

Report on the

**Sixth intercountry meeting of national
malaria programme managers**

Cairo, Egypt
3–6 June 2006



**World Health
Organization**

Regional Office for the Eastern Mediterranean

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1. INTRODUCTION

The sixth intercountry meeting of national malaria programme managers was held in Cairo, Egypt, from 3 to 6 July 2006. The meeting was organized by WHO Regional Office for the Eastern Mediterranean to:

- review with national malaria programme managers the progress made and the problems encountered in the implementation of malaria strategies in their own countries;
- discuss and finalize the 2006–2010 strategic plan with cost estimation;
- present the regional strategic plan for 2006–2010; and
- provide countries with updated information on new developments in malaria prevention and treatment measures.

The meeting was inaugurated by Dr Hussein A. Gezairy, WHO Regional Director for the Eastern Mediterranean. Dr Gezairy pointed to the fact that malaria was still exacting an unacceptable toll on the health and economic welfare of the world's poorest communities. Progress had been made by several malaria-endemic countries in the Region, namely the Islamic Republic of Iran, Iraq and Saudi Arabia in achieving remarkable reductions in the burden of malaria and in proceeding well towards elimination. Successful implementation of malaria-free initiatives had been implemented in some endemic areas in Yemen and Sudan. Challenges had been faced by countries with a high malaria burden and those in complex emergency situations, including Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen.

Dr Gezairy reminded participants of the resolution of the Fifty-eighth World Health Assembly which urged Member States to establish national policies and operational plans to ensure that at least 80% of those at risk of, or suffering from, malaria benefited from the major preventive and curative interventions by 2010 in accordance with the WHO technical recommendations, to ensure a reduction in the burden of malaria by at least 50% by 2010, and by 75% by 2015.

The Regional Director emphasized the effective treatment of malaria as an element of the success of the malaria control programme. He referred to the WHO guidelines on the treatment of malaria which were issued in 2006, and highlighted the fact that the malaria drug policy should be changed when treatment failure equals or exceeds 10% as assessed through the monitoring of efficacy for 28 days. In this regard, artemisinin-based combination therapy (ACT) was the recommended treatment for all cases of uncomplicated falciparum malaria. All malaria-endemic countries in the Region had revised their malaria drug policy and had adopted ACT as the first line of treatment for falciparum malaria and some malaria-free countries had also updated their drug policy and incorporated ACT for the treatment of imported falciparum malaria. There has been slow implementation of the new drug policy and calls for its scaling up.

Dr Gezairy addressed the issue of prompt and accurate diagnosis of malaria as key for effective disease management and the reduction of unnecessary use of antimalarial medicines. Parasitological diagnosis of malaria with microscopy or, where not available, rapid diagnostic tests, was recommended in all situations with few exceptions where only clinical diagnosis

without confirmation was accepted, such as among children under 5 years of age in areas with high transmission, as well as in severe cases where immediate parasitological confirmation was not possible. There was a need for the strengthening of microscopy in malaria-endemic countries in the Region.

In terms of malaria prevention, continuous support was provided by the Regional Office to ensure that the tools available for vector control, such as indoor residual spraying and insecticide-treated bednets were used properly and appropriately. Existing WHO guidelines and manuals on indoor residual spraying and insecticide-treated nets were being revised to ensure equity, maximum coverage and sustainability. In the case of bednets it had been recommended that they were provided free-of-charge in rural areas, but where resources were limited, implementation should be in phases targeting vulnerable groups. In collaboration with partners and other relevant training institutes, the Regional Office was now in the process of initiating a diploma or masters degree programme on entomology and vector control, preferably in one or more of the WHO collaborating centres in the Region.

The Chairmanship was shared on a rotating basis. The agenda, programme and list of participants included as Annex 1, 2 and 3.

2. GLOBAL MALARIA PROGRAMME 2005

2.1 Report on the global malaria programme

Dr Arata Kochi

Rough estimates indicate that globally 3.2 billion people are at risk of contracting malaria with 350 to 500 million cases and more than one million malaria deaths annually. In Africa, where infection is mostly from *P. falciparum*, children under the age of 5 and pregnant women are at the highest risk of contracting the disease. Outside Africa, the risk is mainly among marginalized groups of the population. Malaria is one of the most significant diseases among refugees in complex emergency situations. Malaria is also associated with high direct and indirect costs. In countries with intense transmission, malaria is responsible for an average loss of 1.3% of annual economic growth. Malaria contributes to poverty through the cost of medical care, the reduced productivity of sufferers and caretakers, the adverse effect on cognitive development, the discouragement of foreign investment, trade and tourism and the inhibition of movement of labour.

Abuja coverage targets set for Africa by 2005 include: access to appropriate treatment within 24 hours from the beginning of symptoms for at least 60% of those suffering from malaria, to achieve at least 60% coverage with preventive measures, such as insecticide-treated bednets (ITNs) and intermittent preventive treatment (IPT), for at least 60% of those at risk of contracting the disease and allocation of at least 15% of the government budget to the health sector. A number of southern and central African countries have started to make progress in the fight against malaria as a result of funds from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and the provision of WHO technical assistance, while

others are falling far short of the Abuja targets and monitoring and evaluation systems are often weak.

The emergence of new tools such as artemisinin-based combination therapy (ACT), long-lasting insecticidal nets (LLIN), malaria rapid diagnostic tests (RDTs) and an increase in funds for malaria through the Gates' Foundation, the GFATM and the World Bank (WB) offer some hope for the future. However, many challenges still need to be addressed, including weak political commitment of governments in malaria-endemic countries, weak monitoring and evaluation systems and the increasing resistance of parasites to drugs and mosquitoes to insecticides. Other issues that need to be addressed include the provision of technical assistance, the development of human capacity and management capacity at country level and production capacity for drugs and LLINs.

WHO headquarters is taking the lead in combating malaria globally, but Africa still remains still a high priority. Clear strategies have been developed with a focus on methods of implementation of these strategies. The global malaria control programme for 2006–2007 focuses on activities related to estimation and modelling of the malaria burden, development of minimum indicators for the monitoring of performance, the implementation of household and health facility surveys for assessment of effective coverage and impact and the development of country databases and cost analysis. This is in addition to the development of strategies for case management, indoor residual spraying (IRS) and surveillance for resistance monitoring. Guidelines are being developed for the prevention and control of malaria epidemics and elimination, and efforts are being undertaken to enforce the ban on oral artemisinin monotherapy.

2.2 Progress of malaria control/elimination in the Region

Dr Hoda Atta

In the Eastern Mediterranean Region, malaria remains a public health threat. In 2005, the total estimated number of cases of malaria reached 10.5 million including 37 000 deaths of children under 5. Regionally, 248 million people live in areas at risk of malaria transmission, and of these 43% are at risk from both *P. falciparum* and *P. vivax*.

Countries in the Region are categorized into three distinct groups according to the state of malaria transmission in the country. Group 1 includes countries which have eliminated malaria or those with very limited malaria transmission in residual foci. Group 2 includes countries with a low malaria burden limited to certain areas and with effective malaria programmes. Group 3 includes countries with a moderate to high malaria burden, a weak health system and/or experiencing complex emergencies. For countries in group 1, the objective is to prevent the re-establishment of malaria transmission in malaria-free countries and to eliminate residual foci of malaria. For group 2, the objective is to eliminate malaria and to prevent its reintroduction, and for those in group 3, the objective is to halve the malaria burden (incidence, severity and mortality) by the end of 2010.

In 2005, several achievements were made in the Region, particularly in the area of the diagnosis and treatment of malaria. The regional malaria programme supported the updating

of treatment policy in Djibouti, Saudi Arabia, Somalia and Yemen. Implementation of ACT policy in Afghanistan, Islamic Republic of Iran, Saudi Arabia and Sudan was also supported. A stock of artemether-lumefantrine was procured and provided for malaria-free countries for the treatment of imported cases of falciparum malaria. Continuous support was provided for the monitoring of antimalarial drug efficacy in falciparum-endemic countries. In the area of laboratory diagnosis, the focus was on capacity. Twelve (12) master trainers from Afghanistan were trained in the Islamic Republic of Iran on malaria microscopy and quality assurance. The Region also established a slide bank to be used by countries for training activities. The first course for specialist training in advanced malaria microscopy is to take place in Oman in early 2007.

WHO Regional Office has supported countries in strengthening the capacity of the malaria control programme at all levels. A regional strategic plan was developed for 2006–2010 and malaria-endemic countries (Afghanistan, Djibouti, Somalia, Sudan and Yemen) were supported in developing multi-year malaria control strategies. Support was extended for the planning, implementation and evaluation of malaria elimination strategies in the Islamic Republic of Iran, Iraq and Saudi Arabia. A strategy for the control of malaria epidemics in Somalia was developed in order to be used as a guiding document to develop a comprehensive preparedness plan for the control of malaria epidemics.

In the area of human resource development, 165 participants, mostly from the Eastern Mediterranean Region, were trained in malaria planning and management over nine courses held in Bandar Abbas. The tenth course is planned for early 2007. There is an ongoing course for 20 Iraqi trainees in the WHO collaborating centre for medical entomology and vector control in Ain Shams, Cairo. The central laboratory for malaria diagnosis in Oman was assessed for its possible identification as a regional centre of excellence for malaria laboratory diagnosis. The centre will provide the first one-month course for senior laboratory technicians on malaria microscopy and quality assurance starting in January 2007. A regional consultation to develop a degree course in Ain Shams University, in collaboration with Istituto Superiore di Sanità (ISS) Rome and the Blue Nile Research and Training Institute (BNRTI) in Sudan, is being planned for August 2006. In 2005, the first intercountry (the Islamic Republic of Iran and Sudan) course on case management was conducted in Sudan.

Somalia and Sudan received technical assistance for the implementation of a baseline malariometric survey. The Regional Office participated with WHO headquarters in the development of a global malaria database which was field-tested in Yemen in June 2006. WHO Regional Office supported, through the Special Programme for Research and Training in Tropical Diseases (TDR) Small Grants Scheme (SGS), six operational research projects from the Islamic Republic of Iran, Iraq, Somalia and Sudan at a cost of US\$ 52 214.

The Regional Office has succeeded in mobilizing resources for countries through the GFATM, United States Assistance for International Development (USAID), European Commission Humanitarian Aid (ECHO), Global Environmental Facility (GEF), Arab Gulf Programme for United Nations Development Organizations (AGFUND) and United Nations Development Group (UNDG) Iraq Trust Fund. Collaboration is ongoing with the member countries of the Gulf Cooperation Council (GCC) for the mobilization of resources for Yemen

in the context of a malaria-free Arabian Peninsula. WHO facilitated the meeting of the Deputy Health Ministers of the GCC member countries in Cairo in April and July 2006 to discuss methodologies for supporting malaria control in Yemen.

Successful experiences, such as malaria elimination in Morocco, were documented. With technical support from WHO, the United Arab Emirates documented its programme as part of the certification of a malaria-free status. The documentation of the Khartoum malaria-free initiative and the malaria elimination project in Socotra Island, Yemen, is being planned.

2.3 Achievements and challenges in malaria vector control implementation in the Region

Dr Abraham Mnzava

The global malaria programme has identified IRS and LLIN as the two main interventions for vector control. To achieve maximum impact of these interventions, high coverage is required. The target is to provide one LLIN per two persons or per sleeping arrangement, and where resources are limited, a targeted and a phase-wise approach is recommended. This approach has always been promoted in the Region, although, additional resources will be needed to achieve a high coverage rate in low-income countries.

Data on IRS indicate considerable variation in the rate of coverage between one country and another and from one round to another. Also, in some countries, the amount of insecticide used is not proportional to the number of house structures reported to have been sprayed. For IRS, coverage below 80% is unacceptable. It is also recommended to use wettable powder formulations of insecticides. Other formulations can be cheaper but are not cost effective. In case of lack of agreement between coverage and the amount of insecticides used, it is important to review the selection and target criteria and to make sure that teams at different levels of operation are able to select appropriate insecticides and estimate the correct amount required.

