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Report on the

The seventh intercountry meeting of national malaria programme managers

Dubai, United Arab Emirates
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ANNEXES

1. INTRODUCTION

The seventh intercountry meeting of national malaria programme managers was held in Dubai, United Arab Emirates, from 10 to 12 June 2007. The meeting was organized by WHO Regional Office for the Eastern Mediterranean to:

- review the progress made and problems encountered in the implementation of malaria strategies in countries targeting malaria elimination and countries with high/moderate malaria endemicity;
- update countries on the new developments in malaria prevention and management;
- brief countries on the use of rapid diagnostic tests (RDTs) in malaria diagnosis and establish a system for its quality assurance;
- develop countries plans of action for the 2008–2009 biennium.

Dr Zuhair Hallaj, Special Adviser to the Regional Director, delivered the opening address on behalf of Dr Hussein A. Gezairy, WHO Regional Director for the Eastern Mediterranean. Dr Gezairy thanked the Ministry of Health in the United Arab Emirates for its great achievement in the fight against malaria. In January 2007 certification of malaria elimination was awarded. That process was stopped when Singapore was certified in 1982. He highlighted the success realized under elimination initiatives including: a significant reduction of the disease burden in Saudi Arabia and Iraq, which are close to the consolidation phase, and in Khartoum, Sudan, and eliminating malaria from Socotra Island in Yemen where the last local cases were recorded in 2005. Dr Gezairy reiterated the importance of strong cross-border cooperation with the neighbouring endemic countries and referred to the developing joint project between WHO Regional Office for Europe (EURO) and the Regional Office for the Eastern Mediterranean (EMRO) for eliminating malaria in Tajikistan and for intensifying malaria control in the border areas of Afghanistan.

Dr Gezairy emphasized the importance of parasitological confirmation of malaria in all health facilities by microscopy, and where microscopy was not possible, by rapid diagnostic tests that could be used at the community level with proper training and quality control. The confirmation would save many doses of expensive artemisinin-based combination therapy (ACT) that were used unnecessarily, and minimize emerging resistance to these medicines. He listed some of the challenges facing implementing ACT policies including: small-scale implementation, lack of a delivery mechanism at the community level, poor or limited cooperation with the private sector and lack of community mechanisms to provide the medicines to inaccessible populations. He emphasized the importance of ensuring the quality of procured medicines by procuring from WHO pre-qualified manufacturers of artemisinin compounds and ACTs.

Finally, Dr Gezairy extended his thanks to all partners that have supported countries in the Region, in their fight against malaria, namely the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), Global Environmental Facility (GEF), the Health Ministers' Council for the Gulf Cooperation Council (GCC) States, the Islamic Development Bank (IDB), the Export Development Bank of Iran, International Islamic Relief Organization and technical institutes in Rome.

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

2. DECLARATION OF UNITED ARAB EMIRATES AS A MALARIA-FREE COUNTRY

2.1 What has been achieved and how progress will be maintained

Dr Mahmoud Fekry

The United Arab Emirates used to be endemic for both *P.falciparum* and *P.vivax*, transmitted by the main vectors *A.stephensi* and *A.culicifacies*. In late 1977, the central malaria control department was established. Initially, the strategy was based on indoor residual spraying (IRS) as the main vector control method to reduce transmission in high-risk areas. Between 1984 and 1990, with a reduction in the number of cases and a limitation of the areas of active transmission, the priority shifted to improving surveillance and elimination of residual foci of transmission. In 1990, the country established a national malaria case register and introduced epidemiological investigation of each reported case. The last locally-transmitted case was recorded in 1997.

In 2004, and based on a request from the United Arab Emirates, WHO conducted assessment for possible certification of a malaria-free status. The assessments were carried out until 2006 and included record review, sero-prevalence surveys in previously active foci and among temporary immigrant workers, and field visits by WHO-led evaluation teams. These assessments and the subsequent review by members of the WHO expert committee on malaria concluded that the United Arab Emirates' surveillance system and health service are efficient in detecting and managing malaria infections, and there is no evidence of ongoing malaria transmission. Certification of a malaria-free status was granted in January 2007.

Parts of the country are still receptive to resumption of transmission and are vulnerable because of the high influx of temporary immigrant workers from endemic countries. To prevent reintroduction of malaria, the United Arab Emirates developed a post-certification plan for maintaining a malaria-free status which included the following strategies: strong surveillance involving both the public and private sectors; full case investigations; entomological investigations; and awareness and health education of the health team and travellers. Receptivity will be closely monitored and controlled mainly through larviciding using mainly larvivous fish and temephos. Evolution of the vector control department through expansion of the activities of the central malaria department to cover the control of all vector-borne diseases is anticipated. The country is envisaged to provide technical support to other countries in malaria elimination in coordination with other member countries of the GCC.

3. GLOBAL MALARIA PROGRAMME IN 2006

3.1 Global malaria programme: progress and the way forward for malaria control and elimination

Dr Andrea Bosman

During recent years greater visibility of malaria has resulted in greater political support and funding, and now, new effective tools i.e. ACTs, long-lasting insecticidal nets (LLINs) and RDTs are available. There are clear successes in the reduction of the malaria burden in the Caucasus, Central Asian Republics, central and southern America, North Africa, member countries of the GCC, Eritrea, southern Africa, Zanzibar, the Eastern Mediterranean Region and many Asian countries. However, malaria is still a major problem in many sub-Saharan Africa countries, Indonesia, Philippines, Indian subcontinent, Pacific islands, Myanmar, Laos, Cambodia and the Amazon basin.

Strategic directions of the global programme include to: aim for elimination where feasible; develop strategies and tools; assist countries to successfully implement strategies; monitor and evaluate the progress and impact; focus on performance evaluation of main interventions; ensure and protect effectiveness of medicines and insecticides (through medicine and insecticide-resistance surveillance, monotherapy ban on oral artemisinin derivatives, effective combination of available insecticides (mosaic approaches), increase technical capacity to use the increasing availability of resources for malaria control, ensure availability of high-quality and affordable commodities, research and expansion and strengthening of the "malaria community".

