will commence in September 2002.

Activities: Drs Kitua, Mutabingwa, Ijumba and Bloch assisted with the training at a four-day workshop on Research in Protozoan Parasites organised by the Kenya Medical Research Institute (KEMRI), Seattle Biomedical Research Institute (SBRI) and University of Washington, and funded by the National Institutes of Health, USA. The workshop aimed at generating interest in parasitic diseases research among young East African scientists and emphasised the scientific process as it applies to parasitic diseases, from basic discovery to translational research that leads to new therapeutics, diagnostics and control measures. The workshop was attended by 30 young scientists including two GMP funded LSTM PhD students from Malawi, namely Happy Phiri and Standwell Nkhoma. The workshop was held in Kilifi, Kenya in May 2002. A further workshop is expected to be held in Tanzania in 2003, with input from GMP.

Training proposals under way:

- **malaria and the media:** advocating health policy and practise in Tanzania. This course aims to promote malaria as a newsworthy topic amongst those working in the media at all levels and improve policy and practice concerning the depiction of malaria in the print and broadcasting media in Tanzania. It aims to raise the quality of reporting and programming and provide audiences with accurate, relevant, interesting, entertaining and educational information that will assist them to make healthier choices with respect to malaria control. The training proposal has two components. The first will be a malaria advocacy meeting aimed at Chief Executive Officers (CEOs) and owners of media organisations and relevant ministers from the government. The second part of the programme involves a five day training workshop for print and broadcasting journalists. Forty participants are expected from Tanzania, Kenya and Uganda; in addition two are being invited from Malawi to form a link when the activity is repeated at a later date in Malawi. The workshop aims to engage journalists in strategic reporting on malaria as well as fostering long term professional networks involving journalists, health professionals and researchers. In addition an award for excellence in health reporting is being established as well as scholarships for journalists to attend the Multinational Initiative on Malaria (MIM) conference in Arusha, in November 2002 in collaboration with the Commonwealth Broadcasting Association and the Commonwealth Print Union.

Training proposals agreed in principle:

- **prevention and management of malaria and anaemia in pregnant women in Tanzania:** The use of SP as an intermittent treatment in pregnancy is an objective for both RBM and NMCP in Tanzania. The objective of this proposal is to enable health workers to gain knowledge and skills with respect to malaria and anaemia in pregnancy, and the use of intermittent presumptive treatment. This will be achieved by training trainers at the Centre for Educational Development in Health in Arusha who, in turn, will transfer their newfound knowledge and skills to healthcare providers in the Lushoto and Muheza districts.

Training proposals being developed:

- **three step strategy:** Malaria and community-based health services in Tanzania. Drs Ijumba and Bloch are currently developing a strategy for the improvement of community-based health services with emphasis on malaria prevention and control. The strategy involves a strengthening of
dispensary level services related to antenatal care (ANC) and focussing on malaria in pregnancy (see above) and of health services reaching out to community level through well-trained community-based health care (CBHC) workers linked to the dispensaries. The principle is that a strengthened peripheral health service system provides an enabling environment for the interaction with clients either directly (at ANC clinics or within the communities) or indirectly through interaction with private sector health service providers and school health education programmes. The expectation is that improved community-based health services will lead to more prompt (presumptive) diagnosis of malaria and its treatment as well as providing a better basis for health professionals to meet and interact with people in their own setting. The proposed strategy will be implemented in selected districts in Tanga Region of Tanzania in close collaboration with regional and district authorities. Enthusiastic support from a number of stakeholders, including the Regional Medical Officer in Tanga Region, has been obtained. Specific proposals falling within the framework of the strategy are currently being considered.

Centre for Innovation Against Malaria (CIAM), The Gambia

Staff: The Training Co-ordinator, Dr Yaya Kassé (Figure 4), took up his post in February. He has a medical degree from the University of Conakry and an MPH from the University of South Carolina. He worked previously for the Republic of Guinea Government as a Prevention and Disease Control Officer. His role in The Gambia will be to assist in the development, co-ordination and implementation of training activities that fulfil the GMP goal and objectives and RBM strategy in The Gambia. Dr Kassé is committed to building-up partnerships with countries in the sub-region, particularly French speaking countries, and will visit other WHO offices and malaria control programmes to see their malaria control and training activities and to discuss with the programme managers and senior staff the best way to develop partnerships.

Figure 4: Dr Yaya Kassé, Training Co-ordinator, The Gambia. (Photo: Yaya Kassé)

An assistant co-ordinator, Mr Bala Musa-Joof, will soon join CIAM. Mr Musa-Joof has a Diploma in Public Health from The Netherlands and has worked as a lecturer for the School of Public Health, Brikamo. He will play an important role in community educational activities. The third core member of the staff will be a secretary. All other staff posts will be supported by grant proposals.

Facilities: CIAM will soon be located in Banjul, the capital city of The Gambia. A two-storey building on a small plot of land has been rented for two years. Refurbishment is ongoing at the time of writing. The building will be shared with the Gambian National Malaria Control Programme.
Training proposals under way:

• **short course:** The participants on a short course held at MRC in August 2001 for senior staff of National Malaria Control Programmes in the sub-region (The Gambia, Ghana, Guinea, Niger, Senegal and Sierra Leone) plan to undertake further studies on low birth weight (LBW) and chloroquine resistance using skills in study design learnt during their course. CIAM has received three proposals on LBW from Ghana, Guinea and Sierra Leone, and three on chloroquine resistance from The Gambia, Guinea and Sierra Leone. Implementation of studies on chloroquine resistance studies is not straightforward, so CIAM and MRC, The Gambia are looking for the best way to implement the studies, first in The Gambia and then in the sub-regional countries. WHO/AFRO has been contacted through WHO The Gambia for support and funding.

Training proposals approved in principle:

• **peer health education:** Nova Scotia Gambian Association (NSGA) is a Canadian NGO working in The Gambia, whose aim is to improve the health and well-being of youth, through a health educational programme. This is achieved mainly through the establishment of well-trained school peer health educators. A training proposal has been developed to enable NSGA to extend its health programme, currently concentrating on the prevention of HIV/AIDS, STIs, and substance abuse, to malaria. Thus, the public health educator programme will be extended to a disease whose main impact is not on the students themselves but on their family members. CIAM proposes to concentrate a major part of its efforts evaluating this novel intervention.

• **power of radio:** TESITO is an NGO based in London whose objective is to reduce malaria burden in the Basse region of the Gambia. Its objectives are to increase the use of impregnated bed nets, to decrease the number of malaria attacks in children under five years and pregnant women, and to increase involvement in, and the frequency of, environmental sanitation activities. It intends to use radio to broadcast messages in local languages to reduce malaria in targeted communities. The impact of the intervention will be evaluated conjointly with NMCP of The Gambia.

Training proposals being developed:

• **Training of traditional healers:** CIAM have approached the traditional healers associations to see if they would support the training of traditional healers to identify cerebral malaria and either refer, or treat patients with appropriate allopathic treatment. The associations have supported this proposal. Experience in northern Ghana has shown this approach can be very successful.

• **Training community health nurses in malaria control:** This proposal aims to improve the capacity of community health nurses and village people to assess their health needs, as well as develop and implement strategies to address malaria. It will develop awareness, knowledge and skills at family and community level of malaria on how to prevent and manage malaria, and how to empower communities to make informed decisions regarding the health of their own people. This activity will enable community health nurses to put their basic training into more effective practice.
• **Malaria control supporting school initiative:** A proposal is being developed that will encourage lower basic schools to develop and adopt policies and practices that will have a positive impact on malaria morbidity and mortality among school children, thus making schools active partners in malaria control activities.

**Capacity Development - European Partners**

An electronic malaria learning resource is in the final stages of completion at the LSTM. This resource covers all aspects of malaria in great depth and also provides a portal to relevant literature in accessible electronic format as well as existing web-sites dealing with malaria. The resource is being developed by Professor Marcel Hommel, with financial support from Impact Malaria/Sanofi-Synthelabo. It is proposed that the resource should be freely available on-line and should be available for off-line browsing at all the GMP training centres, with the intention to progressively transform the generic resource into one that is more country-specific.