Some countries in the Region reported a high rate of coverage of IRS although a decrease in the burden of disease was not observed. This calls for a critical review of the quality of spraying equipment, insecticides used and the efficiency of the spraying team. Although the length of the transmission season is known, in many instances spraying is not on time which may be attributed to problems in planning, budgeting or procurement and delivery. It is therefore important that determination of the number of spray rounds and their timing should be according to epidemiological stratification of targeted areas.

For expansion of the use of IRS in the Region, several challenges need to be addressed. For example, an innovative approach is needed to implement IRS in countries with a decentralized health system such as in Pakistan. It is also necessary to strengthen national capacity to respond to epidemics in countries, such as Somalia and Djibouti, and to explore the possibility of introducing IRS in southern Sudan where appropriate infrastructure does not exist, and in Afghanistan in border areas with Tajikistan.

Coverage with ITNs/LLINs is still low. Coverage of 21% is reported from Sudan, while in Somalia coverage is only 7%. On the other hand, reliable information on the coverage of ITNs in Afghanistan, Pakistan and Yemen is not available. If the number of distributed nets, including those torn, were known for the last 3 years, it would be possible to estimate the number of nets available and the percentage of the population protected. Key indicators for monitoring the implementation of ITNs/LLINs would include the proportion of distributed nets out of those needed and the proportion of the population who slept under a LLIN the night prior to the survey. Another indicator would be the proportion of households with one ITN/LLIN for two persons.

Given the limited choices of insecticides available, routine monitoring of vector resistance is of paramount importance in managing resistance whenever detected. In 2005, technical support was provided to some countries of the Region in this respect, in addition to the supply of susceptibility test kits and papers. Resistance to DDT was reported from Iraq, Morocco, Saudi Arabia, Sudan and Yemen. As a result, Morocco switched to pyrethroids for epidemic control, however, if the goal is malaria elimination, it may be necessary to consider a non-excitorepellant insecticide. In Sudan, resistance to pyrethroids was reported from Khartoum and Gezira which calls for immediate implementation of a resistance management strategy with a possible shift to a carbamate. Except in Sudan and Morocco, the number of sentinel sites for the monitoring of insecticide resistance is inadequate. In Oman, where larval control is the main vector control strategy there is a very high level of resistance to Temephos and a switch to Bti and/or insect growth regulator (IGR) is currently being explored.

To strengthen the capacity for vector control, Member States through Resolution EM/RC.52/R.6 endorsed the regional strategic framework for integrated vector management (IVM) and committed themselves to ensuring that they had the national capacity to plan and implement vector control, allocating a specific budget for this activity and establishing a functional intersectoral mechanism for the collaboration and coordination of all sectors in their countries. This was in addition to the development of national strategies and plans of action based on the carrying out of regular vector control needs assessment (VCNA) to identify needs, gaps and opportunities for vector control. Nine countries (Afghanistan, Djibouti, Egypt, Islamic Republic of Iran, Jordan, Morocco, Sudan, Syrian Arab Republic and Yemen) are currently undertaking a comprehensive vector control needs assessment which will result in the development of national IVM strategic plans. A regional consultation is planned in response to the request by Member States to strengthen regional capacity by establishing a master degree programme in entomology and vector control.

2.4 Progress of malaria control/elimination in WHO European Region

Dr Mikhail Ejov

In WHO European Region, malaria remains a problem in Tajikistan and Turkey. In Azerbaijan, Kyrgyzstan and Georgia, malaria epidemics have been contained and the achievements need to be consolidated. Malaria is still a focal problem in Armenia, Turkmenistan, Uzbekistan and the Russian Federation. All remaining European countries are free from autochthonous and imported malaria.

In countries of central Asia, large-scale epidemics of malaria have been contained, transmission of falciparum malaria has been significantly reduced and its elimination is feasible in Tajikistan and the subregion as a whole. This is in addition to the substantial reduction of the incidence and number of active foci of *P. vivax* malaria. There is still concern in the Region as 30% of the population of central Asia live in areas at risk of malaria; the toll of malaria is underestimated in Tajikistan and Uzbekistan and in the southern part of Tajikistan, endemic malaria is a focal problem. In the Region, cross-border malaria is still a problem and potential outbreaks could result in a high incidence of the disease.

In the Caucasian region, large-scale epidemics of malaria have been contained. This region witnessed a substantial reduction in the incidence and the number of active foci of *vivax* malaria and its elimination is feasible in Armenia. In this Region, almost 45% of the total population live in areas at risk of malaria. The toll of malaria is underestimated in Azerbaijan and potential outbreaks may result in a high incidence of the disease. Also, cross-border malaria is a problem.

The goals set for the European Region are to interrupt the transmission of falciparum malaria by 2010 in Tajikistan, and in central Asia as a whole, to interrupt the transmission of malaria by 2015 and to eliminate the disease within all affected countries of the Region. In settings where malaria control is recommended, the strategy should be focused on early diagnosis and treatment, planning and implementation of cost-effective and sustainable, preventive measures, early detection, containment and prevention of epidemics, reinforcing malaria surveillance and increasing community participation for malaria prevention. In settings where elimination is feasible, particular attention should be given to operational planning for malaria elimination, application and regular evaluation of IRS and other attack measures, early notification of all suspected and confirmed cases and treatment and building a reliable and sensitive malaria surveillance system.

The main challenges faced are the limited financial resources invested in malaria control and elimination by governments and donors and identifying ways to attract donors' interest in supporting the new regional malaria elimination initiative. For 2006–2007, priority actions include technical guidance and financial support in planning, implementing and evaluating the anti-malaria programme, maintaining effective partnerships to increase overall resources to support malaria control and elimination, ensuring that actions related to malaria control and elimination are a priority on the health and development agenda of targeted countries, and that pilot countries are fully supported in their efforts to move forward with elimination campaigns. The WHO Regional Office for Europe will continue to support operational research related to malaria. Possible areas of collaboration between the Regional Office for Europe and the Regional Office for the Eastern Mediterranean include cross-border malaria-control projects in areas between central Asian countries and Afghanistan, as well as between Caucasian countries, the Islamic Republic of Iran, Iraq, Syrian Arab Republic and Turkey.

3. MALARIA CONTROL PROGRAMME PROGRESS, CHALLENGES AND THE SHARING OF EXPERIENCE FROM HIGH-BURDEN COUNTRIES

3.1 National malaria and leishmaniasis control programme in Afghanistan

DrKhalil A. Kohestani

In 2005, only 7% of reported confirmed malaria cases were due to falciparum malaria which shows a significant reduction in comparison with the 2002 figure of 21%. To contribute to the improvement of the health status in Afghanistan, the malaria control programme updated the national malaria strategic plan to reduce malaria morbidity and mortality by 50% and 80%, respectively, by 2010.

Case management is fully integrated into the basic package of health services (BPHS) with monitoring, supervision, evaluation and support provided through the national malaria control programme and malaria coordinators at provincial level. In 2005, the national malaria control programme organized a national training session on the management of simple and severe malaria for 138 health professionals and seven national laboratory master trainers were trained in the WHO regional malaria training centre in Bandar Abbas, Islamic Republic of Iran. The centre has trained 50 microscopists in Afghanistan. Three out of the four established sentinel sites have continued monitoring drug efficacy. Studies on ACT during 2005 showed 100% efficacy.

For vector-control activities, the malaria task force requested the Ministry of Public Health to include LLINs in the list of essential medicines for the purpose of tax and tariff exemptions. A total of 2.1 million LLINs were requested in the proposal for the GFATM round 5. In 2005, 202 366 LLINs were distributed in the provinces of first and second malaria stratum.

Monitoring and evaluation activities are carried out by senior staff of the national malaria control programme. In addition, an integrated database for the management of malaria, tuberculosis and HIV/AIDS was developed. No epidemics were reported during 2005, however, training on epidemic preparedness and response, as well as the pre-positioning of anti-malarial drugs for emergent situations was carried out in the 14 WHO-supported high priority provinces.

In 2005, three operational research projects were conducted, these included: a study on malaria in pregnancy, an evaluation of an eight-week primaquine regimen for the radical cure of *vivax* malaria in the eastern region and the adherence of the private sector to the national malaria control programme guidelines in the diagnosis and treatment of malaria.

Coordination exists for the control of malaria across the borders between Afghanistan, the Islamic Republic of Iran and Pakistan. Afghanistan participated in the inception meeting on the malaria elimination initiative in WHO European Region held in Tashkent, Uzbekistan, in October 2005. Also, a national malaria working group is taking part in the preparation for the regional conference on health which will be held in Kabul in April 2006.

The fifth round GFATM malaria proposal for implementation of the national strategic plan was approved. The total amount of approved grant for 5 years was US\$ 28.3 million. The malaria control programme in Afghanistan also received US\$ 800 000 from the United States Agency for International Development (USAID) through WHO and US\$ 75 000 from UNICEF.

The malaria control programme in Afghanistan is facing several challenges, the most important of which is the sustained commitment of government and donors for malaria control. This is in addition to limited human resources and logistics, a lack of security in some areas of the country, the limited involvement of women as health workers and decision-makers, the low purchasing power that makes ITNs unaffordable for the population and the poor participation of the private sector in malaria-control activities, including scaling up of ITNs.

Future plans include the scaling up of ITNs/LLINs, the establishment and strengthening of quality assurance centres for the diagnosis of malaria in integration with tuberculosis and HIV/AIDS, re-activation of entomological activities, strengthening community-based activities and the introduction of home-based management of malaria and increasing the involvement of the private sector and implementation of private sector accreditation schemes.

3.2 Challenges and experiences in integrating the malaria control programme in the basic package of health services in Afghanistan

Mr Kamal Mustafa

The goal of the basic package of health services (BPHS) is to provide a standardized package of basic services that form the core of service delivery in all primary health care facilities. The package is delivered at a cost of US\$ 4.5 per capita per annum and is complemented by an essential package of hospital services (EPHS). The BPHS is provided at four standard levels of facilities to be established primarily on the basis of the population size to be served including health posts, basic health centres, comprehensive health centres and district hospitals. One of the components of the BPHS is the treatment and control of communicable diseases, including malaria, tuberculosis and HIV/AIDS. The BPHS is implemented through contracting out to nongovernmental organizations. Based on available information, current geographical coverage of the BPHS is 77% of the country.

In 2005, the Ministry of Public Health decided to keep the national malaria control programme vertical at the central and provincial levels and fully integrated in the BPHS below the provincial level. At the four levels of the BPHS, interventions related to malaria control include clinical diagnosis and treatment of uncomplicated cases using first line of treatment, distribution of insecticide-treated mosquito nets, information, education and communication (IEC) activities and reporting. Malaria microscopy and treatment of uncomplicated cases not responding to the first line of treatment, as well as complicated cases, are provided at the levels of the comprehensive health services and district hospitals. Supervision and monitoring takes place at the level of the basic health centre, comprehensive health services and district hospitals.

ACT was not included in the first version of the BPHS, mainly as a result of concerns over costs. In 2005, ACT was added in the second version of BPHS. Still, laboratory services for the diagnosis of malaria at the levels of health post and basic health centre are not included in the BPHS. The national malaria strategic plan strongly advocates for inclusion of malaria laboratory diagnosis at the basic health centre level. Workers in the BPHS need training on malaria diagnosis, management and preventive intervention. The future plan is to formulate a national plan for capacity development, training on operational research and evidence-based interventions, as well as creating an intensive training programme for providers of the BPHS.

Integration of malaria monitoring and the evaluation component of BPHS can be considered a good example of smooth and successful integration. National malaria focal points in the BPHS and EPHS have been appointed, malaria indicators for BPHS and EPHS finalized, and an integrated monitoring and supervision checklist and database for malaria, tuberculosis and HIV/AIDS for the national health management information system (HMIS) were developed. Other areas in which the national malaria control programme and BPHS are expected to collaborate are in the promotion of the home-based management of malaria, quality control for laboratory services, detection and response to outbreaks, distribution of ITNs and the conducting of IEC activities.