3.2 Progress of malaria control/elimination in the Region

Dr Hoda Atta

According to 2006 malaria surveillance reports from countries in the Eastern Mediterranean, 54% of the population is living in areas at risk of malaria. The burden has been decreasing gradually since 2000, where reported cases decreased from 6.1 million in 2000 to 3.6 million in 2006 (40% reduction). The majority of cases (approximately 75%) reported from the six high-burden countries are on clinical basis.

A brief overview was presented in the World Health Assembly (WHA) 2007, Resolution 60.18 on malaria, including a proposal for establishing World Malaria Day. Health system challenges facing ACT implementation in malaria-endemic countries include: limited coverage and poor quality of laboratory diagnosis; weak logistic and supply system and weak health information systems to forecast the needs of ACTs. It is emphasized that the following needs to be targeted in order to scale up ACT implementation: delivery of ACT by all public health facilities, development of suitable structures and mechanisms for delivery of ACT at community level, development of partnerships and coordination with the private sector to ensure proper rational use of ACTs.

Several malaria-free countries have updated their medicines policy and included ACT for treating imported *P.falciparum* cases, making use of the regional stock of artemether-lumefantrine. However, Bahrain, Kuwait, Libyan Arab Jamahiriya, Oman and Qatar have not yet adopted ACT and they should take the necessary urgent measures to update their treatment policies.

Monitoring medicine efficacy is an important activity to guide medicine policy. The Regional Office is supporting studies in Afghanistan, Pakistan, Somalia and Yemen between 2006 and 2007. There is a need for data on the efficacy of chloroquine for *P.vivax* from Afghanistan, Islamic Republic of Iran and Pakistan. WHO will continue its efforts to mobilize resources to maintain the HANMAT, which is facing problems at this stage mainly related to the lack of ownership and limited resources.

- The Regional Office will continue to support malaria elimination and initiatives for the creation of malaria-free areas. The success achieved in Khartoum is being expanded to Sudan's central zone Malaria-Free Initiative. Future priorities for the regional programme include: supporting public–private partnerships; ACT delivery at community level; conducting of malaria prevalence surveys; conducting elimination and joint border projects; preparing for certification of a malaria-free status in Oman; and conducting research to address the knowledge gap in *vivax* malaria.

3.3 Implementation of integrated vector management (IVM) for scaling up vector control interventions and progress of the GEF project

Dr Abraham Mnzava

Malaria is a vector-borne disease of major public health importance in the Eastern Mediterranean Region. Whereas case management is the main method of control, vector control forms an important strategic approach for its prevention. Recently, the role of insecticide residual spraying and the use of insecticide-treated nets (ITNs)—especially long-lasting insecticidal nets (LLINs) have been recognized as key interventions for malaria control and prevention. When these interventions are used at high coverage, they have been found to be cost effective. It is for these reasons that WHO developed operational guidelines for IRS implementation and a manual for the implementation of LLINs. In addition to these guidelines and manual, respective position papers have also been produced to assist the implementation of vector control by partners at all levels. For example, it is recommended that one LLIN should be used by two persons and distribution should be free-of-charge. Recognizing the sustainability of this pragmatic decision, a phased approach utilizing different channels of distribution has been recommended. In countries of the Region, the LLIN manual was field-tested in Sudan.

Working with industry, WHO has facilitated the field-testing of a number of products. For example, three LLINs (Olyset, Permanet and Interceptor) and one treatment (KOTAB 123) have interim approval by WHOPES. On the other hand, the evaluation of KOTAB 123 by WHOPES showed that it does not convert a net to an LLIN as was previously claimed. It is important to note that six other LLINs are currently under WHOPES evaluation (Netto, Hikking Group, Yarkool, Dawa Plus, Duranet, Netprotect), including one treatment with

lambda-cyhalothrin. Once evaluation of these products is completed by WHOPES, reports will be made available. Irrespective of the technology of LLINs (incorporated or coated), washing practices are important and it is therefore recommended that this practice is documented in the field.

Another important issue which most programmes are facing is on the decision of which LLIN to procure. For example, which is more cost effective — a 3 or 5–7 years life span LLIN. WHO recommends that in taking any decision, the distribution and replacement costs must be taken into consideration. It is also recommended that procurement of either insecticides or LLINs must be in line with WHO specifications, including physical properties.

Insecticide resistance is a major problem in countries of the Region. Reports on vector resistance to insecticides have recently been documented in Oman (*An.stephensi* to temephos), Morocco (*An. labranchiae* to DDT) and Sudan (*An. arabiensis* to pyrethroids). In addition to these countries, other countries have been encouraged to set up sentinel sites to monitor the development and spread of vector resistance and to include this activity in all funding. The biggest challenge is in the implementation of insecticide resistance management strategies. For example, the mosaic approach (e.g. pyrethroid on nets and non pyrethroid on walls) is a WHO-recommended resistance management strategy. Whereas combining IRS and ITNs/LLINs could, in essence, be effective in interrupting malaria transmission in holoendemic areas and serve as a strategy for managing resistance, the approach has not been tested and could pose a good operational research question. In the coming biennium, it is planned to field-test and document the approach of combining IRS and LLINs in Sudan and Yemen.

3.4 Feedback on malaria surveillance reports 2006

Dr Ghasem Zamani

The first request for submission of an annual surveillance report was made on 4 March 2007. However, a delay in submitting the requested report was observed and reports from two countries are still missing. The main problem encountered in the reports was inconsistency in the reported figures on the malaria burden and other indicators. Some malaria-free countries reported clinically diagnosed cases of malaria. Some countries with local transmission, or with imported malaria from countries with chloroquine-resistant *P.falciparum,* are using chloroquine for treatment of *faliciparum* malaria. In some reports, the number of reported parasitologically-confirmed cases is less than the reported *P.falciparum* and *P.vivax.* One country did not include imported cases from inside as local transmission. Reports on national medicines policy from some countries are inconsistent from one year to the next and in different reports. Unfortunately reports on pesticide usage included many problems: using trade names, missing the type of application and amount of the insecticide and reporting incorrect concentration. Pyrethroids are still used for larviciding in one country which is not in line with WHO recommendations.

Analysis of the reports shows that in 2006, 1 174 868 ITNs were distributed and the total reported allocated budget for malaria was US$ 83 million, of which 60% was from

national resources. Based on the reports US$ 136 million is needed for the malaria control programme in countries of the Region.