In the same spirit of free access to information, the LSTM has created, in collaboration with BioMedCentral, a new on-line journal focusing on every aspect of malaria ([http://www.malariajournal.com](http://www.malariajournal.com)) with Professor Marcel Hommel as its Editor-in-Chief and an Editorial Board of 50 international experts. After 6 months, the journal has already 9 articles on-line and is also available through PubMed central.

**GMP post-doctoral programme**

Dr Siân Clarke, an epidemiologist from DBL, joined the existing GMP post doctoral fellows, Ms Virginia Wiseman (health economist) and Dr TK Mutabingwa (clinician) in January 2002. Progress on their research is given in the research section of this report.

Following a further round of recruitment, five more post doctoral fellows have been recruited. These are all from malaria endemic countries. Their employment contracts will start once they have made a further visit to London to discuss and develop their research proposals in more detail. The five are:

• **Dr Wilfred Mbacham** is from the University of Yaounde, Cameroon. He has two doctoral degrees in parasite biochemistry and public health, from the University of Yaounde and Harvard respectively. He will be developing a project on drug resistance in Cameroon. He will continue to work part-time for MIM TDR as co-ordinator of a malaria drug resistance network.

• **Dr Amebélia Rodrigues** is from the Bandim Health Project, Guinea-Bissau. She has worked previously mainly on cholera, but wishes to expand her knowledge of malaria. She will be developing a proposal on the effects of BCG vaccination on malaria.

• **Dr Obinna Onwujekwe** is a medical doctor from Nigeria, currently working at the College of Medicine, University of Nigeria Enugu Campus. He has recently obtained a PhD from LSHTM in health economics. He will be working with Dr Kara Hanson from LSHTM on projects related to home management of malaria and use of insecticide treated nets (ITNs).

• **Dr Seth Owusu-Agyei** received his epidemiology PhD from the Swiss Tropical Institute, Basel. He has also recently been appointed Director of the Ministry of Health Research Centre at Kintampo, in central Ghana, a field site with which LSHTM has had strong links through the late Dr Paul Arthur. He will be developing proposals on the epidemiology of malaria.

• **Dr Kalifa Bojang** is a clinician working for the MRC, The Gambia. He will retain his post with the MRC but be funded in part by GMP. He will additionally receive an honorary post with LSHTM. He has been working on malaria vaccine trials currently being conducted in The Gambia and will develop a new proposal which will probably continue his previous work on the management of malarial anaemia.

All five will conduct their research at their current institution and visit LSHTM as necessary.
GMP PhD Programme

The GMP PhD programme has proved to be very popular. In the two years that recruitment took place, over 300 applications were received, almost all originating from malaria endemic countries. Such was the quality of the applications that, funding and supervision apart, it would have been possible for around 100 of the applicants to have embarked on a PhD programme. This indicates clearly that there is a demand for training at this level and a wealth of talent that deserves support.

GMP requested funds to support 12 students for the PhD programme. A total of 26 students have been offered studentships, which has been achieved through co-funding from the Danish Agency for Development Assistance (DANIDA), the Wellcome Trust Laboratories in Malawi and other sources. Of the 26 successful candidates, 23 come from malaria endemic countries (Figure 6).

Sixteen PhD students began their studies during 2001/02. Each is based at one of four European institutions – LSHTM, LSTM, DBL or CMP. Their study interests are shown on the adjacent page, together with the institution through which they are conducting their field studies. All students have settled in well and most are currently in their home countries conducting their field work. A further ten PhD students have been awarded studentships to begin in 2002/03 (Table 2, overleaf).

All students are linked to one of the GMP training centres. The purpose of this is both to provide them with additional support, and when appropriate, to integrate them into the activities of the centre.

Capacity Development Post

The position of Capacity Development Co-ordinator was advertised in early June 2002. The post will be located in the AFRO’s Malaria Unit in Harare, Zimbabwe and will be funded by GMP for a two year period. The successful applicant for this post will be responsible for developing and implementing malaria control capacity development strategies and activities that link the Gates Malaria Partnership training component with AFRO’s strategy and plans for RBM capacity development in the region.

Figure 6: Home country of the GMP PhD students

- Malawi
- Ghana
- Tanzania
- Burkina Faso
- Kenya
- Uganda
- Denmark
- Philippines
- Senegal
- The Gambia
- USA
Table 1: PHD research projects

<table>
<thead>
<tr>
<th>Name</th>
<th>Research topic and home institution</th>
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<tbody>
<tr>
<td><strong>Centre for Medical Parasitology, University of Copenhagen, Denmark</strong></td>
<td></td>
</tr>
<tr>
<td>Pamela Magistrado</td>
<td>Identification and characterisation of <em>Plasmodium falciparum</em> variant surface antigens expressed by parasites causing severe malaria in children</td>
</tr>
<tr>
<td>Aziza Mwisongo</td>
<td>Intervention study aimed at improving advocacy of anti-malaria guidelines at the community level&lt;br&gt; <em>National Institute for Medical Research, Tanzania</em></td>
</tr>
<tr>
<td>Ali Salanti</td>
<td>Defining the domains of the conserved PfEMP1 gene family which can be used in a vaccine against pregnancy-associated malaria</td>
</tr>
<tr>
<td><strong>Danish Bilharziasis Laboratory, Copenhagen, Denmark</strong></td>
<td></td>
</tr>
<tr>
<td>Sheick Coulibaly</td>
<td>Relationships between the use of anti-malarial drugs in pregnancy and <em>Plasmodium falciparum</em> resistance&lt;br&gt; <em>Laboratoire National de Santé, Burkina Faso</em></td>
</tr>
<tr>
<td>Anthony Mbonye</td>
<td>New approaches to delivery of malaria prevention interventions to pregnant women at community level in Uganda&lt;br&gt; <em>Ministry of Health, Uganda</em></td>
</tr>
<tr>
<td>Elisamia Nnko</td>
<td>Community perceptions, attitudes and practices in relations to chemical and non-chemical ‘powerful’ substances: implications for insecticidal malaria control strategies in NW Tanzania&lt;br&gt; <em>National Institute for Medical Research, Tanzania</em></td>
</tr>
<tr>
<td><strong>Liverpool School of Tropical Medicine, UK</strong></td>
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<tr>
<td>Kofi Adasi</td>
<td>Investigations on insecticide resistance status and resistance genes/mechanisms in the main malaria vectors of Ghana</td>
</tr>
<tr>
<td>Boniface Kalanda</td>
<td>Statistical evaluation of data on malaria in pregnancy and its consequences for the infant in rural Malawi&lt;br&gt; <em>College of Medicine/Wellcome Trust Laboratories, Malawi</em></td>
</tr>
<tr>
<td>Themba Mzilahowa</td>
<td>Malaria in an area of intense transmission in Malawi: studies on transmission and genetic diversity of <em>P falciparum</em> in the vector&lt;br&gt; <em>College of Medicine/Wellcome Trust Laboratories, Malawi</em></td>
</tr>
<tr>
<td>Standwell Nhkomna</td>
<td>Drug resistant malaria and Lapdap&lt;br&gt; <em>College of Medicine/Wellcome Trust Laboratories, Malawi</em></td>
</tr>
<tr>
<td>Daniel Wacira</td>
<td>Factors influencing re-treatment of mosquito nets with insecticides in malaria control programmes</td>
</tr>
<tr>
<td><strong>London School of Hygiene &amp; Tropical Medicine, UK</strong></td>
<td></td>
</tr>
<tr>
<td>Badara Cisse</td>
<td>A double blind randomised placebo-controlled trial to measure the potential of intermittent treatment with artesunate plus sulfadoxine-pyrimethamine (SP) to reduce the malaria burden in sub-Saharan Africa. Impact of such an intervention on immunity after routine vaccinations&lt;br&gt; <em>L’Institut de Recherche pour le Developpement, Senegal</em></td>
</tr>
<tr>
<td>Diadier Diallo</td>
<td>Assessment of the impact of insecticide treatment of curtains, implemented over 6-8 years on the development of resistance to chloroquine in an area of hyperendemic and season malaria in Burkina Faso&lt;br&gt; <em>Centre National de Recherche et Formation sur la Paludisme, Burkina Faso</em></td>
</tr>
<tr>
<td>Robert Malima</td>
<td>Remote sensing and GIS to study the ecology and spatial prediction of <em>Anopheles funestus</em> in NE Tanzania&lt;br&gt; <em>National Institute for Medical Research, Tanzania</em></td>
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<tr>
<td>Harry Tagbor (DrPH)</td>
<td>The efficacy and safety of amodiaquine compared with chloroquine in the treatment of uncomplicated falciparum malaria in pregnancy in Ghana: a double blind trial.&lt;br&gt; <em>St Theresa’s Hospital, Kumasi, Ghana</em></td>
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<tr>
<td>Eric Tongren</td>
<td>Antibody subclass switching in malaria: Elucidating the factors regulating the production of IgG3 to <em>Plasmodium falciparum</em> Merozoite Surface Protein-2 (MSP-2)</td>
</tr>
</tbody>
</table>

*If no home institution is specified, the student is based at the European host institution.*
Research

A core aim of the GMP is the promotion of research into new interventions against malaria, in malaria endemic countries. The GMP is undertaking and supporting sustainable research of direct use to policy makers, clinicians and others involved in the management of malaria. Research is focussed on developing and assessing strategies and interventions which meet community and health system needs and are likely to be useful within the medium-term time framework set by Roll Back Malaria. The programme also aims to complement ongoing research by other groups and programmes and to be as interactive with other research groups as possible.