3.3 Malaria control programme in Djibouti

Dr Karim Djibaoui

In Djibouti, 470 800 of the population are at risk of contracting malaria, of whom 286 000 live in urban areas. Poor environmental conditions and sanitation prevalent in urban areas encourage the transmission of malaria among the population. Malaria transmission occurs throughout the year with two peak transmission times occurring in July and October. In 2005, a total of 2590 malaria cases were reported and only 413 cases were confirmed by microscopy. Most of the reported cases were among children under the age of 5 years (677 cases) and pregnant women (328 cases). This may not reflect the real extent of malaria in Djibouti as a result of underreporting.

In 2006, the national strategic plan for 2006–2010 was finalized and malaria drug policy changed with the introduction of ACT. Artesunate plus sulfadoxine-pyrimethamine will be used as the first line of treatment and artemether-lumefantrine as the second line of treatment for uncomplicated malaria. Quinine will be used in complicated cases of malaria and during the first trimester of pregnancy. However, this new drug policy has not yet been implemented.

The main achievements of the national programme include the strengthening of the surveillance system with weekly reporting of suspected and confirmed cases, analysis and feedback, and efforts are in place to improve malaria diagnostic services. RDT is being considered for the confirmation of suspected cases in areas with no laboratory facilities, but has not yet been implemented. Vector-control activities include environmental management, biological and chemical control of larvae and outdoor spraying for the control of adult mosquitoes. From 2005–2006, a total of 23 150 LLINs were distributed for children under 5 years of age and pregnant women and environmental management was extended to cover 75% of at-risk areas.

The main challenges for the programme in Djibouti are the limited capacity for surveillance, monitoring and evaluation, weak laboratory services, poor response to outbreaks and poor intersectoral collaboration for integrated vector management. The future plan is to meet those challenges by reinforcing the monitoring and evaluation unit, improving laboratory diagnostics, establishing a national committee for the implementation of the new drug policy, adopting measures for the control of epidemics and operational research on vector and parasite distribution and the resistance of mosquitoes to insecticides.

3.4 Malaria control programme in Pakistan

Dr Mohamed A. Khan

In 2005, a total of 102 720 cases of malaria were reported. The highest reported annual parasite indexes (API) were from Balochistan. The proportion of falciparum cases is increasing in Baluchistan and Sindh, although information on malaria-specific mortality is limited. However, 52 deaths were reported from all over the country.

The last drug resistance and monitoring survey was conducted in 2004 at four sentinel sites with WHO and HealthNet International (HNI) support. High failure was detected with chloroquine and amodiaquine. In one sentinel site, a high failure rate of sulfadoxine-pyrimethamine was reported. Artesunate in combination with sulfadoxine-pyrimethamine was proven to be highly effective for the treatment of falciparum infection and the registration of this drug in Pakistan has been initiated. Currently, anti-malarial drugs are provided in the public sector in accordance with the old protocol. The Ministry of Health approved the shift to the new drug policy in 29 districts targeted by the GFATM.

More than 90% of cases of malaria are diagnosed clinically without the possibility of laboratory confirmation, both in the private and public sector. RDT is not yet adopted for the diagnosis of malaria but may possibly be introduced during GFATM round 6.

The national vector-control guidelines are in the final stages of development. The policy is directed toward the use of LLINs through public-private partnership. LLINs are highly accepted by the public but their availability is quite low. A total of 136 000 LLINs were procured through GFATM round 2 and 70 000 have been distributed. A sum of 12 million Pakistan Rupees (PKR) were allocated for the procurement of LLINs and the contract was awarded in June 2006. For IRS, the target in 2005 was to cover 521 449 houses although only 65% of this target was achieved.

In terms of epidemic control, 20 sentinel sites were selected in epidemic-prone districts mainly at border areas with the Islamic Republic of Iran and Afghanistan. Training in epidemic preparedness, detection and response was accomplished. Weekly reporting was initiated in 2005. The detection and responses to outbreaks in earthquake-affected areas proved effective.

Main surveillance activities are through passive case detection reported monthly from the district to the provincial and national level. New tools are being developed for the

collection of information related to vector-control activities and the use of the monitoring and evaluation tool kit for case-management activities.

There is considerable mobilization of resources to combat malaria in Pakistan. Partnerships have been developed between international agencies including WHO, USAID and the World Bank (WB). Collaboration with the corporate sector began in 2005 for the promotion of anti-malarial drugs. Capacity building is considered at all programme levels with a focus on 20 Roll Back Malaria (RBM) districts, 29 districts targeted by the GFATM and 10 border districts. Capacity building is orientated towards training on malaria microscopy and the management, recording and dissemination of data.

Malaria-control activities in the border areas focus on the high-risk bordering districts with Afghanistan and the Islamic Republic of Iran. Activities include strengthening malaria surveillance, epidemic detection and response, capacity building and enhancing vector-control interventions.

3.5 Global Fund round 2 malaria project in Pakistan: Progress and challenges

Dr Mohammad N. Durrani

Over the last two decades, the malaria control programme in Pakistan has received little attention which has led to a deterioration of services and activities. Eighty percent (80%) of the population are seeking diagnosis and treatment through low-quality private sector services. In 2003, the GFATM round 2 targeted priority areas identified as areas with high case loads and prone to epidemics. The main strategies were the strengthening and expansion of malaria microscopy, capacity building and implementation of ITNs in 11 pilot districts. The objectives were to sustain the functionality of 92 peripheral microscopy centres for prompt diagnosis and treatment at health facility level, to strengthen capacity for case management, monitoring and evaluation, to improve the health care-seeking behaviour of the population and to introduce and promote the use of LLINs in selected districts through public-private partnership.

Problems encountered in phase one of the GFATM round 2 included a lack of clarity regarding the Global Fund system and policies and procedures, poor management of the programme due to the rapid turnover of staff, serious delays in the recruitment of staff and the procurement of required items, a lack of communication and coordination, the domination of the public sector and a conflict of interest at various levels of the programme. Accordingly, assessment by the GFATM resulted in a decision not to extend phase 2.

Remedial actions that should be considered are ensuring political commitment, upgrading programme management capacity at all levels, greater involvement of international nongovernmental organizations, establishment of an independent committee for monitoring and evaluation to assess progress, and finally, applying for GFATM round 6.

3.6 Malaria control programme in Somalia

Dr Haji H. Elmi

In 2005, the number of suspected cases of malaria in the country was 28 529. Malaria was confirmed among 12 516 people and 15 deaths were recorded. The malaria control programme in Somalia relies on the early diagnosis and management of malaria cases, vector control through the provision of ITNs, IRS, mainly in epidemic-prone areas, and the provision of IPT for pregnant women in hyperendemic areas, epidemic preparedness and control, mainly in the north-east and north-west zones.

In 2005, WHO continued to support sentinel sites for malaria surveillance, strengthen human resource capacity, including the training of laboratory technicians on basic malaria microscopy, malaria-epidemic preparedness and geographic information systems (GIS). This is in addition to the Horn of Africa Network for Monitoring Antimalaria Treatment (HANMAT) meeting held in 2005 for soliciting, reviewing and funding operational research studies within the network.

The interim drug policy was updated to include artesunate in combination with sulfadoxine-pyrimethamine as the first line of treatment in hospitals and maternal and child health centres for cases confirmed with microscopy or RDT. Quinine is the second line of treatment and indicated for cases of severe malaria, as well as during pregnancy. At the level of health post, sulfadoxine-pyrimethamine is given. IPT was introduced in maternal and child health in the central and southern zones.

For vector control, IRS was implemented in epidemic-prone areas in the north-west zone with the prospect of extending activities to selected villages in the central and southern zones. A total of 187 500 LLINs were distributed through health care facilities.

A malaria outbreak occurred in the central and southern zones in 2005 and the response was undertaken by WHO. There is a plan for epidemic preparedness for the north-west zone with the support of partners and the intention of extending it to other zones.

The future plan involves implementation of home management in basic development needs (BDN) villages, maintaining sentinel sites for the monitoring of antimalarial drugs, including ACT, ensuring an adequate supply of ACT and RDT at all levels, establishing sentinel surveillance in some districts mainly for estimation of the malaria burden and the strengthening of human capacity in vector control. The main constraints facing the activities of the malaria control programme in Somalia are the lack of a central government and the frequent changes in the security situation. This is in addition to a lack of quality laboratory services or a central reference laboratory, the lack of funds and a considerable shortage of logistics and the sustainability of ACT and RDT after the end of support from the GFATM.

3.7 Experience of the introduction of RDTs and quality assurance for malaria microscopy in Somalia

Dr Waqar Butt

Confirmation of suspected cases by microscopic examination is fraught with many difficulties in Somalia, such as the shortage of laboratory services and technicians and failure of the standardization of methods and techniques. Diagnosis of malaria is made on a clinical basis, based mainly on the presence of fever. This has resulted in over-diagnosis of malaria and poor case management of the disease.

RDT was introduced recently in health facilities as mandatory with new anti-malarial treatment (ACT) as the establishment of peripheral laboratories is in its infancy stage and the results are not very reliable. Therefore, using RDTs will present a new experience in Somalia. RDT is broadly accepted in health facilities as a result of the easy training of staff and the fact that no special equipment is required. RDT has the capacity to detect falciparum infection even if the parasite is sequestered in a deep vascular compartment. However, the continuity of supply of RDTs, cold chain, distribution and high temperatures are some of the concerns expressed by those operating the programme. Progress in the use of RDT in Somalia will provide new experiences in its use.

3.8 Malaria control programme in Sudan

Dr Tariq Abdelgadir

In 2005, 1 988 132 cases of malaria were reported, 98% of which were due to *P. falciparum*. A downward trend has been observed in malaria-associated mortality and yet, it represents 4.4%–40.5% of total mortality and 37% of maternal deaths.

Sudan shifted its treatment policy from chloroquine to ACT. The efficacy of artesunate in combination with sulfadoxine-pyrimethamine and Coartem is monitored in four sites and the drug has proven to be effective. ACT is provided free-of-charge to all patients in 10 states covered by the GFATM and five states covered by UNICEF, but 10 states are not covered by the provision of free drugs. As for diagnosis, malaria microscopy is supported by the GFATM and the 3 x 3 project implemented in 10 districts. RDT use is encouraged in the case of a lack of laboratory diagnosis, as in the states of Darfur and Kassala.

For vector-control activities, a total of 270 000 LLINs were made available through UNICEF, and there is an intention to distribute 255 000 LLINs provided by the GFATM this year. In 2005, coverage with ITNs was as low as 21% with a significant gap between rural and urban areas. IRS is applied in selected areas with a coverage ranging from 21% to 98%. Other vector-control measures include the application of larvicidals and biological control. Monitoring of resistance to insecticides is in place and resistance to pyrethroids was detected in the states of Khartoum and Gezira.

Monitoring and evaluation is strengthened by the training of focal points at state level. A baseline malariometric survey was conducted in 2005 in 10 states covered by the GFATM. A

malaria epidemic did not occur, however, in 10 states mechanisms for rapid assessment and response with weekly epidemiologic information and feedback are in place.

Human resource development is receiving considerable attention. Sixty percent (60%) of targeted candidates obtained a diploma in malariology at the Blue Nile Research Institute and 66 candidates at district level received training in epidemiology and integrated vector management covered by the GFATM. There is continuous upgrading in technical capacity through ongoing education and active involvement in all aspects of malaria-control activities. Operational research is ongoing in the areas of estimation of malaria burden, the utilization of midwives for IPT distribution, volunteer-based home-based management of malaria, assessment of RDTs stability and sustainability of biological vector control.

Control of malaria on the border is implemented in collaboration with the Egyptian Government at an annual cost of US\$ 0.5–1 million. Collaboration has been extended to the River Nile state and the New Halfa malaria-free initiative.