4. MALARIA CONTROL AND ELIMINATION: PROGRESS, CHALLENGES AND LESSONS LEARNT

4.1 Malaria burden

Reports on morbidity and mortality of malaria in the Region by country representatives are summarized in Table 1.

Table 1. Reported malaria burden in countries of the Region, 2006

Countries	Total	Autochthonous	Confirmed	PF	U5	Deaths	Clinical
Afghanistan	329 767	most	82 705	5998			247 062
Bahrain	70	0	70	14	4	0	
Djibouti	7708	most	1796	1796	5912	29	5912
Egypt	29	0	29	27		0	0
Iran, Islamic Republic of	15 909	13 127	15 909	1199	1273	1	0
Iraq	24	23	24	0		0	0
Jordan	116	2	116	27		0	0
Kuwait	235	0	235	112		0	0
Lebanon	42	0	29	28		1	
Libyan Arab Jamahiriya	10	0			0	0	
Morocco	83	0	83	69		2	0
Oman	443	0	443	100		0	0
Pakistan		most	127 894	37 837			
Palestine	2	0	2			0	0
Qatar	198	0	104	18			
Saudi Arabia	1278	269	1278	984	53	0	0
Somalia	49 256	most	16 430	16 430		58	32 826
Sudan (north)	2 789 404	most	589 138	2 733 616		1193	1 985 222
Sudan (south)		most	116 385				
Syrian Arab Republic	34	0	34	27		2	0
Tunisia	36	0	36	32		0	
United Arab Emirates	1663	0	1663	257	30	0	0
Yemen	217 270	most	55 000	53 971		73	162 270
Total	3 413 577	13 421	1 009 403	2 852 542	7272	1359	2 433 292

4.2 Malaria case management

Most *falciparum* malaria-endemic countries have functional sentinel sites for monitoring medicine efficacy. The results of the most recent studies are summarized in Table 2. Afghanistan, Pakistan, Somalia, Sudan and Yemen will have new studies in 2007 with WHO support.

Table 2: Results of medicine efficacy studies in countries of the Region 2006

Country	Monitored medicines	ACPR (%)	Remarks
Afghanistan	AS+SP	100	
Iran, Islamic Republic of	AS+SP	100	
	CQ+SP	97	
Sudan	AS+SP	100	Blue Nile state
		97	Gezira state
Sudan (south)	AS+SP	92.2	By MSF-H
	AS+AQ	92.7	By MSF-H
	AQ	80	By WHO and the Ministry of Health
	AS+AQ	94.8	By WHO and the Ministry of Health

All *falciparum*-endemic countries have updated their medicines policy and are implementing the new policy. First-line treatment in all countries is AS+SP except Sudan (south) which is AS+AQ. The majority of malaria-free countries in the Region have adopted ACTs for imported *falciparum* malaria. The medicine, artemether-lumefantrine, is being provided free-of-charge by the Regional Office.

Countries are facing some challenges for proper implementation of adopted new policies. Lack of reliable estimation of the malaria burden; over usage of the medicine where diagnosis is mainly undertaken on a clinical basis; sustainability of resources which are now mainly from GAFTM; coordination with the private sector and regulation of the market to prevent marketing of artemisinin monotherapy; and low-quality and counterfeit medicines are among common challenges in all high-burden countries. Differentiation between *vivax* and *falciparum* in countries such as Afghanistan and Pakistan, where *vivax* constitute the majority of malaria cases, is another challenge which needs innovative approaches for strengthening malaria confirmation either with malaria microscopy or RDTs. There is a pilot project in Afghanistan for expansion of malaria confirmation to the most peripheral health units and the community by introducing appropriate RDT for confirmation.

To increase the coverage of effective malaria treatment countries such as Sudan started pilot implementation of the home management of malaria. The results of these studies will be used to develop a sound national strategy for universal access to quality malaria diagnosis and treatment.

4.3 Vector control interventions and entomological surveillance

In 2006, countries supported by the Global Environmental Fund (GEF), including Djibouti, Egypt, Islamic Republic of Iran, Jordan, Morocco, Sudan, Syrian Arab Republic, and Yemen, developed their IVM strategic plan, plan of action and a proposal for demonstration sites for using alternatives to DDT. Afghanistan, which is not part of the GEF project, also developed its IVM strategic plan using United States Assistance for International Development (USAID) resources. The national malaria control programme in Pakistan is developing vector control policy and guidelines, mainly focused on IRS.

Based on the report of malaria mangers in Afghanistan, with the training of three entomologists, three sentinel sites will be established and entomological surveillance will start after 30 years. IRS is the main vector control intervention in the Islamic Republic of Iran, Iraq and Saudi Arabia that are targeting malaria elimination.

The reports of country representatives on the number of LLINs distributed in 2006 are as follows: Djibouti 18 750, Pakistan 240 000, Somalia 320 000, Sudan (south) 650 000, Sudan (north) 484 000, and Yemen 156 925.

4.4 Malaria monitoring and evaluation and surveillance system

The main challenge for the malaria control programme in Pakistan is estimating a reliable figure for the malaria burden. The presence of parallel reporting systems with different case definitions and different data collection methodologies has resulted in very different figures from different sources. Conduction of a malaria parasite survey has been planned for round 7 of GFATM to establish a baseline for the estimation of the malaria burden.

The objectives of the project in Somalia to monitor and evaluate the national malaria strategy are to establish sentinel sites for more precise monitoring and evaluation of the Somali national malaria strategy and to reassess the local malaria context. In this project three sentinel sites have been selected and the mapping and auditing exercise of health facilities, settlements, schools and water-points has begun. The first phase of the project started in the Gabiley district in the north-west zone of Somalia. This project is being implemented in collaboration with Kenya Medical Research Institute (KEMRI) and WHO with support from the GF.

The preliminary results of the first phase of the project shows that still Chloro Queen is being used in the nearly all health posts; 43% of health facilities charge for malaria treatment; only 28% of health facilities have national malaria guidelines; and less than 50% of health facilities have the first-line antimalarial treatment in stock.