GMP Research Committee

The GMP Research Committee has met every three months since it’s inception in October 2000 and, to prevent conflicts of interest, consists of members mostly from outside the field of malaria. The Committee is chaired by Professor Hazel Dockrell, a leading specialist in the human immune response to mycobacteria, in particular tuberculosis and leprosy. The committee consists of five further members, drawn from specialties throughout the LSHTM, and two external members from DFID and LSTM. Finally, the Committee is supported by the Director and Deputy Director of the GMP, who act as observers and technical advisors. Following a recommendation from the EOC in March 2002, Professor Ayo Oduola will shortly be joining the Committee, bringing with him substantial experience of research in malaria endemic countries.

The Committee is responsible for the allocation of $8.85 million research funds which it disperses by review of proposals submitted. Principal Investigators (PIs), one of whom must be a member of the LSHTM Malaria Centre, initially submit a brief pre-proposal for consideration by the Committee; to date the Committee has reviewed twenty-seven pre-proposals. If the pre-proposal indicates that the research is of high quality and falls within the Gates Objectives the PI’s are asked to prepare a detailed, full proposal for consideration. PI’s can submit applications for Innovative grants which are designed to support low cost (less than $70,000) innovative research or Project grants which support more substantial research programmes. All of the full proposals are then sent to a minimum of three external reviewers for independent comment on the proposal’s scientific merit and applicability to the Gates Objectives, on the skills and abilities of the PI’s to carry out the research and on the capacity development potential of the proposals. Proposals are also sent to members of the Expert Oversight Committee. The Committee has considered sixteen full proposals since inception and agreed to fund eleven projects, with budgets ranging from $71,500 to $764,000.

The number of pre- and full proposals considered and approved and the values of the projects funded are shown in Table 2 and the full proposals approved for funding described by research objective, are shown in Figure .

<table>
<thead>
<tr>
<th></th>
<th>Pre-proposals</th>
<th>Proposals</th>
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<tr>
<td></td>
<td>Received</td>
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<td>Received</td>
</tr>
<tr>
<td>Oct-00</td>
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<tr>
<td>Mar-01</td>
<td>11</td>
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<tr>
<td>Jun-01</td>
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<td>0</td>
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<tr>
<td>Dec-01</td>
<td>7</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Mar-02</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>17</td>
<td>16</td>
</tr>
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</table>

Table 2: The numbers of pre and full proposals considered and approved by the GMP Research Committee since inception in October 2000 and the monies allocated to those projects.
Table 2 shows that $5,504,350 has so far been allocated to research and of the balance, $750,000 has been set aside to fund projects that result or follow on from proposals already approved. Applications for these funds will be considered from 2004 but if none are forthcoming, the monies will be opened up for new proposal applications. In addition, $850,000 has also been ring-fenced to support the GMP post-doctoral staff. Applications for these funds will still be made through the Research Committee as these proposals are expected to be of the same high quality and scientific standard as proposals already funded, but are reserved to allow time for staff to take up appointments and prepare their proposals.

Of the funded proposals, nine will be operating almost exclusively in West and/or East Africa and all have capacity development or training components, thus forming important links between the research and capacity development parts of the GMP programme. The research projects are discussed in more detail in the following section.

Development of new systems for prediction and detection of malaria epidemics

The occurrence of recent epidemics in East Africa has highlighted the need for development of new operational systems for early warning and detection. This priority of the GMP research programme is evaluation of the usefulness of seasonal climate forecasts for epidemic preparedness, to develop, test and apply meteorological and hydrological models for epidemic early warning, to develop and test district level surveillance systems and algorithms for epidemic detection, and to enhance local capacity amongst national researchers and District Health Management Teams.

New systems for prediction and detection of malaria epidemics in the East African Highlands.

*Principal Investigators:* Dr Tarekegn Abeku (LSHTM), Dr Jonathon Cox (LSHTM)

*Collaborators:* Dr Shak Hajat (LSHTM) Dr Simon Hay (Oxon), Dr Caroline Jones (LSHTM) Dr Peter Langi (NMCP, Uganda), Dr Jo Lines (LSHTM), Dr Sam Ochola. (NMCP, Kenya)

The significant impact of recent malaria epidemics in East Africa has led to renewed calls from WHO and the malaria control community for the development of operational systems for epidemic early warning and detection. However, despite strong political commitment and a relatively high research profile, little practical work is being done to see that such systems become implemented.

Following a framework previously developed with East African malaria control programmes, this project is creating and testing a functional system for epidemic early warning that incorporates district-level surveillance and predictive modelling using environmental data, remote sensing and geographical information systems. The project addresses the technical feasibility of early warning, as well as current prospects for implementation from an institutional perspective. In addition to the PI (Jonathon Cox), two staff members have been recruited to this project: Tarekegn Abeku has taken on the role of co-principal investigator and Shak Hajat will provide statistical support on a part-time basis.
Four highland districts in Kenya (Nandi, Gucha) and Uganda (Kabale, Rukungiri) provide the geographical focus for the project. In February 2002, a workshop was held in Kisumu, Kenya, to bring together staff from the District Health Management Teams (DHMTs) of the study districts, as well as representatives from the national malaria control programmes, Ministries of Health, NGOs and other research organisations.

The principal purpose of the meeting was to draw up a protocol for surveillance activities, detailing responsibilities of various partners in terms of data generation, analysis and dissemination. The agreed model constitutes a network of sentinel health facilities, data from which are collated and analysed at the district level. Subsequent project activities have involved needs assessment visits within each study district in order to finalise details of the sentinel system and to identify capacity development requirements within individual facilities and within DHMTs. Project equipment and vehicles have now been ordered and it is anticipated that full surveillance activities will be underway by September 2002. Emphasis will then shift to the development of analytical software for use at district level, the design of entomological activities and the use of meteorological and remote sensing data in predictive modelling. With respect to the latter, meetings are scheduled with the UK Meteorological Office, NASA and potential European partners to explore possible external collaborations.

Evaluation of new antimalarials and combinations of antimalarials

Significant chloroquine resistance is now almost universal in Africa and Asia, and sulfadoxine-pyrimethamine (SP) resistance is increasing rapidly in Africa. Various drugs, used singly and in combination, have reasonable or good efficacy and safety. There is, however, considerable doubt about which drugs or drug combinations should be deployed when SP can no longer be used which, in East and Central Africa, is likely to be within a few years. There is a complex pay-off between cost, efficacy, safety in both children and pregnant women, and the likelihood of delaying resistance. The GMP intends to contribute to the evaluation of alternatives to SP. Four projects have been approved by the Research Committee to address this issue.


*Principal Investigators:* Dr Neal Alexander (LSHTM), Dr Ali Allouche (LSHTM), Dr Mark Rowland (LSHTM), Dr Colin Sutherland (LSHTM)

*Collaborators:* Dr Steve Bennett (LSHTM), Prof. Brian Greenwood (LSHTM), Prof. Richard Hayes (LSHTM), Prof. Geoffrey Targett (LSHTM), Prof. David Warhurst (LSHTM), Dr Chris Drakeley (LSHTM), Dr Gijs Walraven (MRC, The Gambia), Dr Abdur Rab (Healthnet, Pakistan).