3.9 Progress of RBM implementation in southern Sudan in 2005

Dr Jeylani A. Mohamoud

The total number of malaria cases is still high in southern Sudan, however, reported cases have decreased to 337 582 in 2005 compared with 631 004 in 2003. In 2005, clinically-suspected cases of malaria constituted 27% of all causes of morbidity. The efficacy of artesunate in combination with sulfadoxine-pyrimethamine was tested on 57 cases, and that of artesunate in combination with amodiaquine, was tested on 55 cases and validated with PCR; both yielded a 92% result. Artesunate in combination with amodiaquine was recommended as the first line of treatment for uncomplicated cases of falciparum malaria.

A rapid diagnostic test was recommended in line with the implementation of ACT at primary care level. Two training of trainers courses on malaria case management with a focus on ACT and RDT were conducted for 20 partners funded by the European Commission Humanitarian Aid (ECHO) and the GFATM. This was in addition to two training courses on malaria diagnosis with a focus on microscopy and RDT conducted for laboratory technicians at primary health care units and in hospitals.

For promoting the availability of ITNs, coordination between the Ministry of Health, nongovernmental organizations and UN agencies has been enhanced. The national strategy for the distribution of ITNs has been developed by the GFATM malaria working group. This includes social marketing and distribution through health clinics, in addition to community-based distribution. A mapping exercise was conducted to determine the number of nets distributed per county from 2003–2006 and to calculate the extent of coverage. In 2005, nearly 300 000 ITNs were distributed by all agencies. The plan is to distribute nearly 450 000 nets in 2006 and another 130 000 in 2007, with the assistance of the GFATM and UNICEF.

The first training course on the prevention and control of malaria epidemics was conducted for GFATM subrecipient nongovernmental organizations and partners funded by ECHO. The monitoring and evaluation plan was developed only for GFATM subrecipient

partners. The budget for the malaria indicator survey will be included in GFATM proposal for round 6.

Other achievements of RBM implementation include the mobilization of resources, the building of partnerships and the formation of a malaria technical working group. However, many challenges still need to be met, including limited human resources, the lack of quality control facilities, reliability in the control of malaria in neighbouring countries and the availability of GFATM for limited partners. There is a strong need for the mobilization of resources for capacity building and the establishment of a malaria programme unit.

3.10 Report on the Khartoum and Gezira malaria-free initiative

Mr Mahmoud Wais

Malaria remains the most important cause of morbidity in Sudan and contributes to a substantial number of deaths. It is believed that all of the population are at risk and the condition is exacerbated as a result of excessive population movement.

To improve the situation there needs to be a selection of the most suitable package of multiple interventions including improvements in case management, capacity building with particular attention to training and retention, operational research and participatory communication. As a result, a technically-qualified group was formed at central level, a highly influential management and coordination team was developed and a fully operational state malaria control unit was established.

A successful example of a malaria control programme is the Khartoum and Gezira malaria-free initiative. The success of this initiative has resulted from the creation of a core group of expertise, adoption of sound and effective control strategies, enhancing community support and intersectoral collaboration, effective participatory communication and action-orientated political commitment. Capacity building received considerable attention and resulted in the steady growth and development of an efficient management team. Essential supplies and equipment were procured and supplied in a timely manner. Field operations were facilitated by the availability of vehicles, bikes and motor-cycles with a subsequent increase in coverage. Unprecedented effective intersectoral collaboration was developed and has led to the establishment of links between different partners and the involvement of all community sectors.

Activities undertaken in Khartoum included prompt and appropriate diagnosis, establishing quality malaria microscopy, refurbishing of the central reference laboratory and strengthening quality assurance and implementation of adopted ACT treatment policy.

3.11 National malaria control programme in Yemen

Dr Jamal Amran

In Yemen, 60% of the population is at risk of malaria. The annual number of estimated cases is 700 000 of which 90% to 95% are due to *P. falciparum*. In 2005, the number of clinically diagnosed and confirmed cases of malaria reached 200 560. A total of 472 970

slides were examined for the parasite and only 9.3% were positive. A malaria epidemic occurred in Taiz in December 2005.

In respect to drug policy, artesunate in combination with sulfadoxine-pyrimethamine is recommended as the first line of treatment, and as the second line, artemether-lumefantrine. Parenteral quinine is given for severe cases of malaria and during pregnancy. For severe cases, parenteral artemether is an alternative to quinine. Chloroquine remains the first-line treatment for all non-falciparum malaria cases, e.g. *vivax* malaria. The new therapy is prescribed following laboratory confirmation of falciparum malaria by microscopy or RDT, except for remote areas that have no facilities for confirmation.

Coverage of IRS has been increased to cover 56 254 households in 2005. Between 2003 and 2005, a total of 55 923 ITNs were distributed. LLINs were introduced and 111 673 nets were distributed between January and June 2006. The funds made available by various donors are allocated to strengthening all aspects of the malaria control programme in Yemen, including infrastructure, national capacity, the system of monitoring and evaluation and increasing the coverage of LLINs.

A local and international partnership has been developed in respect to malaria control and elimination activities. Cooperation exists between Yemen and Saudi Arabia, Oman, United Arab Emirates and Japan. Control of malaria in border areas has been implemented. IRS in border areas now covers 11 802 households.

Considerable achievements have been made in respect to the strengthening of the entomology and vector-control unit, including updating the map showing the distribution of the vector, development of a system for the procurement of pesticides and the establishment of four malaria units. Challenges include the shortage and lack of motivation of skilled and efficient personnel, poor intersectoral collaboration, increasing resistance of *P. falciparum* to chloroquine and the poor procurement management of anti-malarial drugs, LLINs and insecticides.

3.12 Results of the malaria elimination project in Socotra Island and intensive malaria control in Tihama

Dr Mohamed A. Khalifa

Before the implementation of malaria control efforts and elimination activities, Socotra Island was hyperendemic, and Tihama was meso to hyperendemic. In both areas, *P. falciparum* was the predominant species. Initiation of the malaria elimination project started in Socotra Island in 2000 and the organized control programme started in Tihama in 2001. In Socotra Island, the rate of malaria was as low as 0.05% in 2005.

There was strong political commitment for malaria control and elimination in Socotra Island, as well as in Tihama. After needs assessment and strategic planning, the establishment of an organizational structure and monitoring and evaluation was undertaken, emphasis was laid on human resource development in the form of training courses, as well as the creation of masters and doctorate degrees in areas of relevance to malaria.

Home management was first introduced in Socotra Island in 2000. Each case of malaria on the island is notified. The strengthening of malaria laboratory services in Tihama and their role has been extended beyond microscopic diagnosis of cases to include training, supervision and quality assurance.

As for vector control, the first sentinel site for the monitoring of susceptibility of the vector to insecticides was established in Tihama. IRS was scaled up in addition to the introduction of LLINs and larvicides. The plan is to include biological and environmental control.

Control and elimination activities in Tihama and Socotra Island face many challenges. The most important is the considerable delay in decision-making and in the procurement process. Another challenge is the shortage of staff and the limited skills in diagnosis and treatment and in planning and implementation of vector-control activities. Effective combination between decentralization and centralization of related activities is required as not all activities can be conducted efficiently by the district health team. In Tihama, ongoing agricultural activities also pose a problem for malaria-control activities.

3.13 Malaria parasitic prevalence and coverage indicators surveys in Sudan

Dr Randa M. Abdel Rahman

One major obstacle facing the malaria control programme in Sudan is the lack of baseline information regarding the extent of the disease and the coverage of adopted preventive and curative measures. Indeed, this information is indispensable for the development of national strategies and serves as a basis for the monitoring and evaluation of progress. The national malaria control programme in Sudan has conceptualized a baseline malariometric survey as a key component for guiding the strategies for malaria control.

A cross-sectional survey was conducted in October 2005 in 10 states of Sudan with different patterns of malaria endemicity. These 10 states are clearly differentiated into two distinct strata. The first is the poor savannah area with seasonal malaria and the second is an area of stable perennial transmission. The target population were all those residing in the 10 states at the time of the survey including all age groups and both sexes. Based on the population count developed by the polio eradication programme (2005), a representative sample of the population which constituted 1 per 1000 of the population was surveyed. In each state, the population was stratified according to rural–urban residence and the sample size was proportionally allocated to population size. Households were the sampling unit and the selection was a two-stage procedure. Firstly, enumeration areas were selected using a systematic sampling technique followed by the identification of the households to be surveyed. Eligible participants were all members of the visited household present at the time of the survey.

Data were collected using a pre-designed, pre-tested interview. Malaria-related morbidity was ascertained by recording the temperature at the time of the survey and the identification of *Plasmodium* species in a freshly-collected blood sample. Inquiry was made

into the coverage by mosquito nets, intermittent preventive treatment during pregnancy and treatment-seeking behaviour among the surveyed population.

The inherent strengths of this survey were the adoption of a sound methodological approach, reliance on objective tools for portraying malaria-related morbidity and ensuring maximum data quality and accuracy. Every effort was made to ensure consistency and completeness of the obtained information. In almost all cases, the name of the anti-malarial drug used was obtained and the number of uncertain answers was negligible. Blood samples were collected from 93% of the population and read twice followed by a third reading of all positive slides and those with incongruent results in the two readings. Slide loss was not experienced and failure of linking a particular slide to a particular individual was encountered in only 11 cases. Inability to reach the desired sample size which resulted in under-representation of young men was a limitation recognized in this survey but it was not considered a threat to its validity.

This survey has been implemented successfully and baseline information was collected from 10 states with a population of more than 17 million. Findings confirm that malaria still imposes a high level of burden in Sudan. This survey also identified the gap between the programme target and coverage of ACT adopted as first and second line of national drug policy in 2004. There is a need for the scaling up of coverage with ITNs and IPT, particularly in areas with intense transmission. It is recommended that the database is linked to the available geographic information system for further spatial analysis of the information.

4. TECHNICAL UPDATES ON MALARIA PREVENTION AND TREATMENT

4.1 Update on availability and procurement of drugs and RDTs and new developments in the field of malaria treatment

Dr Andrea Bosman

At present, 66 countries in Africa, Asia and South America have adopted ACT policy and 36 countries are deploying it. There are still 10 countries in these three regions which need to adopt a ACT policy. Generally, a 12 to 18 month lag was observed between the adoption of ACT and its implementation. In 2005, the production of ACT reached 31.5 million courses with a demand for 27.3 million courses. The forecast for 2006 indicates that demand for ACT will reach 110 million courses with a production capacity of 130 million courses.

A country's choice of ACT varies, out of the 64 countries adopting ACT as the first line of treatment, 42% are using artemether/lumefantrine. Artesunate in combination with amodiaquine followed (28%), followed by artesunate in combination with sulfadoxine/pyrimethamine (17%), and artesunate in combination with mefloquine (11%). New ACT are being planned: artesunate/mefloquine FDC and artesunate/amodiaquine FDC are expected by the end of 2006. In 2007, it is expected that artesunate/lapdap FDC, artesunate/PRN FDC and DHA/PPQ FDC will be ready. Synthetic peroxides in combination are expected by 2011.

ACT is the treatment of choice for all cases of uncomplicated malaria among infants and people living with HIV/AIDS (PLWH) and for the home-based management of malaria. It is also the treatment of choice for pregnant women during the second and third trimester. During the first trimester of pregnancy, it should be given only if no other effective anti-malarial is available. For complicated cases of falciparum, intravenous or intramuscular artesunate or quinine is recommended, as well as intramuscular artemether or artemotil. Artesunate is the first choice in areas with low transmission while when other alternatives are not available, artemotil is recommended. Pre-referral treatment of patients who are not able to take oral treatment is with artesunate rectal capsules or artemisinin suppositories.

Updating the malaria treatment policy is required in case of treatment failure of more than 10% assessed through the monitoring of therapeutic efficacy at 28 days following WHO protocol. Choice of the potentially new first line of malaria treatment is made on the basis of a cure rate of not less than 95% identified by clinical trials.