The results of the Sudan household health survey in regard to monitoring and evaluation showed that only 18.1% of households in south Sudan have at least one ITN and that only 3.1% of children with a fever in the last two weeks had been treated with ACT.

In 2006, pilot implementation of the global malaria database in the Region was started in Yemen. This database will lead to consolidation of malaria information in one database. The malaria programme in Yemen has also started to collaborate closely with the health information department of the Ministry of Health for expansion of the usage of the geographical information system.

In the Islamic Republic of Iran, a web-based reporting system is being developed for the malaria programme in the country. This approach will provide a more reliable and up-to-date information system for implementation of an elimination strategy.

4.5 Partnership, resource mobilization and advocacy

A new approach for strengthening intersectoral partnership has been adopted in Pakistan with the establishment of a technical advisory committee with participation of meteorology, agriculture, environment, irrigation and other sectors, including private sector health care providers. With participation in Health Expo 2006, the malaria programme in Pakistan has attempted to look for new directions in terms of malaria advocacy.

Successful partnerships have been developed in Sudan with companies including CANAR telecommunication, investment banks and health insurance. In 2006, television and radio companies offered free airing of communication messages and exempted 75% of advertisement charges. More local resources have been made available at state and local levels and phase 2 of round 2 of the GFATM grant has been approved due to successful implementation of the first phase.

In south Sudan, the Roll Back Malaria (RBM) partnership has been strengthened and expanded through regular meetings and more constituents joining the existing technical groups in the different programme interventions. Resources were mobilized through the United Nations (UN) Common Humanitarian Fund, WHO, the Ministry of Health, USAID and others. Country Malaria Days have been held in Juba.

Intersectoral collaboration with agriculture and municipality, particularly for vector control interventions has been strengthened in the Jezan area of Saudi Arabia. To strengthen border coordination with Yemen a joint Saudi–Yemeni coordination committee on malaria control has been established. This committee will coordinate assessment, planning, implementation and monitoring of malaria control interventions in the bordering areas. According to the decision in the last meeting of this committee, the malaria treatment policy will be the same on both sides of the border with Yemen.

In 2006, Djibouti, Islamic Republic of Iran, Pakistan, Somalia, Sudan and Yemen submitted proposals for round 6 of the GFATM. Proposals form Somalia and Djibouti were approved. Other countries will submit for round 7.

4.6 Operational research

Ongoing operational research as reported by Sudan's malaria manger include: effectiveness of a volunteer-based strategy for malaria home management in areas with low access to health services; post-marketing surveillance of AS + SP, biology, ecology and behaviour of *A.Arabiensis* under semi-field conditions; efficacy of AS+MQ in the treatment of uncomplicated *P.falciparum* malaria and monitoring the efficacy of ACTs in different states.

In the Islamic Republic of Iran, operational research studies were mainly concentrated on entomology and vector control, which include study on the existing situation of human blood preference of malaria vectors in malaria-endemic areas and evaluation of residual efficacy of Ficam WP 80%, Deltamethrine WG 25% and Sulfac WP 10% on malaria vectors in Sistan and Baluchestan.

5. IMPLEMENTATION OF MALARIA ELIMINATION: ACHIEVEMENTS, CHALLENGES AND LESSON LEARNT

In Morocco, at the beginning of the twentieth century, annually more than 300 000 malaria cases were reported with high mortality. The development of the malaria control strategy has been analysed for four periods: before 1955, from 1956 to 1972, from 1973 to 1998 and from 1999 to 2006. The first period is known by its high incidence of malaria as one of the main public health problems with high *falciparum* proportion. The main objective of the malaria control programme during this period was the protection of workers of infrastructure and agriculture development projects and control of malaria in urban and periurban areas. At the end of this period hyperendemic malaria disappeared and malaria transmission was limited to scattered foci.

The beginning of the period from 1956 to 1972 is marked by the country gaining its independence and the departure of most French health professionals which created a vacuum in the health system. Strengthening the malaria control programme, particularly in rural areas and intensive training programmes were the main objectives of this period. Active and passive case detection, chemotherapy (presumptive, radical and consolidation treatment according the adopted therapeutic scheme) of malaria detected cases, vector-control methods and intersectoral collaboration, community participation and health education were the main approaches. As a result, the incidence rate dropped from 11.37 to 0.47 per 1000 population and the proportion of *Plasmodium falciparum* proportion was 0.8%.

From 1973–1998, the malaria control strategy was mainly based on intensive case detection epidemiological investigation, chemotherapy, intensive indoor residual spraying with DDT WP 75% (2 or 3 cycles) in all areas with active transmission and vector control in breeding sites by using the new products and abandoning fuel and intensification of all the others methods. In 1973 the last indigenous case of *P.falciparum* was detected. At the end of this period only 128 cases of malaria were reported.

With the inception of RBM, Morocco targeted malaria elimination by 2002. In this strategy a stratified approach was selected with emphasis on high-risk areas for detection and treatment of cases, entomological surveillance, vector control interventions and strengthening vigilance to prevent resumption of indigenous malaria transmission. As a result of the successful implementation of this strategy the last indigenous case was reported in 2004.

6. UPDATES ON RAPID DIAGNOSTIC TESTS

6.1 Technical updates on ACTs and RDTs

Dr Andrea Bosman

Seventy malaria-endemic countries (91%) have adopted ACTs and 45 countries are in the process of implementing it. In 2006, procurement of ACTs increased to 82.7 million treatment courses. It is estimated that this figure will be increased to 150 million treatment courses in the current year. Two fixed-dose combinations namely AS+AQ and AS+MQ will be marketed by the Drugs for Neglected Diseases Initiative in 2007. DHA-PPQ, CD-AS (CDA), Pyronaridine-As (Pyramax), Paediatric Coartem are expected to be introduced in the market in 2008 as medicine for malaria.

No treatment failure due to artemisinin resistance has been documented. However, there were reports of decrease of invitro sensitivity in China and Viet Nam in the late 1990s and decreasing sensitivity in reports from Bangladesh, western and eastern Thailand and Cambodia in association to medicine pressure. In vitro cross-sensitivity and synergy among artemisinin and amino-alcohols are other clues to the possible development of resistance to artemisinins. *P.falciparum* resistance to artemisinin is unstable but reappears rapidly after re-exposure to medicine pressure.