The aim of this project is to evaluate combination and mono-therapies in areas of contrasting endemicity by measuring and predicting the transmission of drug-resistance-associated alleles in *Plasmodium falciparum*.

Our approach is to determine the drug-resistance-associated genotype of sexual-stage parasites (gametocytes) occurring in treated individuals, and of consequent stages (oocysts) in membrane-fed
mosquitoes. This project was inspired by our studies of children in The Gambia that have been treated with chloroquine and “cured” of clinical malaria but nevertheless harbour gametocytes.

We have dubbed these successfully treated children “public health failures”, as they are transmitting drug resistance to mosquitoes and thus to other people at an enhanced rate. For maximum public health benefit, any combination of antimalarial drugs must reduce or prevent the transmission of gametocytes carrying genes that confer resistance to any of the component drugs of the combination. We are evaluating combination therapy trials in both The Gambia and Pakistan, two settings with contrasting patterns of malaria transmission. Analysis of parasite DNA (genotyping) is carried out on small blood samples collected from malaria patients before and after drug is administered. In addition, patients carrying gametocytes are asked to donate a few ml of venous blood for membrane feeding of mosquitoes, and a small aliquot of this provides both DNA and RNA for genotyping. Any midguts of blood-fed mosquitoes that are found to be infected with *P. falciparum* are collected and preserved for later DNA analysis.

Successful pilot experiments amplifying *P. falciparum* drug resistance genes from infected midguts have been completed this year. These samples were from our transmission studies in Pakistan. We are thus able to follow the proportion of drug-resistance genotypes that comprise an infection before and after treatment, among gametocytes, and in any mosquitoes that acquire infection from that same infected person. The data collected from this work are being analysed using theoretical models, to address the early events following treatment when parasites are reduced to such low numbers that they are undetectable by sensitive DNA amplification methods. This is to estimate how many of the apparently new post-treatment infections are, in fact, due to temporarily suppressed genotypes. In addition, we are estimating how far the killing effects of the drugs may be diluted by a tendency to induce faster conversion to gametocytes.

In parallel to these analyses, we are examining the prevalence of resistance-associated alleles over time. In The Gambia in 1998, 23% of children with uncomplicated falciparum malaria were harbouring parasites with resistance alleles at the *pfmdr1* and *pfcr* loci. Preliminary analyses of parasite isolates from 91 children seen in 2000 suggest this figure has doubled. This increase in resistance gene prevalence is paralleled by a significant rise in chloroquine treatment failure rates, from 30% to 75%. These results suggest that chloroquine-resistance is increasing in prevalence in the Gambian study population. The need for an effective combination treatment to replace chloroquine is thus urgent. We are currently evaluating parasite genotypes from children treated with chloroquine plus artesunate in 2000. This work will show whether addition of artesunate to chloroquine treatment reduces the emergence of gametocytes carrying resistance genes.

Further studies in our Pakistan series have resumed in 2002. These techniques would be equally useful to endemic country scientists working in the field, and so our project has a strong training component. We are directly involved in training scientists from The Gambia, Burkina Faso and
Pakistan in drug resistance genotyping. Further, we have assisted in building the capacity for PCR studies in Farafenni, The Gambia by purchasing equipment, and contributing to the design of a new laboratory to be run by West African staff.

An open-label, randomised, four-arm efficiency trial of sulfadoxine-pyrimethamine (SP), SP-amodiaquine, artemether-lumifantrine and amodiaquine-artesunate in mild-moderate malaria in Tanzanian children.

**Principal Investigators**: Dr TK Mutabingwa (LSHTM seconded from NIMR), Dr Christopher Whitty (LSHTM).

**Collaborators**: Prof Brian Greenwood (LSHTM), Dr Martha Lemnge (NIMR), Dr Robert Pool (LSHTM), Dr Virginia Wiseman (LSHTM).

Antimalarial drug resistance is a serious and growing problem in East and Central Africa. A number of combinations of antimalarial drugs have been shown to be safe and effective against malaria in areas where there is widespread resistance to first-line drugs when the drugs are given as part of closely observed research studies. What is not yet clear is how these drugs perform when used in a realistic outpatient setting without supervision. Determining this has been identified by experts in the region as a major research priority for East Africa. This trial sets out to investigate the effectiveness of three leading drug combinations which are contenders to take over from current first-line treatment when used within a busy outpatient setting in an area of Tanzania with a high prevalence of drug resistant malaria. Linked to this is an examination of perceptions and acceptability of various drug combinations and an economic evaluation. In addition, to providing an answer to an operational question which is high on the East African public health agenda, the study is designed to have a strong capacity development element. A multidisciplinary study team has been recruited in Tanzania which it is hoped could provide the nucleus for a programme of clinical trials of antimalarials. Additionally, in discussion with the Director of NIMR Amani, resources have been earmarked to allow for training of non-study employed Tanzanian clinical scientists interested in malaria clinical trials methodology on an attachment basis, and for training of a Tanzanian laboratory scientist in malaria PCR techniques.
The core study team have been recruited and have received their first weeks of intensive training. Clearance for the project has been obtained from the Ethics Committees of NIMR Tanzania and LSHTM, COSTECH and the Regional Medical Officer Tanga Region. Following meetings in the Muheza District to explain and discuss the trial with local leaders, recruitment began to a pilot phase of the trial in June 2002 in a new purpose-built research outpatient block in Teule Designated District Hospital, Muheza.

Figure 11: The Study Team, fifth from left, Dr Chris Whitty and at far right Dr TK Mutabingwa, PIs for this trial (Photo: Brian Greenwood).

The pilot trial is designed to provide an estimate of the point prevalence of drug resistance to sulfadoxine-pyrimethamine (SP) and amodiaquine, the drugs currently recommended as national first line treatment in Tanzania. Depending on the results of this pilot one of these drugs will become the standard drug with which all the other drug combinations will be compared. The drug combinations to be assessed in the main study are SP-amodiaquine, amodiaquine-artesunate and artemether-lumefantrine. The main study will probably start in September 2002, with the economic and anthropological components starting a little later. The study team aim to complete the study within two years so as to provide data that will assist local, national and regional policy-makers when they have to decide on what the next steps should be once SP resistance is so high in this part of Tanzania that it will have to be abandoned as first line treatment.


Principal Investigators: Dr Daniel Chandramohan (LSHTM), Dr TK Mutabingwa (LSHTM seconded from NIMR), Dr Christopher Whitty (LSHTM).

Collaborators: Prof Brian Greenwood (LSHTM), Dr Martha Lemnge (NIMR), Dr Caroline Shulman (LSHTM).

The principle that drug combination therapy is likely to take over from monotherapy for malaria in most of Africa has wide acceptance. Several drugs combinations have been shown to work well in treating children who live in areas of high drug-resistant malaria. However little is known about the efficacy or safety in pregnant women, the other major vulnerable group in most parts of Africa. Drug companies are often reluctant to conduct any studies in pregnant women because of the risks that a drug might prove teratogenic. Thus, information on the safety and efficacy of important drugs in pregnant women often lags far behind that known for other groups. In the case of malaria this is a serious problem as pregnant women are at high risk from malaria. Drug combinations will undoubtedly be used by pregnant women, but currently we do not know which drug combinations are safe and effective in pregnancy.

This study, which has now received ethical clearance in Tanzania and in the UK, will look at the efficacy and safety of drug combinations in pregnant women who have malaria in Muheza, Tanzania, an area with a high prevalence of drug resistant malaria. The trial will be conducted in a purpose-built research ward in Teule Designated District Hospital, using combinations of drugs for which there is already reasonable safety data for use in pregnancy when used alone, and which are likely to be deployed for use against malaria in the region. The study will start in January 2003 and run over 2 years. In addition to answering a question which has been put forward as a regional priority, the study should provide a platform for other important operational questions, including the pharmacokinetics of drugs in pregnancy (important in planning optimal dosing schedules). It will also be used, in conjunction with an ongoing effectiveness trial in children in the same hospital, for the training of a core clinical trials team capable of taking on a rolling programme of clinical trials in malaria. Money has been allocated to provide training for a research physician from the region in addition to on-the-job structured training for all members of the study team.
Intermittent SP to prevent moderate/severe anaemia and low birth weight secondary to malaria in multigravidae: a randomised placebo-controlled trial.