WHO is urging pharmaceutical companies to stop immediately the marketing of single drug artemisinin tablets and instead to market artemisinin combination therapies (ACT) only. In 2006, procurement and funding agencies, including UNICEF, WHO, WB, GFATM and the International Development Association (IDA) complied with the WHO recommendations on banning oral artemisinin monotherapies.

In terms of rapid diagnostic tests, there is a rapidly increasing range of malaria RDT products for a wide range of target antigens in a single or combination (combo) test with an estimated global production of 28.2 million in 2005. Compared to microscopy, the sensitivity is variable and all have a poor sensitivity below 100 parasites per micro litre. RDTs' intensity in detecting the parasite deteriorates with exposure to high temperatures and prolonged storage. In areas with *falciparum* and *vivax* malaria, the main options for the type of RDTs are HRP2–aldolase, or new pLDH from standard diagnostics.

Case management with RDTs should follow a definite scheme. In case of the use of RDTs, such as paracheck, in suspected cases of *P. falciparum*, ACTs are given if the test is positive. In case of the use of combo RDTs, such as Pf–pan specific, ACTs should be given if infection with falciparum is ascertained while in non-falciparum infection, chloroquine in combination with primaquine is recommended. In both situations, severely-ill patients with negative results should be given artesunate suppositories before referral. In the case of a negative result in non-severe cases, other illnesses should be considered.

4.2 Development of new tools and insecticides to address current challenges in malaria vector control

Dr Pierre Guillet

ITNs and IRS are the main measures for expansion of vector-control interventions. The use of LLINs is recommended, as they are cheaper than the conventionally-treated nets and they obviate the need for retreatment campaigns. To produce a vector control effect, full coverage is the target as the immediate objective is to protect all populations at risk of malaria by providing one LLIN for two persons at risk of malaria with a plan for a replacement net

once exhausted. Two products are recommended, namely Olyset and PermaNet 2.0. The polyester LLINs last for 3 years, while the polyethylene LLINs last for 5 years.

An ongoing multi-village trial in Tanzania revealed an almost complete interruption of transmission with both Olyset and PermaNet nets for more than 18 consecutive months. A total of eight new LLINs are currently under the WHO Pesticides Evaluation Scheme (WHOPES); testing and results are expected between December 2006 and December 2007. The current production capacity is 5.3 million LLINs per month with two producers (63.6 million/year). This number is expected to increase up to 22 million per month by December 2008. The average price ranges from between US\$ 4.5 and US\$ 5.5 per (X)-family size.

Conventional nets, whether new or in use, should be treated. There is a development of long-lasting treatment kits (LLT kit); two LLT kits are under WHOPES evaluation, one is expected by December 2006, and the other by December 2007. To achieve full insecticide coverage, the public sector is urged to purchase only LLINs. National programmes should target the treatment of existing conventional nets with LLT kits. Also, bednets which are locally made or sold through retail markets should be treated with LLT kits.

There is a need for the improvement of the monitoring of mosquito resistance to insecticides. In fact, the monitoring of resistance should be part of routine operational activities. This requires strengthening the capacity of national malaria control programmes, the presence of a national reference laboratory, the availability of funds and a regional network for resistance monitoring and management. The operational impact of resistance should also be assessed. Resistance management tactics, such as rotations, should be considered and locally adapted, especially for residual spraying and larval control programmes. Mosquito resistance to ITNs should be addressed. In the short term, the use of non-pyrethroids may be considered to restore efficacy against resistant vectors. Another possibility to manage resistance is the combination of insecticides on nets. A long-term solution is the development of a new insecticide alternative to pyrethroids.

For IRS, DDT is still the cheapest and easiest to use with residual efficacy which extends between 6 and 12 months. Moreover, as it is no longer used in agriculture, resistance is less likely to develop. It is recommended that the use of DDT is maintained until a suitable alternative become available. Pyrethroids are also used for IRS with a residual effect of between 3 and 6 months. It is important to note that pyrethroids are not an alternative to DDT in areas where pyrethroid knockdown resistance is the reported mechanism of resistance. There is the possibility of new products for IRS, including longer-lasting formulations, such as microcapsuled chlorpyrifos-methyl and bendiocarb resin-based formulation. Chlorfenapyr (pyrrole), an already existing contact insecticide with a different mode of action and low mammalian toxicity, is currently undergoing testing in experimental huts for both ITNs and IRS. The development of new contact insecticides is in the planning stage. As for larvicides, a wide range of new products exist including *B. thuringiensis* H 14, pyriproxifen (IGR), spinosins, which is under WHOPES evaluation, spinosad, novaluron (IGR) and dinetofuran.

There are new and innovative approaches, such as application of fumigant insecticides, e.g. metofluthrin that evaporate at room temperature. Their efficacy ranges from one night to

up to eight weeks and possibly even up to six months. New products for specific application include insecticide-incorporated plastic sheeting for refugee settings and emergencies, insecticide-incorporated plastic film for indoor use (wall and/or roof lining), as well as long lasting insecticide-treated curtains and blankets. Programme managers need to express their needs and expectations, and WHO needs to stimulate industry to get the right technology for the right application.

5. MALARIA ELIMINATION STRATEGIES IN THE REGION

5.1 Challenges for malaria elimination in Islamic Republic of Iran

Dr Ahmed Raeisi

Populations living in areas where malaria transmission can occur account for more than 43 million, 3.5 million of whom are living in malaria-endemic areas. In 2005, 18 966 cases of malaria were confirmed by microscopic examination of blood samples; 14 396 were autochthonous cases and 4570 were imported cases. The majority of identified cases (88%) were infected with *P. vivax*, while 11% were infected with *P. falciparum*. Mixed infection was encountered in only 1% of the cases. Iranian nationals constituted the majority of cases (61%), followed by Afghani nationals (29%) and Pakistani nationals (10%). Population movement across the Afghan and Pakistan borders contributes to the occurrence of malaria in the Islamic Republic of Iran.

As for the national drug policy, eligible patients are those with diagnosis confirmed by microscopy. Regardless of nationality, diagnosis and treatment of malaria is provided free-of-charge to all confirmed cases. All *P. falciparum* and mixed cases are followed parasitologically and clinically for 28 days. For *P. falciparum*, the first line of treatment is artesunate in combination with sulfadoxine/pyrimithamine, while Coartem is the second line of treatment and quinine + doxycycline or clindamycine is the third line. For *P. vivax*, the treatment includes chloroquine in combination with primaquine.

A feasibility study of malaria elimination in the Islamic Republic of Iran was conducted by a WHO consultant and the preparatory phase for malaria elimination has begun. In view of the elimination strategy, the national malaria strategic plan and the national drug policy have been reviewed. In addition, indicators for monitoring and evaluation were modified. New passive posts for the diagnosis and treatment of malaria were established along the eastern border. There is continuous monitoring of anti-malarial drugs and insecticides. The competency and skills of health professionals are also assessed. A malaria website was established to improve the capacity of e-learning for medical doctors in the area of case management. It also provides a guide for international travellers on the means of self-protection and prophylaxis against malaria. This is in addition to a web-based surveillance data reporting system (HMIS) aiming at the rapid detection of malaria outbreaks.

The proposed framework for malaria elimination in the Islamic Republic of Iran consists of three phases. The first phase is a preparatory phase of 1–2 years which aims at the provision of additional input to malaria control through the allocation of funds, sanctioning

posts, provision of vector-control equipment, revision of the spraying schedule in accordance with the eco-epidemiological situation, as well as an increase in the production and use of locally-produced Bti. The second phase which will extend for 1–2 years aims at the elimination of *P. falciparum* and a reduction of the transmission of *P. vivax*. The third stage, that will extend for another 3 years, aims at the drastic reduction of local transmission of *P. vivax* in residual foci. At the end of the third stage, the majority of cases could be imported ones and the number of indigenous cases occurring in residual foci will range from between 500 and 700 cases.

Specific eco-epidemiological features of the high-priority area at a junction of two zoogeographical zones with five different malaria vectors and a long transmission season, as well as managerial changes, uncontrolled population movement along eastern borders, weak malaria control programmes in bordering areas of neighbouring countries and the considerable effect of long-standing sanctions especially on vector-control interventions are the main challenges facing the malaria elimination programme in the country.

5.2 Moving from control to elimination in complex emergency situations in Iraq

Dr Ahmad A. Ahmad

Iraq is subdivided into three distinct regions in respect to malaria transmission: areas where malaria transmission occurs, including Dahuk, Irbil and Al Sulaymaniyeh; areas in which malaria does not occur due to absence of the vector, including Anbar, Muthana, Wasit and Missan; and a remaining 11 governorates where indigenous transmission has been interrupted although imported cases are still recorded and the potential for malaria transmission exists.

Malaria in Iraq was under control until the second gulf war. The war and sanctions resulted in a deterioration of the health sector, including the malaria control programme. This has resulted in a surge in the number of cases. From 1994 to 1995, the number of malaria cases rose to more than 98 000. This number decreased to approximately 49 000 as a result of a resumption of malaria-control activities. The number of cases has continued to decrease to 47 cases in 2005; 40 of which were from Irbil, Dahuk and Al Sulaymaniyeh.

Vector surveys are carried out routinely in 10 stations in each governorate where 10–20 visits are paid monthly for the observation, collection and measurement of vector density. IRS is carried out in targeted areas in two rounds, in addition to larval control, and a total of 320 000 LLINs have been made available to the targeted population.

Anti-malarial drugs are limited to the governmental health sector. Chloroquine and primaquine are used for the treatment of *P. vivax*, and for *P. falciparum* the first line of treatment is artemether/lumifantrine. Quinine is used in the case of treatment failure and for pregnant women.

Currently, many challenges are facing the malaria control programme in Iraq, including the instability of the political situation and insecurity, the shortage of skilled manpower,

equipment and supplies including pesticides, the lack of participation of relevant governmental sectors and weak surveillance in some malaria foci.

5.3 The experience of Saudi Arabia in combating malaria at the border of Yemen

Dr Sulaiman K. Alfify

Malaria is still endemic in some areas of Saudi Arabia. Nearly one million people, representing 5% of the total population are living in relatively high-risk areas. Malaria-control activities have resulted in the elimination of the disease from eastern, central and northern regions of the country although the disease is still endemic in the south-western region of an altitude below 2000 m. In the south-western region of the country, climate, topography, numerous breeding places and uncontrolled population movement to and from Yemen are factors favouring the transmission of the disease. *P. falciparum* is the predominant species and *Anopheles aretiensis* is the main vector.

Over the past few years, Saudi Arabia has witnessed a considerable reduction in the number of cases of malaria. Between 2004 and 2005, there was a 14.4% reduction in the number of malaria cases and a 34% reduction in indigenous cases. As a result of successful control strategies and strong political commitment, activities aimed at eliminating malaria began in 2004 and it is hoped that the target will be achieved within 5 to 8 years. This is expected to be facilitated by joint cooperation with Yemen in controlling malaria across the border.

The joint Saudi–Yemeni coordination committee agreed in February 2003 to integrate malaria-control activities in the two countries. These activities include the implementation of malaria-control activities, intensification of public education and community participation and the establishment of a joint team for a regular three-month evaluation of control activities at border areas. Agreement was also made for entomological activities to identify positive cases and breeding sites and to spray households in border villages. In 2006, the committee agreed to unify the treatment policy on both sides of the border. Preliminary data indicate that the joint implementation of anti-malarial measures resulted in a reduction in the incidence of the disease in Al Koubha and on the other side of the border in Yemen. Future actions will include expanding joint anti-malarial activities to the other border areas of Jazan, namely Ayban, Ardah and Samthah districts on the Saudi side and to the adjoining area of Yemen.