More than 50% of known pharmaceutical companies will comply with WHO recommendations on the ban of oral artemisinin monotherapy. Main funding agencies including: WHO, UNICEF, GFATM, World Bank, IDA Foundation and Missionpharma responded to the WHO ban by removing these medicines from their catalogue and stopping funding of procurement; 32 out of 76 countries have implemented this WHO recommendation.

Malaria microscopy is the gold standard for malaria confirmation. Parasite density, species diagnosis, monitoring the response to treatment, and evaluation of performance of RDTs in the field only can be done by malaria microscopy. Lower capital costs and infrastructure, less training required, lower maintenance costs, and rapid, (accurate) diagnosis in remote areas are advantages of RDTs. RDTs offer benefits for the management of malaria and non-malaria fever if accuracy is maintained, and can be demonstrated and users and patients act appropriately on results. It is necessary to be cautious while using RDTs as they detect antigen, not parasites degrade by excessive heat, have a limited shelf life, and accuracy is dependent on the technique used. This is probably not happening in most cases now.

Figure 1 shows the algorithm of case management by *P. falciparum* and combo RDT.

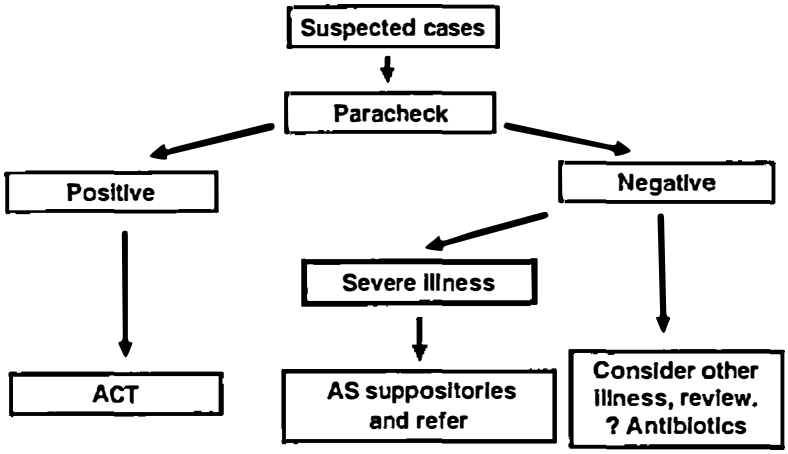

Figure 1. Algorithm of case management by *P. falciparum* and combo RDT

6.2 Challenges and lesson learned from RDT implementation in Somalia

Dr Waqar Butt

Medicines Sans Frontiers (MSF)-H introduced RDT in southern Somalia in 2004. In the newly-developed malaria control strategy in Somalia, ACTs was adopted as the first line for treatment of *falciparum* malaria. To prevent over diagnosis and improper usage of the medicine, confirmation either by malaria microscopy or RDTs was made mandatory. At the first stage, distribution of ACT and RDT was started at hospital and maternal and child health care level in April 2006. Introduction of RDTs and ACT is in under pilot study at health post level. For the monitoring of RDT and ACT usage a new system for data collection using tally and consumption sheets was developed and hospital and maternal and child health staff trained.

Initially, RDT was well accepted by the staff of health facilities although acceptance in the north-west and north-east zones diminished when the positive rate of RDT declined dramatically. Some health staff complained that the community were not happy with the negative results provided by the hospital and maternal and child health staff. The situation occasionally becomes more complicated when the private sector provides positive results to the same patient and uses this as propaganda.

There are some challenges that prevent proper usage of RDTs, including: lack of storage facilities, particularly in areas with high temperatures and humidity and no electricity; timely supply of ACT and RDT; insufficient monitoring and supervision; and the diminishing acceptance of health staff and the community.

6.3 Experience of using RDTs in the Regional Office for the Western Pacific

Dr J. Luchavez

The results of field trials in the Philippines show that sensitivity and specificity for *P.falciparum* of different kinds of RDTs varies from 15.1% to 61%, and 62.6% to 95% respectively. In a review of published studies, sensitivity of "ICT malaria" and "optimal" varies from between 42.6% and 95%.

The exposure of RDTs to high temperatures has been demonstrated with temperature monitoring during RDTs transport and storage in Afghanistan and Cambodia. RDT performance can be adversely affected at the temperatures to which they will be exposed when transported to, and used in, the rural tropics.

There is a wide variation in blood collection and transfer devices in RDTs. In a study, four different kinds of blood collection and transfer devices were assessed for their consistency, accuracy and ease of use in the hands of laboratory technicians and village health workers. Based on the results of this study, as long as sufficient volume is transferred and the strip is not flooded, the volume of transferred blood is not usually critical to the RDT result. This study showed that ease of use and health worker training, including blood safety, are the most important aspects of the blood-handling issue.

Using RDTs for diagnosis at community level will shorten the delay between the onset of symptoms and the beginning of appropriate treatment. It will also slow development of resistance and lead to significant savings in cost by avoiding the unnecessary use of antimalarials. However, achieving a high level of sensitivity and specificity with RDTs in this context will require a product designed, labelled, and explained so that community health workers can use it accurately with minimal formal training and supervision.

In partnership with the WHO Regional Office for the Western Pacific, the quality assurance project carried out quality-design research in the Philippines and the Lao People's Democratic Republic to develop and test a generic RDT job aid, mainly pictorial, that could be adapted with little modification for use with different RDT products and in different cultural settings by health workers with low literacy skills and with little or no prior training in product use.

The result of the project shows that by using the manufacturer's instructions, performance was far below any acceptable levels. By using the improved job aid, most groups were able to significantly improve performance, although the job aid even with an hour orientation given to one group—did not seem to affect correct performance of certain steps. The steps that remained below acceptable levels were: checking the expiration date; checking for exposure to humidity; and waiting for 15 minutes before reading test results. However, participants using the improved job aid were able to complete the test with near acceptable precision when these two steps (checking for expiration date and humidity) were removed from analysis.