Principal Investigators: Dr Caroline Shulman (LSHTM), Dr Gjis Walraven (MRC The Gambia).
Collaborators: Mr Pa Lamin Befai (WHO The Gambia), Prof Brian Greenwood (LSHTM), Dr Mamo Jawla (DoSH Banjul), Dr Fadinding Manneh (DoSH Banjul), Dr Paul Milligan (MRC The Gambia), Dr Katie Paine (MRC The Gambia), Dr Margaret Pinder (MRC The Gambia), Dr Robert Pool (LSHTM), Maimuna Sowe (MRC The Gambia), Dr Warren Stevens (MRC The Gambia), Dr Virginia Wiseman (LSHTM).

Malaria in pregnancy is an important preventable cause of disease and death in the mother and her baby. The frequency and severity of malaria infection is greater in pregnant women and in women who have just delivered (postpartum) than in the same women before pregnancy and in non-pregnant women. In areas such as The Gambia where malaria is endemic, adults have acquired a significant protective immunity. However, during pregnancy this immunity is altered and pregnant women become at risk of severe maternal anaemia and low birth weight babies. Severe maternal anaemia is a risk factor for maternal mortality and low birth weight is the single most important risk factor for infant mortality. The placenta is frequently infected and acts as a site for parasites to feel ‘at home’. Primigravidae are generally more affected than women in subsequent pregnancies.

The World Health Organization recommends treatment at regular intervals (e.g. at each clinic visit with a maximum of 4 treatments) with an effective anti-malarial such as sulfadoxine-pyrimethamine (SP or Fansidar®) to all pregnant women throughout the year in malarious areas in Africa. This is called ‘intermittent preventive treatment’ or IPT. There is good evidence that giving SP at clinic visits is an effective strategy to decrease the risk of moderate/severe anaemia and low birth weight babies. Severe maternal anaemia is a risk factor for maternal mortality and low birth weight is the single most important risk factor for infant mortality. The placenta is frequently infected and acts as a site for parasites to feel ‘at home’.

We have designed a study to estimate the efficacy of intermittent sulfadoxine-pyrimethamine in multigravidae throughout the year. In this randomised, placebo-controlled trial we hope to recruit 3000 multigravidae during the period July 2002 - June 2003 and follow these women through their pregnancy and post-partum period and estimate as the most important endpoints the prevalence of post-partum anaemia and birth weight. We will also determine the cost effectiveness, acceptability and convenience of intermittent SP.

It is not known whether during pregnancy folate supplementation will increase the incidence of treatment failure in women receiving SP. Iron and folate tablets are given routinely to pregnant women in The Gambia during clinic visits, to prevent nutritional anaemia. However, folate supplementation may reduce the activity of antifolate antimalarials such as SP. We will test this in primigravidae who will all be receiving IPT with SP during the period July 2002 until December 2003. We hope to recruit 1000 primigravidae and establish in a randomised controlled trial whether there is any difference in the number of parasites in the blood of women receiving IPT, if folate supplements...
are not started for 2 weeks following the administration of SP as opposed to administration at the same time as SP.

Evaluation of new methods of killing, repelling and controlling mosquitoes

The emergence of anopheline mosquitoes resistant to pyrethroid insecticides in Africa is threatening to undermine the progress in personal protection currently being made through increasing coverage with insecticide treated nets (ITN). ITN constitute the most important weapon in the present arsenal of RBM, and alternative insecticides to pyrethroids must be identified and made available over the next 5-10 years if RBM is to stay on target. To date, one project has been approved to address this issue.

Insect repellents offer the prospect of personal protection against vectors whose feeding cycle is not fully synchronous with human sleeping habits and net use. As such, repellents are perceived as complementary to ITN rather than as a substitute. Approval has been given by the Research Committee to investigate an innovative repellent in the form of a vapourising lamp.

Evaluation of a repellent-vapourising koroboi lamp for household level protection against malaria in rural Tanzania.

Principal Investigators: Dr Ilona Carneiro (LSHTM), Dr Caroline Jones (LSHTM), Dr Jo Lines (LSHTM), Dr Mark Rowland (LSHTM).
Collaborators: Prof. Chris Curtis (LSHTM), Dr Bart Knols, Dr Caroline Maxwell (LSHTM)

This study will evaluate the repellent-vapourising lamp - a novel method of protection from malaria vectors and nuisance mosquitoes, which can be used to protect individuals from pre-bedtime biting before the use of insecticide treated nets. In most of Sub-Saharan Africa, where there is no electricity, locally-made kerosene lamps (known as koroboi or kibatari in Kiswahili) are by far the most common source of light at night. These locally made kerosene lamps have been modified to vapourise the same pyrethroid repellents that are used in mosquito coils and repellent sprays.

The diagram shows one design for the repellent lamp, identifying the main features. This design of the project to maximise safety and utility will be adapted during the course.

This one-year project will evaluate these devices in entomological terms, in preparation for a future epidemiological trial. Preliminary safety and toxicity questions will be addressed, and then the different products and variants will be screened and compared for efficacy against malaria vector biting in the evening.

Figure 13: Design for the Koroboi lamp.

The project received ethical clearance from LSHTM and the NIMR in March 2003. The position of project leader was advertised in the UK and in Tanzania in April, and an interview panel in May appointed Dr Helen Pates to the post. Dr Pates will arrive in Muheza, Tanzania at the start of July to begin setting-up the project. Local posts will be advertised and interviewed, and fieldwork will start in August.
Evaluation of new insecticides and long lasting treatments for nets and other materials used in vector control and personal protection.

**Principal Investigators:** Prof. Chris Curtis (LSHTM), Dr Jo Lines (LSHTM), Dr Frank Mosha (KCMC), Dr Mark Rowland (LSHTM)

**Collaborators:** Mr Richard Allan (WHO Geneva), Dr Chris Drakeley (LSHTM), Dr Pierre Guillet (WHO Geneva), Dr Jean-Marc Hougard (IRD France), Dr Jasper Ijumba (NIMR), Dr Martha Lemnge (NIMR), Dr Stephen Magesa (NIMR), Dr Caroline Maxwell (LSHTM), Dr Morteza Zaim (WHO Geneva)

Insecticide treated nets (ITN) constitute the most appropriate and cost-effective tool for preventing malaria in Africa and Asia. Increased uptake and coverage of nets is continuing apace in much of sub-Saharan Africa, with support from national governments, the World Health Organisation (WHO), UNICEF, non-governmental organisations, the private sector (net and insecticide manufacturers) and the Roll Back Malaria movement. But despite steady progress two factors – one biological and one societal – pose grave threats to future prospects and threaten to undermine recent achievements. Firstly, there is rapid spread of resistance to pyrethroid insecticides in African mosquitoes and secondly, low insecticide re-treatment rates among users of nets after acquisition. Both factors stand to reduce the potency of ITN to that of poor-quality untreated or torn nets, and both must be tackled as a priority if the global control of malaria is to be sustained.

To discuss this and other problems in malaria vector control, the GMP held an international meeting at LSHTM in September 2001. Participants came from all over the world, including the World Health Organisation, African research institutes, European universities (Denmark, Belgium), the French government Institute of Research for Developing Countries (IRD), United States agencies (BASICS and Environmental Health Programmes), LSHTM, LSTM, and private sector representatives. The meeting was a success, and a consensus was reached on research needs and priorities. As a result the vector control research agenda of GMP was established (with partners) and the GMP Vector Control Project was launched.

To overcome the problem of resistance new insecticides must be brought into public health. Public health presents little in the way of commercial opportunity, constituting only about 5% of the global market for insecticide. Thus, it is to the existing agricultural sector that the search for new products for public health must be focused. One of the roles of GMP is to provide the incentive that will stimulate the private sector to seek opportunities in malaria control. To help us in this endeavour we have formed a strategic alliance with the WHO, and have circulated our hopes and aims to manufacturers via trade journals, industrial contacts, and the internet. WHO, as the UN agency responsible for registration of all new insecticide products and for providing a technical lead on malaria control, is crucial to the success of this venture. The partnership has already been approached by several agrochemical corporations and discussions on the evaluation of new products produced by Dow, Bayer-Aventis, Syngenta, and BASF are taking place. These products include alternative insecticides to pyrethroids and new formulations that enable insecticide to withstand repeated washing (circumventing the need for annual re-treatment). Thus, our portfolio of products for evaluation is already filling up, and by next year we shall be working with all the major agrochemical companies (including those less familiar with international public health).