5.4 Documentation of the malaria elimination experience in Morocco

Dr Abderrahmane L. Elidrissi

The national malaria control programme was implemented in Morocco in 1965 and resulted in the elimination of *P. falciparum* in 1973. The number of autochthonous and imported cases of malaria continued to fluctuate until the 1990s when both showed a gradual decline. In 2005, a total of 100 imported cases were identified. In the same year, no cases of indigenous transmission were recorded.

In Morocco, the elimination strategy was adopted in 1998, and implementation was extended from 1999 to 2006. The objectives of this strategy were to eliminate autochthonous

malaria by 2006 and to control imported cases. The elimination of autochthonous malaria relied on the intense focused detection of cases, particularly relapsing carriers, vector control and promoting intersectoral collaboration for the control of risk factors. The control of imported cases relied on the supply of chemoprophylaxis for travellers to endemic areas and vigorous case finding and treatment of imported cases.

The elimination strategy for 2007–2010 was set with two major objectives. The first objective was to maintain a state of no indigenous transmission by reinforcing surveillance activities and controlling risk factors. The second objective was to exert control over imported malaria through the protection of travellers to endemic areas, prompt treatment of detected cases and the application of health control measures at the borders. This strategy is expected to be implemented with an allotted annual national budget of US\$ 300 000 and with the technical and financial assistance of WHO. Experience of malaria control and elimination from 1920 to 2006 has been documented and will be published in 2006.

5.5 Experience of Oman on malaria microscopy and quality assurance

Dr Majed S. Al-Zedjali

The malaria microscopy quality control system includes slide cross-checking, supervisory visits and training. Slide cross-checking is performed on a monthly basis at regional and central laboratories. All positive slides and 10% of negative slides are subjected to cross-checking to assess film preparation, staining, species diagnosis and parasitic density count. Also, any unclear results are subjected to immediate cross-checking upon notification at the regional and/or central malaria laboratories. Supervisory visits are conducted annually at all health institutes with malaria diagnostic services without prior notice. These visits are carried out by the national malaria programme manager and laboratory technologists. The purpose of the supervisory visits is to assess the quality of malaria diagnostic services, including laboratory management, equipment and reagents, film preparation and staining, as well as the competency of laboratory workers. Training is an essential part of the system and is directed to regional laboratory workers in charge and malaria-liaison persons in referral hospitals. In-service training is delivered to laboratory technicians with low scores at assessment and newly-recruited laboratory technicians. For newly-graduated laboratory technicians, two weeks of training during their internship is mandatory.

In collaboration with WHO Regional Office, Oman will launch an advanced regional training course on malaria microscopy and quality control starting in the first quarter of 2007. It is a four-week training course supported by the Ministry of Health in Oman and WHO Regional Office. This training is intended for malaria laboratory supervisors and senior technologists. The main objectives of the training course are to enhance participants' skills in respect to laboratory management, advanced malaria microscopy, setting malaria microscopy quality control and the establishment of slide banks. At the end of the training, a certificate signed by the Ministry of Health of Oman and WHO Regional Office will be granted to participants who have demonstrated a competence level of more than 95%.

5.6 Experience of the United Arab Emirates in the certification of malaria elimination

Dr Abdul Aziz M. Almuthanna

A national malaria surveillance system was established in 1990, consisting of both active and passive case detection, treatment of confirmed malaria cases, epidemiological investigation of cases and foci, and post-treatment follow-up of malaria cases. After routine health services were expanded to provide near universal coverage, active case detection was phased out and epidemiologic investigation of cases has since improved.

Between 1978 and 1990, the number of malaria cases decreased from 22 791 to 3514. From 1990 to 2001, the number of malaria cases has continued to decline from 3514 to 1322. From 2002 to 2005, there has been an average of about 1600 cases reported per year.

The last autochthonous malaria case was reported in 1997. The primary countries of origin of reported cases are Afghanistan, Bangladesh, India, Pakistan, Sudan and Yemen. In addition, each year a number of United Arab Emirates citizens are reported to have acquired malaria infections while travelling abroad. In 2004, malaria was diagnosed in a total of 34 United Arab Emirates citizens; 27 of whom acquired malaria while in Pakistan or Yemen, and the remainder while in Madagascar, Mali or Tanzania.

In 2004, a serological survey for malaria-specific IgG antibodies was conducted among recent immigrants to one of the most vulnerable areas of the country, covering 10 007 immigrants from 52 different countries. The number of seropositives was 648 (6.48%), nationals from Afghanistan, Eritrea, Kenya, Mauritania, Somalia and Sudan showed the highest seropositivity rates. The epidemiological investigation of the seropositives yielded four microscopically-confirmed cases (three *P. vivax* and one *P. falciparum*). The highest mean seropositivity rate was recorded among immigrants from hyper-endemic countries (20.9%).

Based on detailed geographical reconnaissance, a serological survey for malaria-specific IgG antibodies was conducted in 2005 in localities (foci) where malaria transmission has been observed between 1991 and 1997, in order to detect any signs of continued focal activity. The survey covered all people resident within a radius of 500 m from an affected household. In total, 5748 people were examined. There were 136 seropositives (2.37%). A total of 2482 samples were taken from United Arab Emirates citizens, yielding 50 seropositives. Among the 50 seropositives of United Arab Emirates nationality, 45 had a history of travel to malarious countries. The seropositivity rate observed among United Arab Emirates nationals was significantly lower as compared to that of resident foreigners from meso and hyperendemic countries ($p < 0.01$).

As none of the seropositives had a recent history of fever and all blood slides taken from them proved to be negative for malaria parasites, it can be concluded that there is no evidence of recent transmission in the former foci. The seropositivity rate among the resident foreigners originating from highly-malarious areas is lower than that observed among new immigrants. In a comparison between foreigners resident in the former foci and newcomers from the same countries (weighted for nationality distribution), the difference between the seropositivity

rates (5.08% versus 20.32%) was highly significant ($\chi^2 = 128.3994$; $p < 10^{-10}$). This clearly points to an absence of recent infectious change among foreigners resident in the former foci of transmission.

The request for the certification of malaria-free status in the United Arab Emirates by WHO was submitted on the basis of a conscientious review of the epidemiological situation within the country, and an analysis of the disease-control and vector-control activities. In addition to these epidemiological features, the request was considered reasonable as the country has natural boundaries of malaria transmission in the west, north and south, while in the east, it borders with Oman, a country far advanced in the strife towards the elimination of malaria, and a partner with whom the United Arab Emirates maintains intensive technical cooperation.

It is understood that the continued substantial importation of malaria cases from abroad will require the maintenance of strict surveillance and vigilance, as well as intensive vector control in order to prevent the re-establishment of malaria in the country. These provisions will also guarantee fast recognition of any cases of local transmission in the future and the implementation of effective remedial measures without undue delays.

In March 2006, the WHO special team made a final visit for verification of background documents on malaria-control activities and finalization of recommendation for certification of malaria-free status by WHO. The evaluation concluded that the evidence strongly supports that malaria elimination has, in fact, been achieved and that the country has not experienced local malaria transmission since 1997. The evaluation team realized that the malaria control department will continue to benefit from the strong political commitment to malaria control that has existed so far. With this support, the evaluation team felt that the United Arab Emirates will be more than able to maintain their malaria-free status in the future.

Therefore, it was recommended that WHO should, after an appropriate internal review of this report, approve the certification of the United Arab Emirates as having achieved the elimination of malaria.

5.7 Current status of the malaria situation in the Syrian Arab Republic

Dr Atef Al Tawil

In the Syrian Arab Republic, the malaria eradication programme was implemented in 1956. As a result of the intensive campaign of indoor spraying of DDT, the transmission of *P. falciparum* was interrupted in the 1960s, however, the transmission of *P. vivax* continued along the borders with Turkey and Iraq.

The peak incidence of indigenous malaria transmission in the country was recorded in 1993 when 966 cases were confirmed in Aleppo and Hasakeh. An outbreak of malaria occurred in 2001 when 63 local cases occurred in the districts of Ras El Ain and Al Malkeih of Al Hasakeh province. Since 1993, the number of malaria cases has declined and in 2005, no indigenous cases were reported. In 2005, 28 imported cases of malaria were identified,

which were mainly from African countries and the predominant infections were *P. falciparum* (17 cases) and *P. vivax* (4 cases).

Regular bednets are used sporadically by some of the population who sometimes sleep outdoors during the hot summer months. The use of ITNs is not the adopted strategy in the country, however, a total of 4000 ITNs were made available to the population in Al Malekieh and Ras Al Ein. In 2005, 13 083 households were sprayed which resulted in the protection of 89 161 individuals.

National drug policy includes the use of chloroquine and primaquine for the treatment of *P. vivax*, *ovale* and *malariae*. Sulfadoxine-pyrimethamine or quinine and doxycycline are used for the treatment of uncomplicated cases of *P. falciparum*, and for complicated cases, quinine dihydrochloride is used. In 2006, the plan is to implement artesunate in combination with sulfadoxine-pyrimethamine. As for chemoprophylaxis, chloroquine or mefloquine are made available for travellers to endemic areas.

In the Syrian Arab Republic, national malaria-control activities are implemented through 14 centres. The programme aims at the prevention of the reintroduction of malaria, controlling imported cases, maintaining a state of preparedness to contain probable outbreaks and strengthening entomological activities to identify potential vectors. Programme activities extend to include early case finding and treatment, entomological surveys and vector control, forecasting and control of outbreaks, capacity building and operational research. Currently, the problems and constraints facing the programme are the lack of an insect laboratory, the lack of a system for monitoring insecticide resistance, a shortage of well-trained laboratory technicians and spray workers, poor maintenance and a shortage of spare parts for spray pumps. This is in addition to population movement and ongoing irrigation projects.

5.8 The present situation of malaria in Egypt

Dr Hussein A. Hussein

Malaria has been endemic in Egypt since the dawn of history. In 1942, a malaria epidemic resulting in thousands of deaths occurred in four southern governorates of the country as a result of the introduction of *A. gambia*, the most efficient malaria vector, from Sudan. The Ministry of Health launched an eradication campaign, and in 1946, it declared Egypt free from *A. Gambia*.

The endemicity of malaria gradually receded in Egypt as a result of control activities implemented in the 1960s, and in 1988, all governorates became malaria-free with the exception of Fayoum as a result of its particular environmental and geographic location. Later in 1998, Fayoum also became malaria-free. Nevertheless, imported cases are encountered among travellers between Aswan and Wadi Halfa and in hospitals dealing with fever.

Strategies of the RBM programme vary according to geographic locality. Large, artificial Lake Nasser in the southern part of Egypt, 500 km between Egypt and Sudan may be considered a receptive area for *A. gambia*, in addition to the Fayoum governorate as they represented previous malaria transmission areas. Major constraints are insufficient legislation

in ports, the presence of two vectors of the disease namely *A. pharoensis* and *sergenti* resulting in a long transmission season and the presence of *A. gambia* at the southern borders.

In Egypt, the national goal is to strengthen active surveillance for the malaria programme, initiate a transborder cooperation project between Egypt and Sudan and to improve capacity building. In Egypt, activities of the malaria-control programme include: establishing a malaria-control unit all over the country, application of integrated vector-control activities, protecting southern borders from the reinvasion by *A. gambia*, use of RDT as a new diagnostic tool, in addition to microscopy among travellers coming from endemic areas, the supply of all malaria-control units and fever hospitals with Coartem as the first line of treatment and quinine as the second line and making mefloquine available to travellers to endemic areas.

5.9 Challenges for the prevention of the reintroduction of malaria in Egypt

Progress made in malaria elimination in different countries of the world should not be jeopardized by its reintroduction from other countries where the disease continues to be a serious public health problem. This should not be viewed as unusual, as in some countries malaria has reappeared after long periods of absence.