The issue of waiting a full 15 minutes before interpreting test results is more problematic. Early reading of the test results would tend to decrease test sensitivity (more false negatives), meaning that more patients with malaria infections would remain undiagnosed and, presumably, untreated. The manufacturer should be consulted about what, if any, tolerance exists in the 15-minute waiting period. If such studies have not been carried out, it will be important to determine the minimum wait necessary to ensure maximum test sensitivity. Still, a change in product design or issuing of timers may be necessary to ensure compliance with the 15-minute wait before reading. Job aids are available now for common products, including a panel of tests for interpretation (available in the WHO RDT website).

To overcome the problem of limited access to health services due to distance, geographic location, lack of facilities and poverty, using the GFATM grant for expanding malaria diagnosis and treatment at community level has been started in 16 provinces in the Philippines by: the establishment of village microscopy centres and RDT sites, the establishment of RDT sites include development of guidelines, and the selection of RDT sites and the selection of RDT village workers with one-day training using a standard curriculum. The selection and number of RDT sites (villages) was made by the district health officer, in coordination with the village leaders. Criteria includes: (1) extremely remote endemic localities where microscopy services are not available within 3 hours of travel by any form of transportation or walking: and, (2) places with a very low catchment population (60 cases per week).

Many challenges influenced the implementation of the above project, and these challenges included:

- the criteria for remoteness are not always followed, role of malaria incidence rates/API and/or the DOH malaria risk stratification not clear;
- most health workers with RDTs did not have malaria first-line medicines;
- some health workers with RDTs perform active case detection including school surveys, particularly in low prevalence areas;
- not all villagers were aware of the existence of new diagnostic services in their community, and some became surprised of the new role of health workers in diagnosis and dispensing of medicines;
- re-supply system (reporting, request for re-supply, procurement/supply, stocks and distribution channels) for laboratory supplies (including RDTs) and medicines seemed not yet established and responsibilities were not sufficiently clear;
- a rural health unit medical technician supervises health workers but procedures, checklists and standard reporting forms do not yet exist;
- RDT storage is not optimal in some cases with quality assurance at peripheral level;
- sustainability of funding is questionable.

6.4 Introduction of the guidelines *How to use RDTs*
Dr Andrea Bosman

The guidelines *How to use RDTs* for the training of community and other health workers were developed based on the experience of training peripheral health workers in the

Philippines and in Zambia and provide a detailed training plan for a short course, identifies materials and resources for the course and includes useful tips and answers to frequently asked questions. The manual for combo tests is under preparation.

The guidelines place emphasis on blood safety, including the use and disposal of gloves; sterile lancet or sterile hypodermic needle for finger-pricking; availability of 2–3 initial doses of antiretroviral post-exposure prophylaxis to reduce HIV/AIDS risks if someone is pricked by a used lancet; and availability of sharps disposal bins. The guide includes useful annexes which provide: frequently asked questions, a sample job aid, two sample test sets with photos of actual RDTs, RDT interpretation chart for *P. falciparum* only and combo tests (*P.falciparum* + pan-malaria antigens).

Based on experiences from implementation of this guide, some points should be more highly emphasized i.e. any visible test line, even if very faint, indicates a malaria-positive test; attention to product specificity of certain parameters, e.g. drops of buffer and time before reading the test and capillary tube can fail to deliver blood if contact with absorption pad is interrupted.

6.5 Estimation of needs and procurement of RDTs

Dr Andrea Bosman

Production of RDTs increased from 2.8 million tests in 2000 to 28.25 million in 2005. The first step for estimation of RDT needs is to have a plan for the oduction of RDTs and to take decisions on the area, level and sectors targeted for implementation of RDT or microscopy.

In order to quantify requirements for the public sector, it is necessary to:

- define the target area, number of health facilities and level of care where RDTs will be deployed (hospitals, health centres, dispensaries, health units, health posts and community providers);
- consider if the number of health facilities will be increasing or decreasing in the time-frame of the quantification (e.g. health sector development plan);
- provide estimates of expected variations in attendance of health facilities after introduction of the new malaria treatment policy, pricing of medicines and access to new diagnostic services;
- RDT public sector demand for target area = (number of reported malaria cases—number of blood examinations for malaria) divided by proportion of health facilities reporting malaria cases;
- adjust the overall requirements to the operational plan, reflecting changes of coverage over time.

It is expected that WHO prequalification will be finalized in 2008. At this stage the quality of RDTs should be assured by good procurement practice of stable tests from reliable manufacturers, establishing air conditioned storage with lot quality control testing, monitoring

at sentinel sites versus microscopy and using carefully prepared and implemented appropriate instructions.

At the time of RDT procurement the following items should be requested from manufacturer: temperature-stability data, evidence of accuracy from the data of a good field trial, evidence of viability of manufacturer, evidence of good manufacture QA (ISO131 485:2003), sample products to test for ease of use, training, etc. and agreement for replacement of failed product. Request for appropriate packaging and staggered delivery of single orders will facilitate logistic management of the procurement.

In areas where both *falciparum* and *non-falciparum* malaria are prevalent, combo tests are indicated to distinguish *P.falciparum* from *non-falciparum* malaria. The other possible option i.e. use of tests which detect *P. falciparum* only and treating all RDT-negative patients with chloroquine will reduce the advantage of RDTs in recognizing non-malaria illness and could result in a loss of confidence in the reliability of RDT results by health workers and patients.

6.6 Announcement of the forthcoming malaria microscopy course in Oman

Dr Majed S. Al-Zedjali

After an evaluation mission in 2005, preparation work for the implementation of the first international course on advanced malaria microscopy and quality assurance including construction, procurement of the equipment and maintenance started. The training course 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 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%. The first course will be conducted from 1 to 30 of November in Muscat, Oman. Entry requirements for the course include: good command of written and spoken English; diagnostic competence at high levels of accuracy; experience in supervising a malaria laboratory; and experience in organizing and running national training in malaria microscopy at a basic level.

7. MALARIA SUPPORT BY THE ISLAMIC DEVELOPMENT BANK

Dr B. Sallam

The objective of the Islamic Development Bank malaria initiative is to support the efforts of concerned governments in achieving the targets of the Millennium Development Goals (MDGs) through a significant reduction of malaria morbidity and mortality by 2010. This initiative is based on a holistic approach for partnership building and intercountry cooperation for implementation of cost-effective malaria control interventions.