No less important to this venture are our southern collaborators. In East Africa (Tanzania) our two partners are the National Institute for Medical Research and the Kilimanjaro Christian Medical Centre, both of which have a long history of research into new pesticide products. In West Africa our collaborators are the Institut Pierre Richet (Ivory Coast) and IRD (France), both of which have an outstanding research record on insecticide resistant mosquito vectors. We are presently establishing the project on both sides of the continent, finalising institutional arrangements, constructing facilities, and building local capacity. Thus, the pieces of this complex jigsaw are set in place and the first evaluations are about to begin.

**Vaccine evaluation**

Development of a vaccine that has the potential to be operationally useful for malaria in endemic countries in Africa and elsewhere remains the major goal of much basic malaria research. Such a vaccine may well need very different characteristics from one that is useful in the short-term prevention of malaria in travellers. Two vaccines projects have been approved. The first is a short
innovative project, the second a clinical trial to be run jointly by the University of Oxford (Oxon), the Medical Research Council in The Gambia (MRC) and LSHTM.

**In vitro/ex vivo assessment of vaccine-induced immunity to malaria.**

**Principal Investigators:** Dr Patrick Corran (on secondment from NIBSC), Dr Amy Joynson-Hicks (LSHTM), Dr Brenda Okech (LSHTM), Prof. Eleanor Riley (LSHTM), Dr Jim Todd (LSHTM).

**Collaborators:** Dr T Egwang (MedBiotech Laboratories, Kampala), Dr A Holder (NIMR Mill Hill), Dr L Miller (Laboratory for Parasitic Diseases, NIAID)

The aim of this project is to develop assays that measure functional antibody responses to the candidate vaccine antigen MSP-119 in a reproducible manner that can be applied to large-scale vaccine trials. Immunisation with MSP-119 has been shown (in model systems) to give protection against challenge infection, and this protection is antibody mediated. However, in humans total anti-MSP-119 antibody levels correlate poorly with protection; the specificity of the antibody response is thought to be critical. Antibodies that “inhibit” merozoite invasion of red blood cells are believed to be protective whilst antibodies that “block” the inhibitory antibodies are not. The aim of this project is to determine which anti-MSP-119 antibody specificities in human serum are indicative of protective immunity.

Anti-MSP-119 antibodies in serum may compete with monoclonal antibodies (MAb) which recognise overlapping regions of the MSP-1 molecule, enabling us to map the specificity of the antibody response to MSP-119. We have shown that in sera from children in The Gambia, a moderately endemic area, and Uganda, in a highly endemic area, although there is no correlation between the ability of a serum to recognise MSP-119 itself, there is a significant association between ability of sera to compete with certain MAbs and measures of anti-malarial immunity, specifically resistance to infection resistance to high density parasitaemia. Both these studies therefore support the hypothesis that the qualitative nature of antibody responses to MSP-119 is more important for protection than the absolute quantity of antibody. These data also indicate that the competition assay gives information about antibody specificity and may be useful for epidemiological studies.

![Figure 14: Binding of two MAbs and serum from one Gambian child (1242) to mutant rMSP-119 proteins. Values have been normalised against binding to the wild type MSP-119 sequence (extreme right). The ‘blocking’ MAb 1E1 does not bind to the mutants 3x, 4x15 and 4x34 whilst the ‘inhibitory’ MAB does bind to these mutated proteins. The binding of serum 1242 is almost abolished by single mutations at residues 28 and 34 and also by the 3x, 4x15 and 4x34 mutations. This serum thus contains anti-MSP-119 antibodies with “blocking” characteristics.](image-url)
We have also used a set of mutated MSP-1\textsubscript{19} protein, in which up to 6 amino acid residues have been changed, to map antibody specificity. Some of these mutated proteins no longer bind “blocking” MAbs but still bind ‘inhibitory’ MAbs. We found no significant associations between recognition of these mutated proteins and protection in Gambian children, but in Ugandan children we found that children whose sera bound less well to these mutants (that is had higher ‘blocking’ antibody levels) were significantly more likely to have high density parasitaemia.

Finally, we have been setting up an \textit{in vitro} bioassay to determine whether inhibition of post-translational processing of MSP-1 by antibodies is an important component of naturally acquired anti-MSP-1\textsubscript{19} immunity. This assay requires large numbers of pure, extracellular merozoites. In order to simplify the preparation of merozoites we have been investigating the use of the cysteine protease inhibitor E64 to prevent final maturation of schizonts, allowing an entire culture to be harvested synchronously. We hope this will provide a technical breakthrough that will allow this bioassay to be scaled up to allow higher through put of samples.

In summary, we have made substantial progress in the past 9 months. Two manuscripts describing our results are currently in preparation. We hope to evaluate these assays further once clinical trials of MSP-1\textsubscript{19} vaccines begin.

Phase IIb studies of heterologous prime-boost immunisation against malaria infection in the Gambia. \textit{Principal Investigators:} Dr Kalifa Bojang (MRC, The Gambia), Prof Brian Greenwood (LSHTM), Prof. Adrian Hill (Oxon), Dr Vasee Moorthy (Oxon).

\textit{Collaborators:} Dr Margaret Pinder (MRC, The Gambia), Dr Sam McConkey (MRC, The Gambia), Dr Paul Milligan (MRC, The Gambia), Prof. Keith McAdam (MRC, The Gambia), Dr Sam Dunyo (MRC, The Gambia), Dr Tunde Imoukhuede (MRC, The Gambia), Dr Gijs Walraven (MRC, The Gambia), Dr Sarah Gilbert (Nuffield Department of Medicine, Oxon), Dr Jenni Vuola (Nuffield Department of Medicine, Oxon), Dr Daniel Webster (Nuffield Department of Medicine, Oxon), Dr Susie Dunachie (Nuffield Department of Medicine, Oxon), Dr Robert Pool (LSHTM), Dr Colin Sutherland (LSHTM).

Attempts to develop an effective malaria vaccine have been much more difficult than had been anticipated originally. A number of antigens have been identified which probably invoke a protective immune response but the most effective ways of presenting these antigens to the host have not been defined. Antigens have been given as purified peptides or as proteins expressed in a variety of viruses, bacteria and yeasts. In addition, vaccines based on DNA have also been developed and shown to be effective. Defining the optimum way of using these different constructs to induce protective immunity has required a series of experiments in animals and, more recently, in man. These studies have shown that better immune responses can usually be obtained when different constructs are used for priming and boosting than when repeated immunisation with the same construct are given (the prime boost strategy). Studies have been carried out in human volunteers at the University of Oxford using a vaccine based on a construct which comprises 18 T cell and 2 B cell epitopes from pre-erythrocytic antigens of \textit{Plasmodium falciparum} together with almost the whole of the coding region for the antigen thrombospondin related adhesive protein (TRAP). This vaccine has been given either as DNA (DNA-TRAP) or following insertion of DNA into a modified vaccinia virus (MVA)(MVA ME-TRAP) or into fowlpox virus (FP9 ME-TRAP). Protection against challenge, as measured by a delay in the time to infection in volunteers, has been achieved with both regimens of DNA followed by MVA vaccine and with FFP vaccine followed by MVA vaccine. In the latter study 2 of 5 volunteers were completely protected.

Following these encouraging results in UK volunteers, pilot safety and immunogenicity studies of these constructs have been carried out in Gambian children and adults. No serious adverse effects have been found and both DNA and virus based vaccines have been shown to induce strong cellular immune responses. Thus, a phase 11b trial of a DNA/MVA is planned with support from GMP. Approximately 400 adult Gambian males, resident in the Farafenni area of The Gambia, will be immunised with two doses of DNA TRAP vaccine followed by one dose of MVA ME-TRAP or three doses of control vaccine (rabies) and monitored throughout the course of the rainy season. The main trial end-point will be the time to first infection.

Evaluation of the impact of interventions at a community and health system level

Many interventions have an impact both at the individual and at the community level. Those most effective at an individual or household level (such as drugs or treated nets) may differ in effectiveness at a community level. Thus, one of the main objectives of the GMP research programme is to evaluate
interventions at community and household levels as appropriate. Two projects have been approved that address this issue.

An investigation of the economic and socio-economic determinants of the demand for malaria treatment.