Egypt is prone to the reintroduction of malaria as a result of climatic factors and environmental change, the previous history of the disease, the vast and dynamic geographic distribution of vectors, population movement, rapid urbanization and the extensive use of water. This is in addition to the fact that Egypt shares borders with malarious countries. A system analysis of malaria reintroduction in Egypt should be considered by addressing inputs and process to control outputs. Inputs include imported cases and multi-resistant strains of *P. falciparum*, invasion of vectors, failure in diagnosis and notification, ineffective treatment and undetected foci of transmission. As for the process, it includes creation of a suitable habitat for the vector, dynamic vector spatial patterns, host-vector contact, host immunity, vector-control activities and the susceptibility of vectors to these activities. The main challenges are dissemination of information on the status of malaria, coordination between various national services dealing with immigrants or international travel, prompt and competent diagnosis, treatment and follow-up of cases, in addition to timely notification, analysis of the receptivity of formerly malarious areas, up-to-date mapping of vectors and their resistance to insecticides, in addition to intersectoral cooperation for vector control and proactive preventive measures, and the conducting of research.

Some of the aforementioned challenges were addressed through operational research funded by WHO Regional Office and conducted by the Ministry of Health and Population, jointly with the Institute of Environmental Studies and Research at Ain Shams University. The research aimed at developing a digital database (GIS-based) for the management of malaria in Egypt. The GIS database (1970–2001) includes socioeconomic and epidemiological data, data on vectors, climate, geology, soil and hydrogeology. This research revealed that most cases of malaria and mosquito-breeding habitats were found in areas experiencing rising underground water in Cairo. It also proved that the number of breeding habitats was in correlation with the percentage of poorly managed/undeveloped lands, poor sanitation and slum conditions. In

addition, socioeconomic, abiotic and landscape features derived from satellite data were capable of discriminating malarious areas with accuracy ranging from 75% to close to 90%. Spatial statistics proved the spatial association of cases and vectors and indicated that mosquito-breeding habitats were widely dispersed within Greater Cairo, which constitutes a challenge to vector-control authorities.

In conclusion, Egypt is highly susceptible to the reintroduction of malaria. Spatial patterns of vectors are excellent indicators for areas at risk. The risk is heterogeneous because of the variability in landscape, urbanization levels and socioeconomic conditions, thus interventions need to be targeted. New technologies can provide an excellent framework for the management and targeting of vector and disease control. It is therefore recommended that the findings of operational research are integrated into the national malaria strategy, including the use of space technology as one of the available tools.

6. FEEDBACK ON THE MALARIA SURVEILLANCE REPORT

Dr Ghasem Zamani

The WHO Regional Office first requested countries to submit the number of cases of malaria on 15 January, 2006. The first request for submission of the annual surveillance report was made on 30 March, 2006. However, delays in submitting the requested reports were observed and several problems were noted in the submitted reports. The main problems encountered were the inconsistencies in the reported figures on the malaria burden and the lack of a clear statement about the methodology of the estimation of the malaria burden. Some malaria-free countries reported clinically-diagnosed cases of malaria. If there is no problem in terms of case definition then this issue should be addressed carefully as all malaria cases should be confirmed and epidemiologically investigated, otherwise these countries would be in danger of the reintroduction of malaria. Another problem was the reliability of laboratory-diagnosed malaria. A large proportion of malaria cases were either unclassified or misclassified. Reports on the coverage of IRS were not consistent with the reported figures on the level of insecticide usage. Reported malaria data were only at provincial or governorate level with no reference to malaria cases at district level. This issue will be discussed in greater detail in relation to the global database. This review of reports and highlighting the areas of weakness aims at improving malaria surveillance and reports submitted to WHO Regional Office. Country-specific feedback will be communicated to the malaria control programme.

7. REGIONAL MALARIA STRATEGIC PLAN 2006–2010

Dr Hoda Atta

The goal of the national malaria control programme is to reduce malaria to a level which is no longer a major cause of morbidity or mortality or a barrier for social and economic development. The objectives vary depending on the state of malaria in each country of the Region. For countries where malaria has been eliminated, or for countries with limited malaria transmission in residual foci, the objective is to prevent the reestablishment of malaria transmission in malaria-free countries and to eliminate residual foci in countries where residual foci still exist. The second group includes countries with a low-malaria burden, limited to certain areas and where effective malaria programmes are in place. This group

comprises Iraq, Islamic Republic of Iran and Saudi Arabia representing 19% of the population of the Region. For these countries, the objective is to eliminate malaria and to prevent its reintroduction. For countries with a moderate to high-malaria burden, a weak health system and/or complex emergency situation, including Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen, the objective is to halve the malaria burden in terms of incidence, severity and mortality by the end of 2010.

Six strategic approaches were set and expected results were developed along with indicators for monitoring progress with an estimated budget of US\$ 45 million. The strategic approaches and expected results by the end of 2007 and 2010 are to promote and facilitate the access of the population at risk to reliable diagnosis and effective treatment. It is expected that by the end of 2007, all countries will have an effective treatment policy, including the provision of effective, quality assured and safe anti-malarial drugs. By the end of 2010, all countries will provide reliable malaria laboratory diagnosis, in addition to timely and effective treatment of uncomplicated and severe malaria.

Further strategic approaches include the promotion and facilitation of the application of effective preventive measures against malaria for populations at risk. It is expected that by the end of 2007, all countries will have developed an integrated vector-management strategy and strengthened their capacity to plan, implement, evaluate and monitor vector-control interventions at all levels. Also, by the end of 2007, all endemic countries will have implemented WHO recommended strategies for the prevention of malaria and anaemia among pregnant women, infants and other vulnerable groups of the population in targeted areas. By the end of 2010, all countries will have implemented appropriate vector-control measures, particularly IRS and ITNs, and will have established entomological surveillance system.

Strategic approaches also include to support the prevention and control of malaria in epidemic situations, complex emergencies and urban settings. It is expected that by the end of 2007, all epidemic-prone countries will have implemented weekly malaria surveillance with appropriate epidemic thresholds in at least 80% of epidemic-prone settings. By the end of 2010, selected epidemic-prone countries will have implemented a suitable malaria early-warning system in selected epidemic-prone areas or districts. These countries will have also implemented a national contingency plan for malaria epidemic preparedness and response. In addition, comprehensive malaria-control strategies in complex emergency situations will have been implemented by all involved partners.

The capacity of the malaria control programme at all levels will be strengthened, in partnership with all relevant agencies. It is expected that by the end of 2007, all countries will have improved institutional capacity for the planning and management of malaria control. For endemic countries, all will have scaled up community-based services for malaria prevention and treatment and will have developed national partnerships and advocacy and information, education and communication (IEC) strategies according to the local sociocultural environment by the end of 2007. By the end of 2010, all endemic countries will have strengthened human capacity in planning, implementation, monitoring and evaluation of malaria control at all levels.

Support for the expansion and maintenance of malaria-free areas and malaria elimination will be provided and it is expected that by 2007, countries in the Region, where interruption of malaria transmission is feasible, will have developed and implemented a malaria-elimination strategy. By 2010, countries which have eliminated malaria will have maintained a malaria-free status, and the malaria-free status will be validated or certified, if needed. Malaria-free projects will be supported and expanded in selected malaria-endemic countries.

Malaria surveillance, the monitoring and evaluation system and operational research will also be strengthened. It is expected that by the end of 2007, all countries will have developed and implemented a malaria monitoring and evaluation plan. By the end of 2010, all countries will have strengthened an integrated malaria surveillance system. Also, all countries will have the capacity to define priorities and design and conduct malaria operational research projects.

8. GLOBAL MALARIA DATABASE

Dr Maru Aregawi

The global malaria database aims at the development of a standardized country profiles database, primarily at global and regional level, and whenever possible, to customize and standardize country databases. There is an intention to work with other taskforces and to harmonize the databases with a minimum set of indicators and to look for data that exist or which are feasible to collect.

The global source of information for malaria control was reviewed by the surveillance and monitoring and evaluation taskforce. One source of information is the routine health management information system (HMIS) or health facility data, which is either underutilized or has been ruled out as a reliable source of information. As a result, in many situations there are no standardized data recording and reporting forms, and programmatic information for planning, decision-making and advocacy is not available. Surveys are another source of information and have been the focus of WHO and the Roll Back Malaria Monitoring and Evaluation Reference Group (MERG) but they are expensive, assess only a few indicators and are only implemented at 3–5 year intervals. Other sources of information include studies and research on tropical diseases. Modelling and simulation could be considered another source of information in the absence of other solid evidence.

Global malaria programme efforts are directed towards the optimization of the utilization of the routine HMIS for regular assessment of programmes' performance and to estimate the burden in the absence of surveys. Efforts are directed towards the expansion and improvement of surveys with the purpose of complementing HMIS and other studies and standardizing questions and indicators. The global malaria programme will attempt to strengthen monitoring and evaluation systems and country capacity through the creation of a standardized database and indicators, as well as a customized database for country needs while maintaining compatibility with the global and regional databases.

For the country profile database, the collection of registered data started in March 2006. Currently, country visits are conducted with the purpose of the validation and improvement of the database and the global report is expected in February/March, 2007. Components of the database are demographic and epidemiological data, malaria control programme structures, goals, objectives, policy and strategy and programme financing. It also includes assessment of performance through indicators collected from the routine HMIS and through supervision, as well as surveys. This is in addition to resistance studies for anti-malarial drugs and insecticides.

The global malaria programme is facing several challenges in the development of a global malaria database, which includes variations in indicators and definitions, diversity in the type and depth of the information between Regions, lack of evidence and clarity on some epidemiological definitions and little use of data by staff of national malaria control programmes. This is in addition to decentralization that limits the flow of information. A point to emphasize is that in many cases data and information exist but are often fragmented within the national malaria control programme. Regions, governorates and provinces are interested in the added value of the tool on the condition that decentralization is taken into account without disrupting the existing system. Furthermore, data will be compatible with the Global Disease Atlas (WHO) and Health Mapper.

9. GROUP WORK: REVIEW AND FINALIZATION OF COUNTRIES' MALARIA CONTROL/ELIMINATION STRATEGIC PLANS WITH COST ESTIMATION

Dr Ghasem Zamani

Group work was conducted for the purpose of finalization of the strategic plan 2006–2010. Participants were divided into three groups on the basis of the similarity between malaria situations in the different countries. The first group included Bahrain, Egypt, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Qatar, Syrian Arab Republic, Tunisia and the United Arab Emirates. The Islamic Republic Iran, Iraq and Saudi Arabia formed the second group and the third group comprised of Afghanistan, Djibouti, Pakistan, Somalia, Sudan and Yemen and included country programme managers and WHO field staff.

The first group work session was orientated towards a discussion on strategies for the prevention of the reintroduction of malaria. The second group discussed the sharing of experience on the malaria elimination strategy including development, implementation and monitoring. The expected product of group 3 countries was to provide a summary of the malaria-control strategy, including goals, objectives, main activities, estimated cost of control interventions and their main expectations from WHO in the coming years.

In the afternoon session, the discussions of groups 1 and 2 focused on consultation to finalize *Guidelines on the prevention of the reintroduction of malaria* and *Guidelines on the elimination of residual foci of malaria transmission*. Group 3 concentrated on finalizing the malaria-control strategy and the costing of malaria interventions.

10. COST ESTIMATION OF COUNTRIES' SPECIFIC MALARIA CONTROL/ELIMINATION STRATEGIC PLANS 2006–2010 (GROUPS 2 AND 3)

The results of costing exercises of national malaria strategic plans by endemic countries are shown in Table 1. The total cost of malaria control/elimination in this group of countries for a 5-year period is as follows.