In sub-Saharan Africa, 20 out of 25 IDB member countries are malaria endemic, of which 10 have been selected to participate in the malaria initiative in the first phase. From the Region, Sudan has been selected for supporting a central malaria-free zone based on

expansion of the Khartoum Malaria Free Initiative to the neighbouring states of Gezira, River Nile and While Nile. The four target states host 42.5% of the population living in northern Sudan, including the capital city, IDPs and large-scale economic development projects. The cost of the IDB malaria project in Sudan is US$ 17.05 million.

8. ECO-EPIDEMIOLOGY OF *VIVAX* MALARIA IN COUNTRIES OF THE REGION

Dr A. Beljaev

P.vivax and *P.falciparum* have a number of common traits: both are transmitted by *Anophelines*, infect hepatocytes, infect erythrocytes and cause fever and anaemia. However, there are striking differences in life cycle, parasitology, clinical presentation, immunity and epidemiology. In *P.vivax*, in addition to a direct, fast development: sporozoite-exo-erythrocytic schizont (same as in *P.falciparum*) there is an indirect development pathway in hepatocytes with a hold for several months: sporozoite-hypnozoite-exo-erythrocytic schizont. *P.vivax* has a slower tempo of development with less merozoites produced in both erythrocytic and extra erythrocytic schizonts. No sequestration of parasitized erythrocytes occurs and gametocytes develop at the same pace as asexual forms. In *vivax*, synchronization of development of asexual forms is more marked.

Clinical presentation of *vivax* malaria is dramatic, scaring, but with short paroxysms which is in contrast to a gradual but continuous progress into a severe state in *falciparum* malaria. Between paroxysms the patient feels quite well. Usually, the patient knows the time of the next attack, there is no systemic organ failure or long-lasting sequelae. This disease is non-fatal, as a rule, but not necessarily mild. The overall duration of infection is longer than in *P.falciparum.*

In *P.vivax*, acquired immunity develops faster and pyrogenic threshold is lower. The clinical manifestations start at a very low parasitaemia i.e. 1–2 per 100 fields versus 1–2 per 1 field in P.*falciparum.* Parasitaemia is of a shorter duration and most of the overall time of the infection is due to a single infective bite, blood is parasite-free. Some population factors affects susceptibility to *P vivax.* In most of the Afrotropical region, Duffy-negative populations are unable to maintain existence of *P.vivax* and G6PD-deficient individuals are less susceptible to this parasite.

For treatment of *vivax* malaria, in addition to the shcizontocidal treatment, antihypnozoite treatment is required and there is no need for antigametocyte treatment. Resistance, if any, builds up slowly although there are some reports of tolerance to primaquine. A patient with *vivax* malaria is infective to mosquitoes from the very beginning. Extrinsic development requires lower temperatures, sporogony takes less time and transmission season is longer than *P.falciparum.* In *P.falciparum, the* peak of transmission is at the end of the summer because it requires higher temperatures. In *P.vivax* there are often two peaks that may partly overlap: spring and summer. The spring peak is the result of the transmission during the previous season (activation of hypnozoites).

Vivax malaria re-emerges easier than *falciparum* malaria. Reintroduction may be in the form of remote metastases unlike in *falciparum* malaria, where it spreads like an oil spot. The features that may hinder the control of *vivax* malaria include: a longer duration of infection; undetectable infection during the latency; infectivity of the cases right from the outset; relatively low temperatures required for development in mosquitoes; and ability to infect different species of the vector. However, sensitivity of gametocytes to medicines, the short life span of mature gametocytes and the very slow development of medicine resistance may help to control *vivax* malaria.

9. REGIONAL EXPECTED RESULTS AND KEY ACTIVITIES FOR MALARIA AND VECTOR CONTROL, 2008–2009

Dr Hoda Atta

The regional expected results are as follows:

- Endemic countries have provided universal access to reliable malaria laboratory diagnosis and effective, quality assured and safe antimalarial treatment.
- All malaria-endemic countries have applied effective preventive measures against malaria for populations at risk.
- Endemic countries have supported capacity strengthening of the malaria control programme at all levels and established effective partnerships with all relevant agencies and have mobilized resources.
- Countries/areas, where interruption of malaria transmission is feasible, have developed and implemented a malaria elimination strategy.
- Countries have been enabled to prevent, detect and control malaria epidemics.
- Malaria surveillance, the monitoring and evaluation system and operational research have been strengthened.

10. RECOMMENDATIONS

Member States

1. Take the necessary action to include medicines for artemisinin-based combination therapy (ACT) in the essential medicines list and ensure free-of-charge provision to malaria patients.

2. Update national treatment guidelines for the management of imported malaria cases in line with the WHO treatment guidelines, 2006.

3. Develop a comprehensive strategy for the diagnosis of malaria, with a clear indication of the role and levels of use of microscopy and rapid diagnostic tests (RDTs), noting that microscopy is the recommended diagnostic method for parasitological confirmation of malaria.

4. Use microscopy for confirmation of malaria diagnosis in malaria-free countries and countries targeting malaria elimination.

5. Establish a quality assurance system to ensure proper procurement, storage, transport and usage of RDTs.

6. Provide complete, accurate and timely annual malaria surveillance reports to the Regional Office.

7. Exempt insecticide-treated nets (ITNs) and long-lasting insecticidal nets (LLINs) from import taxes, and procure only ITNs and LLINs approved by WHOPES.

8. Include resources for fellowships in medical entomology and vector control in budgets as a priority.

WHO Regional Office

9. Strongly advise, in coordination with local health authorities, other partners to discontinue the provision of chloroquine for the treatment of *falciparum* malaria and to provide ACT instead.

10. Play a leading role in seeking to ban the procurement of oral artemisinin monotherapy by all providers.

11. Adapt the global malaria database to address specific needs according to the different epidemiological situation of countries, with specific attention to countries targeting malaria elimination.

12. Support countries to strengthen the capacity of health workers, including community health workers, for appropriate use of RDTs.

13. Provide technical and financial support to conduct malaria coverage and parasite prevalence surveys in high-burden countries, including the development of survey guidelines.

14. Ensure effective functioning of the regional network on insecticide resistance and provide technical support on issues related to capacity-building, monitoring and adoption of resistance management strategies.