Principal Investigators: Dr William Mwengee (Bombo Hospital), Dr Robert Pool (LSHTM), Dr Warren Stevens (MRC The Gambia), Dr Virginia Wiseman (LSHTM)

Collaborators: Ms Lesong Conteh (LSHTM), Dr Mamo Jawla (DoSH, The Gambia) Dr Amy Ratcliffe (MRC, The Gambia) and Dr Gijs Walraven (MRC, The Gambia).

This study aims to investigate the factors influencing household demand for the treatment of malaria in Tanzania and The Gambia. Qualitative and quantitative methods will be used to explore why households make certain economic choices relating to malaria treatment and how this relates to the economic situation of the household. Particular attention will be paid to the way price, income, (perceived) quality of care/service, current health status, cost of access, ethnicity, religion, tribal affiliation, household size, marital status, and other demographic variables influence consumption choices.

This study will investigate the demand for different forms of malaria treatment, health care providers, the timing of treatment and the quantity of care consumed in both countries. A sub-sample of 300 households will be asked to record their consumption and expenditure in diaries and to participate in a series of in-depth interviews exploring the reasons behind the entries in the diaries and the strategies used by households to cope with the associated cost of malaria. The field workers conducting the in-depth interviews will also observe at close hand why households make certain economic choices relating to malaria and how this relates to the economic situation of the household.

The quantitative data from the household survey and the diaries will be used to develop econometric models of demand. To avoid selectivity bias, exogenous measures of price and quality will also be obtained from retail outlets and used in the econometric analysis. The quantitative results will be triangulated with the qualitative data to assess validity and to identify method-dependent differences in the consumption and expenditure data. All of the data will be combined to form a composite, in-depth picture of the demand for malaria treatment and health care more generally. This information will inform the design of current and future malaria treatment and prevention programmes and contribute to the development of local expertise in health economics. Project staff are currently being recruited. The project manager/economist post was filled in April of this year. All other staff including the remaining three research and training positions are expected to be filled by August 2002.
Scaling up ITN coverage in Tanzania: Understanding the contribution and limitations of the private sector.

**Principal Investigators:** Dr Jo Lines (LSHTM), Prof Anne Mills (LSHTM).

**Collaborators:** Dr Salim Abdulla (Ifakara Health Research and Development Centre/NMCP Tanzania), Dr Kara Hanson (LSHTM), Dr Caroline Jones (LSHTM), Dr Eve Worrall (LSHTM).

The Abuja meeting of African Heads of State set ambitious targets for ITN coverage in Africa: at least 60% of high risk groups (pregnant women and young children) should own and use an ITN by 2005. There has been much discussion of alternative intervention strategies, but very little evidence to inform this debate.

Nevertheless, it widely recognised by malaria control authorities that private sector involvement will be necessary if these goals are to be achieved and sustained. On the other hand, there is also wide recognition that commercial systems will not be sufficient alone: some form of subsidy will needed in order to guarantee coverage of the most vulnerable groups.

In Tanzania, the commercial market in nets has expanded greatly in the last ten years. Now, two major national level ITN interventions are about to start. One is a DFID-supported social marketing project (‘SMARTNETS’) which is intended to foster continued growth of demand, and of private sector activity in supplying nets and insecticide. The other is funded by the Global Health Fund. It will support the targeting of subsidies to pregnant women and young children, and will be the first national-scale use of vouchers for this purpose. These two interventions thus offer an opportunity to assess the emerging ‘RBM strategic framework’ for ITN implementation in Africa, which recommends a pluralistic combination of targeted subsidies and private sector growth, but which is not well supported by experience of the suggested approaches.

Our research project’s aim is to inform scaling up strategies in two ways. One is by tracking the progress of the commercial sector in nets and insecticide in Tanzania, and the limitations of its ability to achieve geographical penetration and high rates of coverage amongst groups that are especially vulnerable for biological and/or economic reasons.

In order to collect data on sales at retail level, the technique of retail audit will be used. This technique is familiar in market research, but has apparently never been used to study markets in health products. It involves monitoring stock levels and restocking patterns in a panel of outlets, in order to track prices, sales volumes and market shares. Surveys will be used to collect complementary data on household coverage, in-depth interviews will be used to collect data on the structure of the supply chain, and on the behaviour and incentives of suppliers and traders.

The project will also monitor and evaluate an innovative scheme that will employ vouchers to target subsidies to pregnant women. The basic idea is that vouchers will be given at ante-natal care clinics, and will enable pregnant women to buy nets and insecticide from commercial outlets in the usual way but at a discount price. This scheme is to be funded by a grant from the Global Health Fund, and will be implemented at national level. The performance of this scheme will be investigated by tracking coverage of target groups, leakage of the subsidy to non-target groups, and the costs of the system.
‘Mystery shoppers’ and key informant interviews will be used to understand how the system could be cheated. The results will be used to refine the system.

The study will collaborate closely with the NMCP, with the SMARTNETS project (managed by PSI), and with the national ITN Steering Committee.

Lapdap Public Health Group

Lapdap (chlorproguanil-dapsone) has been developed within a public private partnership as an affordable treatment for uncomplicated *falciparum* malaria in Africa. This partnership comprised WHO, GlaxoSmithKline, DFID, the University of Liverpool, LSHTM and the Wellcome Trust. Drug development has been steered by the Lapdap 'Product Development Team' (PDT).

Phase I, II and III clinical trials were conducted to provide data for the regulatory authorities. These studies demonstrated that Lapdap is efficacious and is well tolerated. They were conducted in a very controlled manner and on carefully selected patients who had no other complications or underlying disease. However if a drug is designed for a public health need, and therefore for widespread community use, then studies should now be conducted in ‘real life’ settings where the drugs true utility can be tested. As this work fulfils one of the major GMP research objectives (evaluation of antimalarials and combinations of antimalarials), GMP has pledged US$1.5 million towards this work, through an agreement made with WHO TDR through the offices of the Lapdap PDT.

The Lapdap Public Health Group (PHG) is a research initiative established within WHO TDR to gather an evidence base so that data can be made available to decision-makers. The PHG has a 'pathfinder role', and it is hoped that lessons learnt and methodologies established could benefit the evaluation and safe introduction of any new treatment for malaria. To achieve this the PHG will need to build partnerships between experts from endemic countries in public health and social science. There are several key areas that have been identified as priorities for research, these are

- optimise dosing: finding a practical alternative to dosing by weight;
- examine the relationship between compliance and clinical outcomes;
- information, education and communication work which, among other aims, will examine ways of optimising compliance;
- real life effectiveness and safety;
- pharmacovigilance;
- *in-vivo* resistance monitoring; and
- optimising packaging and supply to improve proper use

A workplan has been agreed and the first studies are due to begin in September 2002. The planned work will run until end 2007.

Research Initiative Fund

A sum of $250,000 has been set aside from the research funds to support small grants, up to a maximum of $30,000. The aim of these projects is to give investigators support for pilot studies that may be needed to provide data to produce a major application to the GMP or other funding agency or to support an add-on study that will increase the value of a project that has already been funded. Proposals can be submitted at any time and are considered by the Director and Deputy Director of the GMP with support from external referees so that turn around time is rapid. Five proposals were approved in 2001-2 with two rejected. The successful proposals are listed in Annexe 3. Further use of the Research Initiative Fund was the rental of the Lighthouse Residence (Figure 17).

As many of the GMP funded research projects are ongoing in NE Tanzania it is more cost-effective and efficient for the staff to have a base in Tanga, which can be used as both accommodation for visiting scientists and as office space. The Residence has been rented for a period of 3 years and also provides free accommodation for the family who provide housekeeping, laundry and security services to the scientists.
The Research Initiative Fund (RIF) is also used to support the GMP Researchers in hosting meetings and workshops. This has included the Vector Control workshop, hosted by Dr Mark Rowland (discussed in more detail above) in September 2001 and the Malaria Vaccine Launch, hosted by Prof Brian Greenwood in February 2002. The RIF also provides funds for a miscellany of other research activities, these include; funds for the GMP Researchers to visit sites and establish collaborations in advance of research proposal submission and funds for insectary and laboratory equipment.