Table 1. Costing exercise of national malaria strategic plans by endemic countries

Situation of endemicity	Country	Estimated cost (2006–2010)	Estimated gap (2006–2010)
Endemic	Afghanistan	45 300 000	17 300 000
	Djibouti	9 808 000	3 594 000
	Pakistan	40 000 000	25 000 000
	Somalia	5 528 000	5 528 000
	Sudan (north)	167 019 000	116 913 300
	Sudan (south)	103 130 000	103 130 000
	Yemen	52 842 243	25 698 376
Targeting elimination	Islamic Republic of Iran	63 577 000	15 577 000
	Iraq	2 000 000	—
	Saudi Arabia	325 000 000	—

11. RECOMMENDATIONS

Political commitment, partnership and resource mobilization

1. Recognizing the importance of sustainability and the need to scale up prevention and control interventions to reach the desired coverage level of at least 80% in malaria-endemic countries, ministries of health of those countries should maintain and strengthen their political commitment and resources allocated to malaria. Malaria control should be part of the national development policy.
2. Member States should strengthen the national level partnership with involvement of the private sector and research institutes. The national multi-year strategic plans for 2006–2010 should be used as a tool for advocacy, resource mobilization and the coordination of malaria-control efforts with all relevant partners and sectors.
3. Noting the importance of resource mobilization at the country level, WHO should arrange a workshop for improving the resource mobilization skills of the national malaria managers. WHO should identify the potential interested donors/partners and invite them to the malaria managers meetings to facilitate direct dialogue with the countries.
4. WHO should continue to support interregional and cross-border coordination activities, as laid out in the recent Tashkent and Kabul Declarations on coordination of disease-control efforts.

Drug policy

5. Noting that oral artemisinin monotherapy is still marketed in some countries of the Region, ministries of health and national regulatory authorities should ban the importation, marketing and use of oral artemisinin monotherapy and ensure provision of quality artemisinin combination therapy (ACT) for the public and private sectors.
6. WHO should support countries, particularly Pakistan, to refrain from local production of oral artemisinin monotherapy and shift to producing ACT as blister-packs.
7. In complex emergency situations, WHO in coordination with local health authorities, should play a leading role in seeking to ban the procurement of oral artemisinin monotherapy by all providers.
8. All countries should take the necessary action to include ACT drugs in their essential drug list and to ensure provision to malaria patients free-of-charge.
9. Noting that small quantities of ACT drugs are needed by malaria-free countries for treating imported falciparum patients, WHO should continue to maintain a regional stock of ACT drugs to be provided to those countries as per need.

Diagnosis

10. Countries using rapid diagnostic tests (RDTs) should establish a quality control system to ensure proper procurement, storage, transport and usage. Organization of an intercountry workshop in this regard in 2007 is recommended.
11. WHO should support countries to strengthen the capacity of health workers, including community health workers, for appropriate use of RDTs.
12. Countries should identify proper senior candidates for the first advanced international training course in malaria microscopy and quality assurance, to be held in the Regional Centre of Excellence in Muscat, Oman, in early 2007.

Monitoring and evaluation

13. Countries agreed that the global malaria database is an essential monitoring and evaluation tool that should be soon finalized after field testing. WHO should support capacity building for its use and customization at country level.
14. Malaria-endemic countries should ensure the presence of a strong monitoring and evaluation team, including the appointment of a data manager/database focal point.
15. WHO should adapt the database to address specific needs according to the different epidemiological situation of countries.
16. WHO should provide technical and financial support to conduct malaria coverage and prevalence surveys in high-burden countries, including the development of survey guidelines.
17. WHO should provide technical support to countries in malaria risk mapping and in establishing a simple and reliable model for estimation of the malaria burden. Organization of an intercountry workshop in 2007 and the sharing of experiences with other Regions are recommended.

Malaria vector control

18. Recognizing the importance of vector-control interventions in the prevention of malaria, countries should strengthen and promote key vector-control interventions using indoor residual spraying (IRS) and insecticide-treated bed nets (ITNs). WHO should continue to provide guidance and technical support on the implementation and monitoring and evaluation of these interventions. Countries should include insecticide-treated nets and long-lasting insecticidal nets in the national essential drug list.
19. Capacity in vector control is still weak. WHO should support countries in strengthening human resource development in medical entomology and vector control.

20. Given the current problems of vector resistance to a number of insecticides, especially pyrethroids in countries of the Region, WHO should ensure effective functioning of the regional network on insecticide resistance and provide technical support on issues related to monitoring and adoption of resistance management strategies.

Malaria elimination

21. Given the concern that in malaria-free countries, malaria is not considered a national priority and the programmes are not receiving support to implement activities for addressing imported malaria and preventing its reintroduction, WHO should support these countries to strengthen political commitment of governments and strengthen global awareness activities on malaria among travellers.
22. Noting that a number of countries in the Region are either malaria-free or are aiming at eliminating malaria, it is recommended that WHO organize a multisectoral consultation on the potential impact of malaria on the tourism industry.
23. WHO should establish a standard mechanism and guidelines to support countries that have eliminated malaria to validate the interruption of malaria transmission.
24. WHO should strengthen its technical support and capacity building for countries aiming at malaria elimination, should develop guidelines on malaria elimination and establish a relevant database.

Annex 1

AGENDA

1. Opening session
2. Objectives and expected outcomes of the meeting
3. Progress in the implementation of malaria programme at global, regional and country levels: success, problems and constraints
4. Presentation of the regional strategic plan 2006–2010
5. Finalization of countries' strategic plans for malaria control/elimination 2006–2010 with cost estimation
6. Malaria parasitic prevalence and coverage indicators surveys: examples from Sudan
7. Update on the availability and procurement of drugs, ITNs and RDTs and new development in the field of prevention and treatment measures
8. Strategies for human resource development in the Region: planning course in Bandar Abbas, malaria microscopy in Oman and regional vector control course
9. Recommendations
10. Closing session

Annex 2**PROGRAMME****Monday, 3 July 2006**

- 08:30–09:00 Registration
- 09:00–09:40 Opening session
Moderated by Dr Z. Hallaj, DCD, WHO/EMRO
 Message from Dr Hussein A. Gezairy, WHO Regional Director for the Eastern Mediterranean
 Introduction of participants
 Nomination of officers
- Global Malaria Programme in 2005**
- 10:00–10:30 Report on the global malaria programme (GMP)/*Dr A. Kochi, Director GMP, WHO/EMRO*
- 10:30–11:15 Progress of malaria control/elimination in the Region/*Dr H. Atta, RBM, WHO/EMRO*
 Achievement and challenges in malaria vector control implementation in the Region/*Dr A. Mnzava, RBM (VC), WHO/EMRO*
- 11:15–11:30 Progress of malaria control in WHO European Region/*Dr M. Ejov, Malaria Control Programme, WHO/EURO*
 Malaria control programme progress, challenges and the sharing of experience from high burden countries
- 11:30–11:45 National malaria and leishmaniasis control programme in Afghanistan/*Dr Khalil A. Kohestani, NMCP managers, Afghanistan*
- 11:45–12:00 Challenges and experiences of integrating malaria control programme in BPHS/*Mr K. Mustafa, RBM, WHO/Afghanistan*
- 12:00–12:15 Malaria control programme in Djibouti/*Dr K. Djibaoui, Medical Officer, WHO/Djibouti*
- 12:15–12:45 Malaria control programme in Pakistan/*Dr Mohamed A. Khan, Director malaria control, Pakistan*
 Global Fund round 2 malaria project in Pakistan, progress and challenges/*Dr M. Durrani, Technical Adviser, HealthNet International*
- 12:45–13:00 Discussions
- 14:00–14:30 Malaria control programme in Somalia/*Dr H. Elmi, National malaria focal point, Somalia*
 Experience of the introduction of RDTs and quality assurance of malaria microscopy in Somalia/*Dr W. Butt, RBM Coordinator, WHO/Somalia*
- 14:30–15:15 Malaria control programme in Sudan/*Dr T. Abdelgadir, Director NMCP Sudan*
- 14:45–15:00 Progress of the implementation of RBM in Southern Sudan in 2005/*Dr J. Mohamoud, RBM Coordinator, WHO/South Sudan*
- 15:00–15:15 Report on the Khartoum and Gezira malaria-free initiative/*Mr M. Wais, RBM Coordinator, WHO/Sudan*
- 15:15–15:45 National malaria control in Yemen/*Dr J. Amran, Director general NMCP, Yemen*

- Results of the malaria elimination project in Socotra Island and intensive malaria control in Tihama/*Dr M. Khalifa, RBM, WHO/Yemen*
- 16:00–16:30 Malaria parasite prevalence and coverage indicators surveys in Sudan/*Dr R. Abdel Rahman, Temporary Adviser, WHO/EMRO*
- 16:30–17:00 Discussions

Tuesday, 4 July 2006

- Technical updates on malaria prevention and treatment**
- 09:00–09:30 Update on availability and procurement of drugs and RDTs and new developments in the field of malaria treatment/*Dr A. Bosman, GMP, WHO/EMRO*
- 09:30–10:00 Development of new tools and insecticides to address current challenges in malaria vector control/*Dr P. Guillet, GMP, WHO/HQ*
- 10:00–10:30 Discussions
- Malaria elimination strategies in the Region**
- 10:45–11:30 Challenges for malaria elimination in the Islamic Republic of Iran/*Dr A. Raeisi, Manager, NMCP/Islamic Republic of Iran*
Moving from control to elimination in complex emergency situations in Iraq/*A. Ahmed, Manager, NMCP/Iraq*
Experience of Saudi Arabia in combating malaria at the border of Yemen/*Dr S. Al Fify, Director of Malaria Department/Saudi Arabia*
- 11:30–12:00 Discussions
- 12:00–12:15 Documentation of malaria elimination experience in Morocco/*Dr A. Elidrissi, Head of Parasitic Disease Department/Morocco*
- 12:15–12:30 Experience of Oman on malaria microscopy and its quality assurance and upgrading of national malaria laboratory to become a regional centre of excellence in Oman/*Dr M. Al Zedjali, Head of Malaria Epidemiology/Oman*
- 12:30–12:45 Experience of United Arab Emirates in the certification of malaria elimination/*Dr A. Almuthanna, Director, Central Malaria Control Department, United Arab Emirates*
- 12:45–13:00 Discussions
- 14:00–14:15 Malaria programme activities in the Syrian Arab Republic/*Dr A. Al Tawil, Manager, NMCP, Syrian Arab Republic*
- 14:15–14:30 Malaria control activities in Egypt/*Dr H. Hussein, Director-general, malaria, filariasis and leishmaniasis/Egypt*
- 14:30–14:45 Challenges for the prevention of malaria reintroduction in Egypt/*Dr A. Hassan, Temporary Adviser, WHO/EMRO*
- 14:45–15:00 Discussions
- 15:00–15:30 Feedback on malaria surveillance reports 2005/*Dr G. Zamani, RBM, WHO/EMRO*
- 16:00–16:30 Regional strategic plan 2006–2010/*Dr H. Atta, RBM, WHO/EMRO*
- 16:30–17:00 Discussions

Wednesday, 5 July 2006**Regional and national malaria control and elimination 2006–2010**

- 09:00–09:30 Global malaria database/*Dr M. Aregawi, GMP, WHO/HQ*
- 09:30–10:00 Discussions
- 10:00–10:30 Group work: Review and finalization of countries' malaria control/elimination strategic plan with cost estimation/*Dr G. Zamani, RBM, WHO/EMRO*
- 10:45–13:00 Review and finalization of countries' malaria control/elimination strategic plan with cost estimation/Group work
- 14:00–15:45 Finalization of countries' malaria control/elimination strategic plans with cost estimation from malaria free countries and countries with residual transmission/Group work
Discussion on draft proposals to be submitted to R6 GFATAM (for country planning to submit to R6)/Plenary
- 16:00–17:00 Consultation on finalization of *Guidelines on prevention of the reintroduction of malaria* and *Guidelines on the elimination of residual foci of malaria transmission*/Group work
Discussion on draft proposals to be submitted to R6 GFATM (cont'd)/Plenary

Thursday, 6 July 2006

- 09:00–10:30 Presentation of countries' specific malaria control/elimination strategic plans with cost estimation/Presentation by country representatives
- 12:30–13:00 Discussion
- 14:00–14:30 Conclusions and recommendations
- 14:30 Closing session

Annex 3

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