15. Support countries to conduct training on the general supervision of interventions and on the reporting of data on insecticides used, including types and amounts.

16. Continue to support cooperation among countries within the Region and in other WHO Regions in initiatives aiming at malaria control and elimination.

17. Organize a workshop to strengthen resource mobilization skills among national malaria programme managers.

18. Continue to support countries in the process of certification of malaria elimination.

19. Include malaria elimination and prevention of its re-introduction on the agenda of the next Regional Committee meeting.

Annex 1

AGENDA

1. Opening session
2. Objectives and expected outcomes of the meeting
3. Global malaria programme in 2006: progress and the way forward
4. Progress of malaria control/elimination in the Region at regional and national level
5. Follow-up on the implementation of the recommendations of the 2006 meeting
6. Report on the implementation of IVM for scaling up vector control interventions and progress of the GEF project
7. Report and discussion on the certification of malaria-free status in the United Arab Emirates
8. Update on using RDTs and its quality assurance and supply chain management
9. Review of resource mobilization activities and partnership with the Global Fund, IDB, GCC, GEF and other partners
10. Presentation of the WHO expected results for 2008–2009 and country-specific plans of action, including priority activities for WHO support
11. Recommendations
12. Closing session

Annex 2

PROGRAMME

Sunday, 10 June 2007

08:30–09:00	Registration	
09:00–10:00	Opening session	
	• Recital from the Holy Quran	
	• Address by H.E. Mr Hamid Mohamed Obeid Kattami, Minister of Health	*Dr Z. Hallaj* *Dr M. Fekry*
	• Message from Dr Hussein A. Gezairy, WHO Regional Director for the Eastern Mediterranean	
	• Summary on the declaration of United Arab Emirates as a malaria-free country and how to keep it so	
	Global malaria programme in 2006 Objectives of the meeting and method of work nomination of officers	
10:00–10:20	GMP: progress and way forward for malaria control and elimination	*Dr A. Bosman*
10:20–10:40	Progress of malaria control/elimination in the Region	*Dr H. Atta*
10:40–11:00	Implementation of IVM for scaling up vector control interventions and progress of the GEF project	*Dr G. Zamani*
	Certification of malaria elimination	
11:00–11:20	Malaria-free status in United Arab Emirates: What has been achieved and how it will be maintained	*Dr M. Fekry*
11:20–11:40	Process of certification of malaria-free status in United Arab Emirates	*Dr W. Wernsdorfer*
11:40–12:00	Film (malaria control in UAE)	
	Malaria control in high burden countries: progress, challenges and lessons learnt	
12:00–13:00	Afghanistan Challenges for ACT implementation with *P.vivax* as the dominant species – Development and implementation of capacity development plan	*Dr A. Asha*
	Djibouti Preparation for implementation of R6 GFATM grant	*Dr Mouna Osman*

	Pakistan	*Dr Faisal Mansoor*
	Addressing the challenges facing malaria control in Pakistan-Summary of gap analysis	
	Discussions	
14:00–15:00	Somalia	*Dr H. Elmi*
	Monitoring of malaria through sentinel district approach	*and* *Dr W. Butt*
	Sudan (north and south)	*Dr T. Abdelgader*
	North: Overcoming challenges for implementation of ACTs and ITNs	*Dr O. Thabo Ojamen*
	Yemen	*Dr A. Al Aqel*
	Planning, implementation and monitoring of IRS interventions	
15:00–15:15	Discussions	
	Implementation of malaria elimination: achievements, challenges and lesson learnt	
15:30–16:00	Islamic Republic of Iran	*Dr A. Raeisi*
	How to address the steady state of malaria transmission in the Islamic Republic of Iran	
	Iraq	*Dr Q. Al Salihi*
	Implementation of malaria elimination in complex emergency situation	
	Saudi Arabia	*Dr S. Alfaify*
	Progress towards malaria elimination and management of cross-border transmission	
16:00–16:15	Discussions	
16:15–16:30	Lessons learnt from malaria elimination in Morocco	*Dr M. Laaziri*
16:30–16:45	Poster session	*Poster presentations*
	Key points and conclusions from poster presentations on measures for prevention of reintroduction of malaria in all other malaria-free countries, (Bahrain, Egypt, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Palestine, Qatar, Syrian Arab Republic and Tunisia)	*Plenary session*
16:45–17:00	Closure of Day 1	

Monday, 11 June 2007

	Rapid diagnostic tests	
09:00–09:40	Technical updates on ACTs and RDTs	*Dr A. Bosman*
09:40–10:00	Country experiences: challenges and lesson learned from RDT implementation in Somalia	*Dr W. Butt*
10:00–10:30	Experience of using RDTs in WPRO	*Dr J. Luchavez*

10:45–11:15	Discussions	
11:15–11:30	Introduction of guidelines "*How to use RDTs*"	*Dr A. Bosman*
11:30–13:00	Practical session for performing a rapid diagnostic test and reading the test results	*Drs Luchavez and Dr A. Bosman*
14:00–14:45	Quality assurance of RDTs	*Dr J. Luchavez*
14:45–15:15	Estimation of needs and procurement of RDTs	*Dr A. Bosman*
15:15–15:45	Discussions	
15:45–16:00	Announcing the forthcoming malaria microscopy course in Oman	*Dr M. Al Zedjali*
16:15–16:45	Updates on vector control interventions in malaria endemic and malaria-free status	*Dr H. Atta*
16:45–17:00	Film on vector control in the United Arab Emirates	
17:00–17:15	Feedback on malaria surveillance reports 2006	*Dr G. Zamani*
17:15–17:30	Closure of day 2	

Tuesday, 12 June 2007

09:00–09:20	Eco-epidemiology of *vivax* malaria in countries in the Region	*Dr A. Beljaev*
09:20–09:30	Discussions	
	Priority actions for malaria and vector control, 2008–2009	
09:30–09:45	Regional expected results and key activities for 2008–2009 for malaria and vector control	*Dr H. Atta and Dr A. Mnzava*
09:45–10:00	Introduction to group work	*Dr G. Zamani*
10:00–13:00	Country priority activities for WHO support 2008–2009	*Group work*
13:00–13:30	Conclusions and recommendations and closing session	

Annex 3

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