GMP Laboratories

After extensive consultation, the plans for two malaria research laboratories in Tanzania have been agreed. The laboratories, based at Kilimanjaro Christian Medical College, Moshi and Bombo Hospital, Tanga will focus on immunology and pharmacology respectively. Tendering has now been completed and approval for the release of funds from the LSHTM Planning & Finance Committee is awaited. Rules pertaining to VAT exemption have recently been changed in Tanzania. This means that building works will not commence until issues relating to VAT exemption have been resolved with the Ministry of Finance. This is expected to cause only a short delay. It is anticipated that several of the research projects operating in Tanzania will make use of these facilities.
Knowledge into Practice

Having firmly established the capacity development and research components of the Partnership, GMP is now beginning to turn its attention towards the third component – knowledge into practice. A job description has been drafted for the position of Knowledge into Practice Co-ordinator. Exploratory discussions are in hand with the Ministry of Health in Tanzania to confirm whether it would be possible, and appropriate, for the post holder to work along side the NMCP in Tanzania. It is hoped that the post holder will find ways of implementing existing interventions which have already been approved as policy.

Publications

Few publications have yet arisen directly out of GMP funded research or training activities. Publications on malaria by GMP staff that relate to work completed before the start of the partnership can be found in the 2001-2 Malaria Centre Annual Report, copies of which are available from Dr Sue Smith (sue.smith@lshtm.ac.uk) or can be viewed through the malaria centre web page (http://www.lshtm.ac.uk/centres/malaria/).

Financial Issues

By Spring 2002 GMP had accurately identified the scope of the different components of the Programme. This enabled a comprehensive budgeting exercise to be carried out, from which a cash flow forecast was generated and a new projected income calculated. Financially, GMP remains on target, with 93% of the budget committed to meet GMP objectives.

The financial statement for 2001/02 has been prepared by GMP and signed off by the LSHTM Financial Officer. The statement shows the current budget, income and expenditure to date, and current commitments. Please contact the GMP Manager if you would like a copy of the statement.
Priorities for 2002/03

Targets for the forthcoming year (July 2002 – June 2003) include:

Training activities at African centres

- training activities that have already been approved, or will be approved at the July 2002 meeting of the Training Committee will run in all countries and where possible, evaluation will also have taken place;
- the effectiveness of the Training Committee will be reviewed and, if required, the meeting structure will be altered to provide a better service to the each of the training centres; and
- business plans will be drafted for each training centre.

Post doctoral programme

- the latest recruits will commence their LSHTM contracts, liaise with their LSHTM counterparts and have submitted and had approved their research proposals.

PhD programme

- where relevant, students starting in 2001/02 will successfully upgrade from MPhil to PhD status;
- students commencing their studies in 2001/02 will have the opportunity to meet each other and discuss their research experiences at the MIM Conference in Arusha, November 2002; and
- all students selected in the second round will commence their studies in October 2002.

Capacity development & research into practice posts

For both posts:
- recruitment will be completed;
- in country offices will be established; and
- work plans will be agreed, and work will commence.

Research projects

- the last round of research awards from the initial tranche of funds will be made;
- all projects funded in 2001-2002 will have commenced and
- annual reviews of all the projects listed in this report will have taken place.

Buildings

- the training centres in Ghana and Malawi will be completed, and staff will move into the new buildings;
- the offices in Banjul, The Gambia will have been refurbished and staff relocated into the building; in addition steps will be taken to progress building plans for 2004/5 and identify a source of funds; and
- the training centre and laboratory building in Tanzania will be nearing completion.
Annexe 1 Committee Membership

**Expert Oversight Committee**

**Members**
Dr Hatib Njie (WHO retired, The Gambia) CHAIR  
Dr Dan Colley (University of Georgia, USA)  
Dr Don de Savigny (TEHIP, Tanzania)  
Prof Wen Kilama (AMANET, Tanzania)  
Dr Jane Kengaya-Kayondo (WHO Geneva)  
Dr Jean Francois Trape (IRD, Senegal)  
Prof Peter Kazembe (MoH, Malawi)  
Prof Francis Nkrumah (Noguchi, Ghana)  

Representatives of WHO, DFID, MRC the Gates Foundation are also invited

**Attendees**
Prof Brian Greenwood (LSHTM, UK)  
Prof Janet Hemingway (LSTM, UK)  
Dr Andrew Kitua (NIMR, Tanzania)  
Dr Grace Malenga (CoM, Malawi)  
Prof Niels Ørnbjerg (DBL, Denmark)  
Dr Margaret Pinder (MRC The Gambia)  
Prof John Shao (KCMC, Tanzania)  
Prof Geoffrey Targett (LSHTM, UK)  
Prof Thor Theander (CMP, Denmark)  
Dr Fred Wurapa (SPH, Ghana)

**Secretary**
Ms Cathy Bowler (LSHTM)

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**Research Committee**

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Prof Hazel Dockrell (LSHTM) CHAIR  
Prof David Bradley (LSHTM)  
Dr Peter Godfrey-Faussett (LSHTM)  
Prof Paul Fine (LSHTM)  
Prof Richard Hayes (LSHTM)  
Prof David Mabey (LSHTM)  
Dr Barbara McPake (LSHTM)  

**External members**
Dr Ayo Oduoala (WHO Geneva)  
Dr Alistair Robb (DFID)  
Dr Stephen Ward (LSTM)  

**Observers**
Prof Brian Greenwood (LSHTM)  
Prof Geoffrey Targett (LSHTM)

**Secretary**
Dr Tracey Henshaw (LSHTM)

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**Training Committee**

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Dr Paul Bloch (DBL, Denmark)  
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Dr Tom Sukwa (WHO AFRO)  
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# Annexe 2  Key Staff*

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<tr>
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<tr>
<td>Ms Virginia Wiseman</td>
<td>Health Economist</td>
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<tr>
<td>Ms Alison Yates</td>
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</tr>
</tbody>
</table>

* as at 30 June 2002
## Annexe 3 Research Initiative Grants

<table>
<thead>
<tr>
<th>Title of Study</th>
<th>PIs (host institution)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A pilot study to assess the association between malaria and pre-eclampsia at Farafenni Hospital, The Gambia.</td>
<td>Caroline Shulman (LSHTM), Gijs Walraven (MRC, The Gambia)</td>
<td>$9,050</td>
</tr>
<tr>
<td>A small grant to support the completion of the Malarone trial, Macha Mission Hospital, Zambia.</td>
<td>Steve Bennett (LSHTM), Modest Mulenga (Macha Malaria Research Institute, Zambia)</td>
<td>$18,530</td>
</tr>
<tr>
<td>Response of haemoglobin to oral supplementation with iron in children living in a malaria endemic area of Zambia. Determination of entomologic inoculation rate (EIR) and the mosquito species involved in <em>P falciparum</em> transmission in the Macha area, Zambia.</td>
<td>Phil Thuma (Macha Malaria Research Institute, Zambia)</td>
<td>$7,500</td>
</tr>
<tr>
<td>A comprehensive ethnobotanical survey of anti-insect plant use among the indigenous minority peoples of Yunnan, SW China.</td>
<td>Nigel Hill (LSHTM)</td>
<td>$19,972</td>
</tr>
<tr>
<td>Immunological properties of <em>Plasmodium falciparum</em> merozoite surface protein-2 (MSP-2)</td>
<td>Eric Tongren (LSHTM)</td>
<td>$15,340</td>
</tr>
<tr>
<td>The micro-spatial epidemiology of malaria in epidemic-prone and endemic areas in Western Kenya</td>
<td>Siân Clarke (LSHTM), Joseph Kiambo Njagi (MoH, Kenya), Simon Brooker (LSHTMTM), Jon Cox (LSHTM)</td>
<td>$15,810</td>
</tr>
<tr>
<td>A stitch in time: turning poor bednets into good ones</td>
<td>Siân Clarke (LSHTM), Steve Lindsay (University of Durham), Catherine Painter-Brick (University of Durham)</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

**Total allocated by Director**

$106,202
PARTNERS

Centre for Medical Parasitology, University of Copenhagen, Denmark
Danish Bilharziasis Laboratory, Denmark
College of Medicine, University of Malawi, Malawi
National Institute for Medical Research, Tanzania
Kilimanjaro Christian Medical College, Tanzania
Liverpool School of Tropical Medicine, UK
London School of Hygiene & Tropical Medicine, UK
Medical Research Council Laboratories, The Gambia
School of Public Health, College of Health Sciences, University of Ghana, Ghana

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